RESEARCH ARTICLE

MHD Free Convection Flow and Mass Transfer of a Dissipative Fluid over a Vertical Porous Plate with Thermal Conductivity and Viscosity Depending on Temperature

Rasool Alizadeh*, Komeil Rahmdel and Babak Kalali

Department of Mechanical Engineering, Quchan Branch Islamic Azad University, Quchan, Iran.

*Address for correspondence
Rasool Alizadeh
Department of Mechanical Engineering,
Quchan Branch Islamic Azad University,
Quchan, Iran.
E-mail: r_alizadeh86@yahoo.com

ABSTRACT

This paper presents a numerical analysis of the MHD free convection flow and mass transfer of a dissipative fluid along a vertical porous plate with thermal conductivity and viscosity depending on temperature and mass transfer, the surface of which is exposed to a constant heat flux. The non-linear system of partial differential equations is numerically solved by the implicit finite difference scheme of Crank–Nicolson's type. Velocity, temperature and concentration profiles, local skin-friction, local Nusselt and local Sherwood numbers are plotted for air. The influence of the Suction rate parameter, buoyancy ratio parameter, dissipation number, viscosity variation parameter, thermal conductivity variation parameter, Schmidt number and magnetic parameter on heat and mass transfer are discussed.

Keywords: thermal conductivity and viscosity depending on temperature, MHD free convection, dissipative fluid, Mass transfer, porous plate.

INTRODUCTION

In recent years MHD free convection flow of a dissipative fluid problems have become in view of its significant applications in industrial manufacturing processes such as plasma studies, petroleum industries Magneto-hydrodynamics power generator cooling of clear reactors, boundary layer control in aerodynamics. Many authors have studied the effects of magnetic field on mixed, natural and force convection heat and mass transfer problems. Buoyancy is also of importance in an environment where differences between land and air temperatures can give rise to complicated flow patterns. Magnetohydrodynamic has attracted the attention of a large number of scholars due to its diverse applications. In astrophysics and geophysics, it is applied to study the stellar and solar structures,

Rasool Alizadeh *et al.*

interstellar matter, radio propagation through the ionosphere etc. In engineering it finds its application in MHD pumps, MHD bearings etc. Convection in porous media has applications in geothermal energy recovery, oil extraction, thermal energy storage and flow through filtering devices .The phenomena of mass transfer is also very common in theory of stellar structure and observable effects are detectable, at least on the solar surface. The study of effects of magnetic field on free convection flow is important in liquid-metals, electrolytes and ionized gases. The thermal physics of hydromagnetic problems with mass transfer is of interest in power engineering and metallurgy.

Numerous works have studied this problem, the first of which, Pohlhausen [1], did not consider viscous dissipation but obtained a solution employing the integral method. Harris et al. [2] investigated the transient free convection from a vertical plate when the plate temperature is suddenly changed, obtaining an analytical solution (for small time values) and a numerical solution until the steady-state is reached. Polidori et al. [3] proposed a theoretical approach to the transient dynamic behaviour of a natural convection boundary-layer flow when a step variation of the uniform heat flux is applied, using the Karman–Pohlhausen integral method. Other authors studied the effect of the surface temperature oscillation [4,5]. Kassem [6] solved the problem for unsteady free-convection flow from a vertical moving plate subjected to constant heat flux. Gebhart [7] was the first to study who studied the problem taking viscous dissipation into account and this author defined the non-dimensional dissipation parameter. Takhar and Soundalgekar [8] studied the effect of a harmonic oscillation in the plate temperature in the form of a travelling wave convected in the direction of the free-stream of viscous incompressible fluids. Pantokratoras [9] solved the problem in a stationary situation using the finite-difference method, with isothermal and uniform flux boundary conditions in the wall, taking into account viscous dissipation. Soundalgekar et al. [10] solved the transient problem with an isothermal vertical wall. When heat and mass transfer occurs simultaneously, it leads to a complex fluid motion (the combination of temperature and concentration gradients in the fluid will lead to buoyancy-driven flows). This problem arises in numerous engineering processes, for example, biology and chemical processes, nuclear waste repositories and the extraction of geothermal energy. Soundalgekar and Ganesan [11] solved the problem of transient free convection with mass transfer on an isothermal vertical flat plate. Gokhale and Samman [12] studied the effects of mass transfer on the transient free convection flow of a dissipative fluid along a semi-infinite vertical plate with constant heat flux. They obtained many conclusions concerning the effect of the variations of the different non-dimensional parameters that defined the problem on the time required to reach the steady-state. When the presence of a uniform magnetic field is considered, a new problem can be studied, "Unsteady free convection MHD with coupled heat and mass transfer". This problem has attracted the interest of many researchers in view of its application in astrophysics, geophysics fluid dynamics and engineering. Shanker and Kishan [13] studied the effects of mass transfer on the MHD flow past an impulsively started infinite vertical plate with variable temperature or constant heat flux. Ganesan and Rani [14] solved the unsteady free convection flow over a vertical cylinder under the influence of a magnetic field problem, without taking into account the viscous dissipation. Hossain et al. [15] considered surface temperature oscillations, using three different methods, including perturbation and asymptotic methods, the local non-similarity method and an implicit finite-difference method. Aboeldahad and Elbarbary [16] employed a numerical solution using a fourth-order Runge–Kutta scheme to study the Hall effects on the heat and mass transfer. the natural convection flow of a conducting visco-elastic liquid between two heated vertical plates under the influence of transverse magnetic field has been studied by Sreehari Reddy et al [17]. Suneetha et al.[18] have analyzed the thermal radiation effects on hydromagnetic free convection flow past an impulsively started vertical plate with variable surface temperature and concentration is analyzed by taking into account of the heat due to viscous dissipation. Recently Suneetha et al. [19] studied the effects of thermal radiation on the natural conductive heat and mass transfer of a viscous incompressible gray absorbing-emitting fluid flowing past an impulsively started moving vertical plate with viscous dissipation. Very recently Hiteesh [20] studied the boundary layer steady flow and heat transfer of a viscous incompressible fluid due to a stretching plate with viscous dissipation effect in the presence of a transverse magnetic field.

The object of the present paper is to study the thermal conductivity and viscosity depending on temperature effects on the transient free convection flow and mass transfer of an incompressible dissipative viscous fluid past a vertical

Rasool Alizadeh *et al.*

porous plate, under the influence of a uniform transverse magnetic field in the presence of constant heat flux. The dimensionless governing equations are solved by using the implicit finite difference scheme of Crank–Nicolson's type.

Mathematical model

Consider the free convection flow and mass transfer of a dissipative fluid over an infinite vertical porous plate with constant heat flux and thermal conductivity and viscosity depending on temperature (Fig.1) under the action of a transverse magnetic field. Under these assumptions and Boussinesq's approximation, the flow is governed by the following system of equations:

Continuity equation:
$$\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} = 0 \tag{1}$$

Momentum equation:
$$\frac{\partial u}{\partial t} + u\frac{\partial u}{\partial x} + v\frac{\partial u}{\partial y} = \frac{1}{\rho}\frac{\partial}{\partial y}\left(\mu\frac{\partial u}{\partial y}\right) + \beta g\left(T - T_\infty\right) + \beta^* g\left(c - c_\infty\right) - \frac{\sigma B_0^2}{\rho}u - \frac{\mu}{\rho K}u \tag{2}$$

Energy equation:
$$\frac{\partial T}{\partial t} + u\frac{\partial T}{\partial x} + v\frac{\partial T}{\partial y} = \frac{1}{\rho c_p}\frac{\partial}{\partial y}\left(k\frac{\partial T}{\partial y}\right) + \frac{\mu}{\rho c_p}\left(\frac{\partial u}{\partial y}\right)^2 \tag{3}$$

Mass equation:
$$\frac{\partial c}{\partial t} + u\frac{\partial c}{\partial x} + v\frac{\partial c}{\partial y} = D\frac{\partial^2 c}{\partial y^2} \tag{4}$$

Where u and v are components of the velocity in x and y directions, respectively, υ is the kinematic viscosity, $\mu(T)$ is the viscosity of the fluid depending on the fluid temperature T , $k(T)$ is the thermal conductivity of the fluid depending on the fluid temperature T, β is the volumetric coefficient of thermal expansion, β^* is the volumetric expansion coefficient for mass transfer , g is the acceleration due to gravity, ρ is the density, σ fluid electrical conductivity, B_0 is magnetic induction, α is fluid thermal diffusivity, c_p is specific heat at constant pressure, T is the temperature, T_∞ is the temperature of the fluid far away from the plate, C is the concentration, C_∞ is the concentration far away from the plate and D is the molecular diffusivity.

Out of the many forms of thermal conductivity variation, which are available in the literature, we will consider only following form proposed by Rahman et al [21], as follows:

$$k_f = k_\infty\left[1 + \delta^*\left(T - T_\infty\right)\right] \tag{5}$$

Where k_∞ is the thermal conductivity of the ambient fluid and δ^* is defined as follows

$$\delta^* = \frac{1}{k_f}\left(\frac{\partial k}{\partial T}\right)_f \tag{6}$$

Rasool Alizadeh *et al.*

Out of the many forms of viscosity variation, which are available in the literature, we will consider only following form proposed by Charraudeau [22]

$$\mu = \mu_\infty \left[1 + \gamma^* \left(T - T_\infty \right) \right] \qquad (7)$$

Where μ_∞ is the viscosity of the ambient fluid and γ^* is defined as follows:

$$\gamma^* = \frac{1}{\mu_f} \left(\frac{\partial \mu}{\partial T} \right)_f \qquad (8)$$

Here f denotes the film temperature of the fluid.

The necessary boundary conditions are:

$$u = 0 \;,\; v = 0 \;,\; T = T_\infty \;,\; c = c_\infty \text{ at } \quad t = 0$$

$$u = 0 \;,\; v = 0 \;,\; T = T_\infty \text{ at } \quad x = 0$$

$$u = 0 \;,\; v = -V_0 \;,\; -k \frac{\partial T}{\partial y} = q_w \qquad \text{at} \quad y = 0 \qquad (9)$$

$$u = 0 \;,\; T \to T_\infty \text{ at } \quad y \to \infty$$

Now introduce the following non dimensional quantities:

$$U = \frac{uL}{\upsilon_\infty Gr^{\frac{1}{2}}} \;,\; V = \frac{vL}{\upsilon_\infty Gr^{\frac{1}{4}}} \;,\; X = \frac{x}{L} \;,\; Y = \frac{y}{LGr^{-\frac{1}{4}}} \;,\; \theta = \frac{(T - T_\infty) k Gr^{\frac{1}{4}}}{q_w L}$$

$$\Pr = \frac{\mu_\infty . C_P}{k} \;,\; Gr = \frac{g \beta L^4 q_w}{k \upsilon_\infty^2} \;,\; \varepsilon = \frac{g \beta L}{c_p} \;,\; M = \frac{\sigma B_0^2 L}{\mu_\infty . Gr^{\frac{1}{2}}} \;,\; \tau = \frac{t.\upsilon_\infty}{L^2 . Gr^{-\frac{1}{2}}}$$

$$N = \frac{\beta^* (c_w - c_\infty) k}{\beta q_w L} \;,\; \gamma = \frac{q_w . L}{k . Gr^{\frac{1}{4}}} \frac{1}{\mu_f} \left(\frac{\partial \mu}{\partial T} \right)_f \;,\; \delta = \frac{q_w . L}{Gr^{\frac{1}{4}} . k_\infty} \frac{1}{k_f} \left(\frac{\partial k}{\partial T} \right)_f \qquad (10)$$

where L is the wall height, X is the dimensionless axial coordinate, Y is the dimensionless axial coordinate perpendicular to X, U,V is the dimensionless velocities, θ is the dimensionless temperature, C is the non-dimensional species concentration, q_w is the heat flux at the plate, Sc is the Schmidt number, N is the buoyancy ratio parameter, Gr is the Grashof number, S is the Suction rate parameter, M is the magnetic parameter, $\Pr$ is the prandtl number, δ is the thermal conductivity variation parameter, γ is the viscosity variation parameter and ε is the dissipation number .

Then the governing equations reduce to the following non-dimensional boundary-layer equations:

$$\frac{\partial U}{\partial X} + \frac{\partial V}{\partial Y} = 0 \qquad (11)$$

$$\frac{\partial U}{\partial \tau} + U \frac{\partial U}{\partial X} + V \frac{\partial U}{\partial Y} = (1 + \gamma \theta) \frac{\partial^2 U}{\partial Y^2} + \gamma \frac{\partial U}{\partial Y} \frac{\partial \theta}{\partial Y} + Gr^{-\frac{1}{4}} \theta + N.C - MU \qquad (12)$$

Rasool Alizadeh *et al.*

$$\frac{\partial \theta}{\partial \tau} + U\frac{\partial \theta}{\partial X} + V\frac{\partial \theta}{\partial Y} = \frac{1}{\Pr}\left(1+\delta\theta\right)\frac{\partial^2 \theta}{\partial Y^2} + \frac{\delta}{\Pr}\left(\frac{\partial \theta}{\partial Y}\right)^2 + \varepsilon.Gr^{\frac{1}{4}}\left(1+\gamma\theta\right)\left(\frac{\partial U}{\partial Y}\right)^2 \tag{13}$$

$$\frac{\partial C}{\partial \tau} + U\frac{\partial C}{\partial X} + V\frac{\partial C}{\partial Y} = \frac{1}{Sc}\frac{\partial^2 C}{\partial Y^2} \tag{14}$$

The dimensionless boundary conditions become:

$$U = 0\,,V = 0\quad,\quad \theta = 0\quad,\quad C = 0 \qquad\qquad \text{at} \qquad \tau = 0$$

$$U(0,Y) = 0\quad,V(0,Y) = 0\quad,\quad \theta(0,Y) = 0\quad,\quad C(0,Y) = 0\ \text{at}\quad X = 0$$

$$U(X,0) = 0\quad,V(X,0) = S\quad,\quad \frac{\partial \theta(X,0)}{\partial Y} = -1\quad,\quad C(X,0) = 1\ \text{at}\quad Y = 0 \tag{15}$$

$$U(X,\infty) = 0\quad,\quad \theta(X,\infty) = 0\quad,\quad C(X,\infty) = 0 \qquad \text{at}\quad Y \to \infty$$

For practical applications, the major physical quantities of interest in heat transfer include the local skinfriction coefficient C_{fX}, the local Nusselt number Nu_X and the local Sherwood number Sh_X. They can been expressed as follows:

$$\frac{C_{f_X}Gr^{\frac{1}{4}}}{1+\gamma} = \left(\frac{\partial U}{\partial Y}\right)_{Y=0} \tag{16}$$

$$\frac{Nu_X Gr^{-\frac{1}{4}}}{1+\delta} = \frac{X}{\theta_W} \tag{17}$$

$$\frac{Sh_X}{Gr^{\frac{1}{4}}} = -X\left(\frac{\partial C}{\partial Y}\right)_{Y=0} \tag{18}$$

Numerical Solution of the problem

The governing equations (11-14) are unsteady, coupled and non-linear with boundary conditions. An implicit finite-difference technique of Crank–Nicolson has been employed to solve the nonlinear coupled equations, as described (Thomas algorithm) in Carnahan et al [23]. The finite difference equations corresponding to equations (11–14) are as follows:

$$\frac{U_{i,j}^{n+1} - U_{i-1,j}^{n+1} + U_{i,j}^{n} - U_{i-1,j}^{n}}{2\Delta X} + \frac{U_{i,j+1}^{n+1} - U_{i,j-1}^{n+1} + U_{i,j+1}^{n} - U_{i,j-1}^{n}}{4\Delta Y} = 0 \tag{19}$$

$$\frac{U_{i,j}^{n+1} - U_{i,j}^{n}}{\Delta \tau} + U_{i,j}^{n}\frac{U_{i,j}^{n+1} - U_{i-1,j}^{n+1} + U_{i,j}^{n} - U_{i-1,j}^{n}}{2\Delta X} + v_{i,j}^{n}\frac{U_{i,j+1}^{n+1} - U_{i,j-1}^{n+1} + U_{i,j+1}^{n} - U_{i,j-1}^{n}}{4\Delta Y}$$

$$= \left(1+\gamma.\theta_{i,j}^{n}\right)\left(\frac{U_{i,j+1}^{n+1} - 2U_{i,j}^{n+1} + U_{i,j-1}^{n+1} + U_{i,j+1}^{n} - 2U_{i,j}^{n} + U_{i,j-1}^{n}}{2\Delta Y^2}\right)$$

Rasool Alizadeh *et al.*

$$+\gamma\left(\frac{U_{i,j+1}^{n+1}-U_{i,j-1}^{n+1}+U_{i,j+1}^{n}-U_{i,j-1}^{n}}{4\Delta Y}\right)\left(\frac{\theta_{i,j+1}^{n+1}-\theta_{i,j-1}^{n+1}+\theta_{i,j+1}^{n}-\theta_{i,j-1}^{n}}{4\Delta Y}\right)+Gr^{-\frac{1}{4}}\left(\frac{\theta_{i,j}^{n+1}+\theta_{i,j}^{n}}{2}\right)$$

$$+N\left(\frac{C_{i,j}^{n+1}+C_{i,j}^{n}}{2}\right)-M\left(\frac{U_{i,j}^{n+1}+U_{i,j}^{n}}{2}\right)-\left(1+\gamma.\theta_{i,j}^{n}\right)K_{P}\left(\frac{U_{i,j}^{n+1}+U_{i,j}^{n}}{2}\right) \tag{20}$$

$$\frac{\theta_{i,j}^{n+1}-\theta_{i,j}^{n}}{\Delta\tau}+U_{i,j}^{n}\frac{\theta_{i,j}^{n+1}-\theta_{i-1,j}^{n+1}+\theta_{i,j}^{n}-\theta_{i-1,j}^{n}}{2\Delta X}+v_{i,j}^{n}\frac{\theta_{i,j+1}^{n+1}-\theta_{i,j-1}^{n+1}+\theta_{i,j+1}^{n}-\theta_{i,j-1}^{n}}{4\Delta Y}$$

$$=\frac{\left(1+\delta\right)}{\Pr}\left(\frac{\theta_{i,j+1}^{n+1}-2\theta_{i,j}^{n+1}+\theta_{i,j-1}^{n+1}+\theta_{i,j+1}^{n}-2\theta_{i,j}^{n}+\theta_{i,j-1}^{n}}{2\Delta Y^{2}}\right)+\frac{\delta}{\Pr}\left(\frac{\theta_{i,j+1}^{n+1}-\theta_{i,j-1}^{n+1}+\theta_{i,j+1}^{n}-\theta_{i,j-1}^{n}}{4\Delta Y}\right)^{2}$$

$$+\left(1+\gamma\right)\varepsilon Gr^{\frac{1}{4}}\left(\frac{U_{i,j+1}^{n+1}-U_{i,j-1}^{n+1}+U_{i,j+1}^{n}-U_{i,j-1}^{n}}{4\Delta Y}\right)^{2} \tag{21}$$

$$\frac{C_{i,j}^{n+1}-C_{i,j}^{n}}{\Delta\tau}+U_{i,j}^{n}\frac{C_{i,j}^{n+1}-C_{i-1,j}^{n+1}+C_{i,j}^{n}-C_{i-1,j}^{n}}{2\Delta X}+v_{i,j}^{n}\frac{C_{i,j+1}^{n+1}-C_{i,j-1}^{n+1}+C_{i,j+1}^{n}-C_{i,j-1}^{n}}{4\Delta Y}=$$

$$\frac{1}{Sc}\left(\frac{C_{i,j+1}^{n+1}-2C_{i,j}^{n+1}+C_{i,j-1}^{n+1}+C_{i,j+1}^{n}-2C_{i,j}^{n}+C_{i,j-1}^{n}}{2\Delta Y^{2}}\right) \tag{22}$$

The region of integration is considered as a rectangle with sides $X_{\max}\left(=1\right)$ and $Y_{\max}\left(=10\right)$, where corresponding to $Y\rightarrow\infty$ which lies far from the momentum, energy and concentration boundary layers. An appropriate mesh sizes considered for the calculation are $\Delta X=0.01, \Delta Y=0.05$ and $\Delta\tau=0.005$. The local truncation error is $o(\Delta Y^{2},\Delta X,\Delta\tau)$ and it tends to zero as ΔY and ΔX tend to zero. Hence the scheme is compatible. Stability and compatibility ensures convergence.

RESULTS AND DISCUSSION

The velocity, temperature and concentration profiles have been computed by using the implicit finite difference scheme of Crank–Nicolson's type. The numerical calculations are carried out for the effect of the flow parameters such as Suction rate parameter (S), Prandtl number (Pr), Schmidth number (Sc), Grashof number (Gr), magnetic parameter (M), dissipation number (ε), buoyancy ratio parameter (N), viscosity variation parameter (γ) and thermal conductivity variation parameter (δ) on the velocity, temperature and concentration distribution of the flow fields are presented graphically in figure 2-21.

The effects of magnetic parameter on the velocity, temperature, and concentration profiles are shown in Figs. 2-4. These presented profiles are those at X = 0.5. It is seen that, velocity decreases with increase in magnetic parameter. Temperature and concentration increases with increase in the magnetic parameter.

The effects of buoyancy ratio parameter (N) on the velocity, temperature, and concentration profiles are shown in Figs. 5-7. It is observed that the velocity increases with increase in buoyancy ratio parameter. Temperature and concentration decreases with increase in the buoyancy ratio parameter.

Rasool Alizadeh *et al.*

The effects of Suction rate parameter (S) on the velocity, temperature, and concentration profiles are shown in Figs. 8-10. It is observed that the velocity, concentration and temperature increases with increase in the Suction rate parameter.

The effects of thermal conductivity variation parameter (δ) on the velocity and temperature profiles are shown in Figs. 11-12. It is observed that the velocity and temperature increases with increase in thermal conductivity variation parameter.

The effect of Schmidth number (Sc) on the concentration profile is shown in Fig. 13. It is observed that the concentration decreases with increase in Schmidth number.

The effect of Prandtl number (Pr) on the temperature profile is shown in Fig. 14. It is observed that the temperature decreases with increase in the Prandtl number.

The effects of viscosity variation parameter (γ) on the velocity and concentration profiles are shown in Figs. 15-16. It is observed that the velocity decreases with increase in viscosity variation parameter. Concentration increases with increase in the viscosity variation parameter.

Figs.17-18 Present the axial evolution of the local skin-friction $\dfrac{C_{f_x} Gr^{\frac{1}{4}}}{1+\gamma}$ in steady-state situation .From this figures it is observed that an increase in the magnetic parameter M and viscosity variation parameter (γ) leads to a decrease in C_{fx} .

Fig. 19 Depict the axial evolution of the local Nusselt number $Nu_x Gr^{-\frac{1}{4}} \Big/ {1+\delta}$ in a steady-state situation. From this figure it is observed that an increase in the magnetic parameter M leads to a increase in Nu_x .

Fig. 20 Show the axial evolution of the local Sherwood number $Sh_x \Big/ {Gr^{\frac{1}{4}}}$ in a steady-state situation. From this figure it is observed that an increase in the magnetic parameter M leads to a decrease in Sh_x .

Fig. 21 Show the axial evolution of the local Sherwood number $Sh_x \Big/ {Gr^{\frac{1}{4}}}$ in a steady-state situation. From this figure it is observed that an increase in the Schmidth number (Sc) leads to a increase in Sh_x .

CONCLUSION

In this paper the effects of the thermal conductivity and viscosity depending on temperature in MHD free convection flow of a dissipative fluid along a vertical porous plate with mass transfer, the surface of which is exposed to a constant heat flux have been studied numerically. Implicit finite difference scheme of Crank–Nicolson's type is employed to solve the equations.

From the present numerical investigation, following conclusions have been drawn:

Velocity increases, temperature and concentration decreases with an increase in Grashof number (Gr) ,
Velocity and temperature decreases, concentration increase with an increase in magnetic parameter (M) and viscosity variation parameter (γ).Velocity and temperature increase with an increase in thermal conductivity variation

Rasool Alizadeh *et al.*

parameter (δ).With effects of the dissipation number (ε), velocity and temperature increases.Increase in the buoyancy ratio parameter (N), velocity increases, temperature decreases.

REFERENCES

1. E. Pohlhausen, Zur näherungsweisen Integration der Differentialgleichung der laminaren Grenzschicht, ZAMM, 1(1921), 115-125.
2. S.D. Harris, L. Elliot, D.B. Ingham and I. Pop, Transient free convection flow past a vertical flat plate subjected to a sudden change in surface temperature, Int. J. Heat Mass Tran., 41(1998), 357-372.
3. G. Polidori, C. Popa and T. Hoang-Mai, Transient flow rate behaviour in an external natural convection boundary layer, Mech. Res. Commun., 30(2003), 515-621.
4. D.A.S. Rees, The effect of steady streamwise surface temperature variations on vertical free convection, Int. J. Heat Mass Tran., 42(1999), 2455-2464.
5. J. Li, D.B. Ingham and I. Pop, Natural convection from a vertical flat plate with a surface temperature oscillation, I. J. Heat Mass Tran., 44(2001), 2311-2322.
6. M. Kassem, Group solution for unsteady free-convection flow from a vertical moving plate subjected to constant heat flux, J. Comput. Appl. Math., 187(2006).
7. B. Gebhart, Effects of viscous dissipation in natural convection, J. Fluid Mech., 14(1962), 225-232.
8. A. Pantokratoras, Appl. Math. Model.29 (2005) .
9. H.S. Takhar and V.M. Soundalgekar, Stability of MHD Couette ∞ow in a narrow gap annulus , Appl. Sci. Res, 46(1989) .
10. V.M. Soundalgekar, B.S. Jaiswal, A.G. Uplekar and H.S. Takhar, Transient free convvwction flow of viscous dissipative fluid past a semi-infinite vertical plate, Appl. Mech. Eng., vol. 4 (1999), pp. 1-25.
11. V.M. Soundalgekar and P. Ganesan, The finite difference analysis of transient free convection with mass transfer of an isothermal vertical flat plate, Int. J. Eng. Sci., 19(1981), 757-770.
12. M.Y. Gokhale and F.M. Al Samman, Effects of mass transfer on the transient free convection flow of a dissipative fluid along a semi-infinite vertical plate with constant heat flux, Int. J. Heat Mass Tran., 46(2003), 999-1011.
13. B. Shanker and N. Kishan, The effects of mass transfer on the MHD flow past an impulsively started infinite vertical plate with variable temperature or constant heat flux,, J. Eng. Heat Mass Tran., 19(1997), 273-278.
14. P.G. Ganesan and P.H. Rani, Unsteady free convection MHD flow past a vertical cylinder with heat and mass transfer, Int. J. Therm. Sci., 39(2000), 265-272.
15. M.A. Hossain, S.K. Das and I. Pop, Heat transfer response of MHD free convection flow along a vertical plate to surface temperature oscillations, Int. J. Non-linear Mech., 33(1998), 541-553.
16. E.M. Aboeldahad and E.M.E. Elbarbary, Hall current effect magneto-hydrodynamics free convection flow past a semi.-infinite vertical plate with mass transfer., Int. J. Eng. Sci., 39(2001), 1641-1652.
17. Sreehari Reddy, P., Nagarajan, A.S. and Sivaiah, M.(2008): Hydro magnetic Elastic Free convection of a conducting elastico–viscous liquid between heated vertical plates, Journal of Naval Architecture and Marine Engng, 2, 47 – 56,2008.
18. Suneetha, S, Bhaskar Reddy, N., Ramachandra Prasad,V, (2008): The thermal radiation effects on MHD free convection flow past an impulsively started vertical plate with variable surface temperature and concentration. Journal of Naval Architecture and Marine engineering,2, 57–70.
19. Suneetha, S., Bhaskar Reddy, N., Ramachandra Prasad, V., (2009): Radiation and mass transfer effects on MHD free convection flow past an impulsively started isothermal vertical plate with dissipation. Thermal Science, 13, 2, 71 – 181.
20. Hitesh Kumar: (2009): Radiative Heat Transfer with Hydro magnetic flow and viscous dissipation over a stretching surface in the presence of variable heat flux. Thermal Science 13, 2, 163 – 169.

Rasool Alizadeh *et al.*

21. Rahman, M. M., Mamun, A. A., Azim, M. A. and Alim, M. A. (2008): Effects of Temperature Dependent Thermal Conductivity on MHD Free Convection Flow along a Vertical Flat Plate with Heat Conduction, Nonlinear Analysis: Modell. and Cont. Vol. 13, No. 4, pp. 513-524.

22. Charraudeau J. (1975), Influence de gradients de properties physiques en convection force application au cas du tube, Int. J. Heat Mass Trans. 18, 87-95

23. B. Carnahan, H.A. Luther, and J.O. Wilkes., (1969) .Applied Numerical Methods, Wiley, New York.
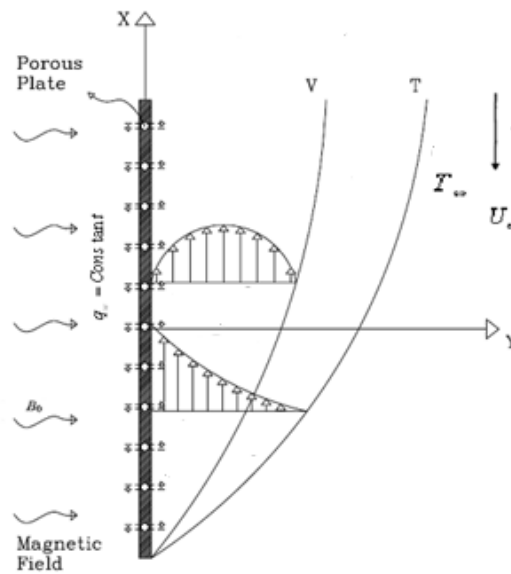
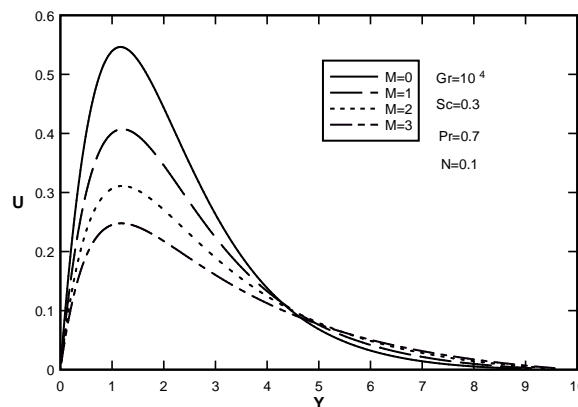**Fig1. Sketch of the physical mode**

Figure2. Effect of magnetic parameter on dimensionless velocity
Profiles at dissipation number ($\varepsilon = 1.0$)
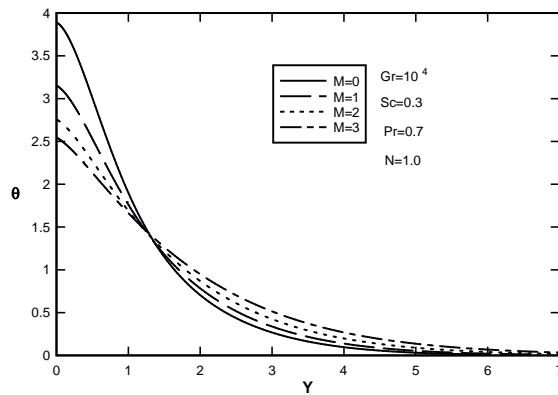
Rasool Alizadeh *et al.*

Figure3. Effect of magnetic parameter on dimensionless temperature distributions at dissipation number ($\varepsilon = 1.0$).
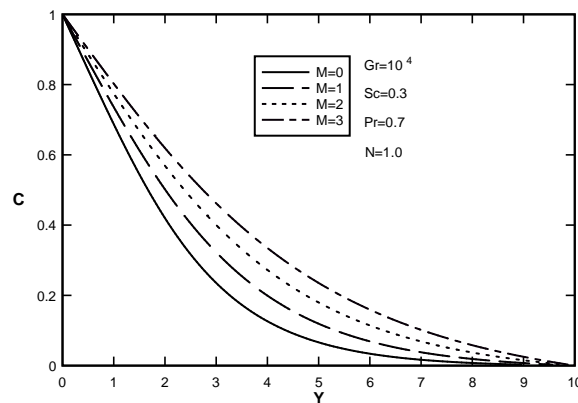

Figure4. Effect of magnetic parameter on dimensionless concentration distributions dissipation number ($\varepsilon = 1.0$)
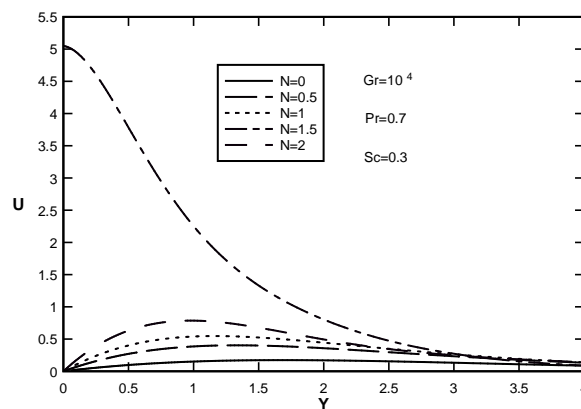

Figure5. Effect of buoyancy ratio parameter (N) on dimensionless velocity Profiles at dissipation number ($\varepsilon = 1.0$)
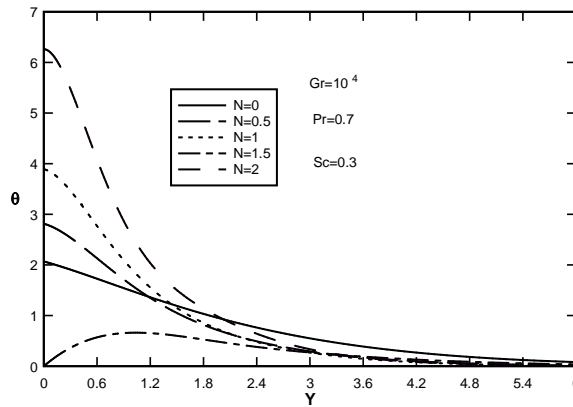
Rasool Alizadeh *et al*.

Figure6. Effect of buoyancy ratio parameter (N) on dimensionless temperature distributions at dissipation number ($\varepsilon = 1.0$)
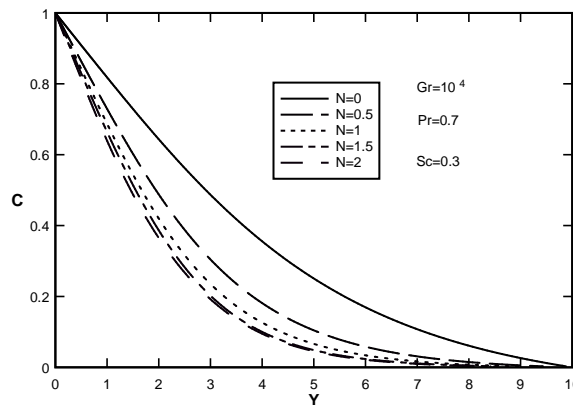

Figure7. Effect of buoyancy ratio parameter (N) on dimensionless concentration distributions dissipation number ($\varepsilon = 1.0$)
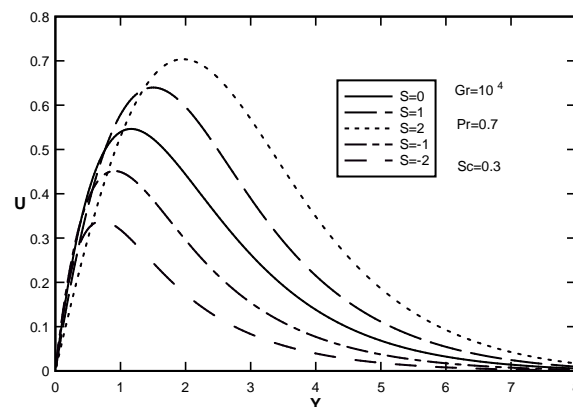

Figure8. Effect of Suction rate parameter (S) on dimensionless velocity Profiles at dissipation number ($\varepsilon = 1.0$)

Rasool Alizadeh *et al.*

Figure9. Effect of Suction rate parameter (S) on dimensionless temperature distributions at dissipation number ($\varepsilon = 1.0$)
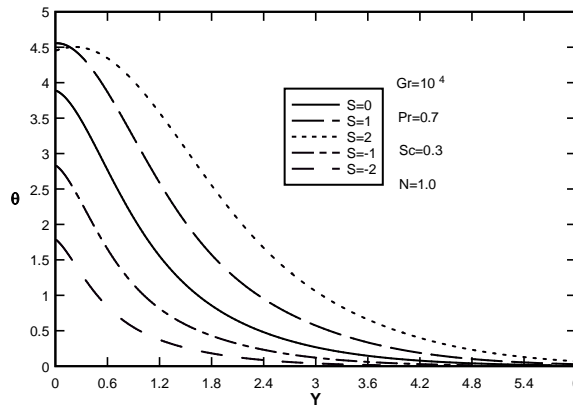

Figure10. Effect of Suction rate parameter (S) on dimensionless concentration distributions dissipation number ($\varepsilon = 1.0$)

Figure11. Effect of thermal conductivity variation parameteron (δ) on dimensionless Velocity Profiles at dissipation number ($\varepsilon = 1.0$)

Rasool Alizadeh *et al.*
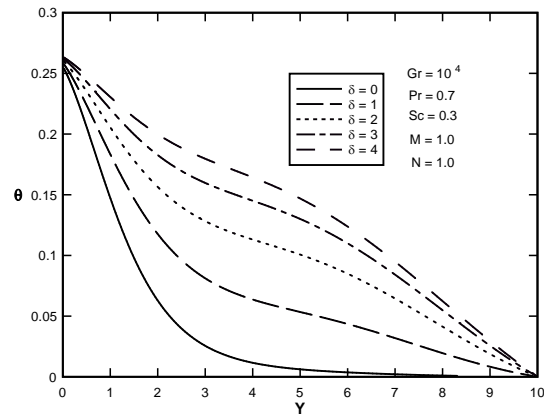
Figure12. Effect of thermal conductivity variation parameteron (δ) on dimensionless temperature distributions
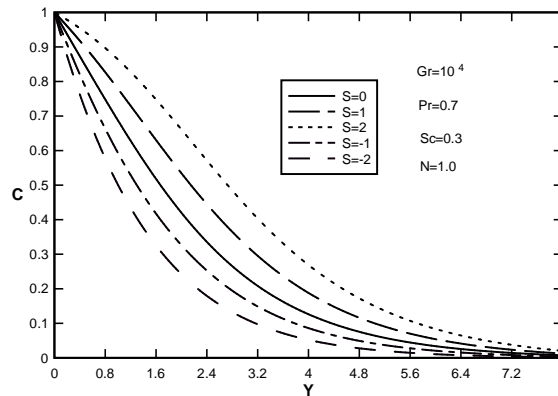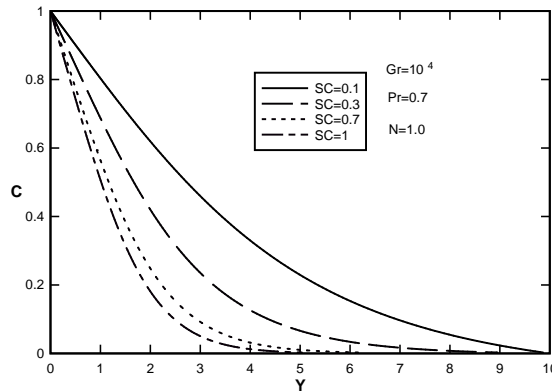

Figure13. Effect of Schmidth number (Sc) on dimensionless Concentration distributions dissipation number $(\varepsilon = 1.0)$
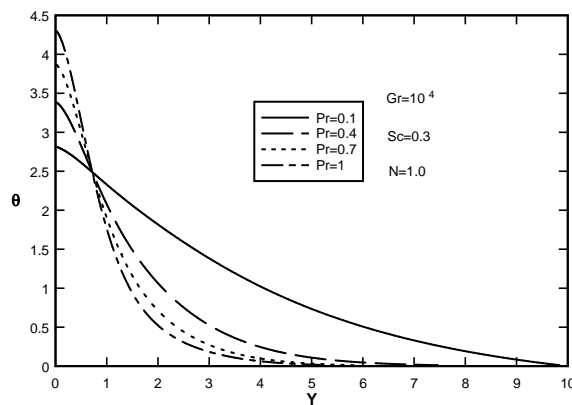
Figure14. Effect of Prandtl number (Pr) on dimensionless temperature distributions at dissipation number $(\varepsilon = 1.0)$
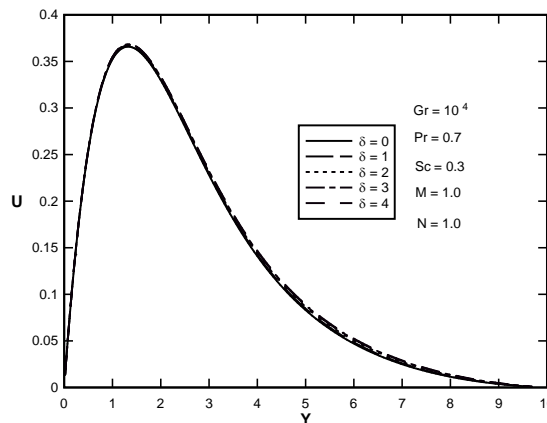
Rasool Alizadeh *et al.*
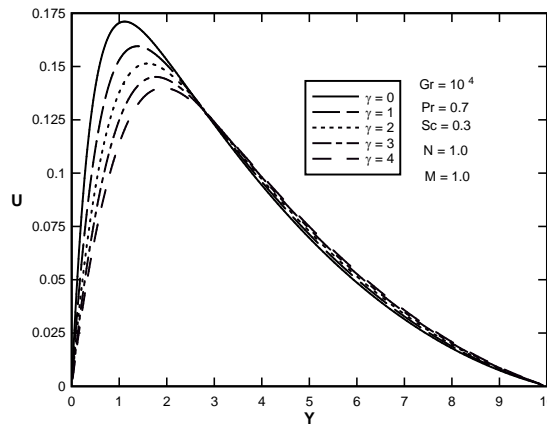
Figure15. Effect of viscosity variation parameter (γ) on dimensionless Velocity Profiles at dissipation number ($\varepsilon = 1.0$)
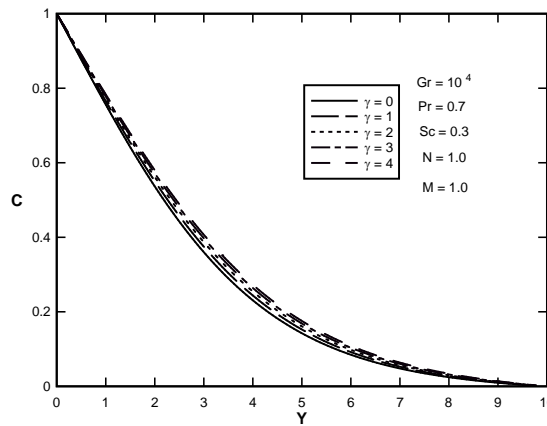
Figure16. Effect of viscosity variation parameter (γ) on dimensionless Concentration distributions at dissipation number ($\varepsilon = 1.0$)
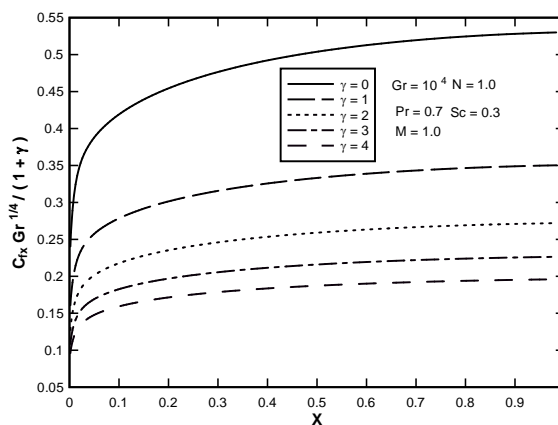
Figure17. Effect of viscosity variation parameter (γ) on Local skin-friction

Rasool Alizadeh *et al.*
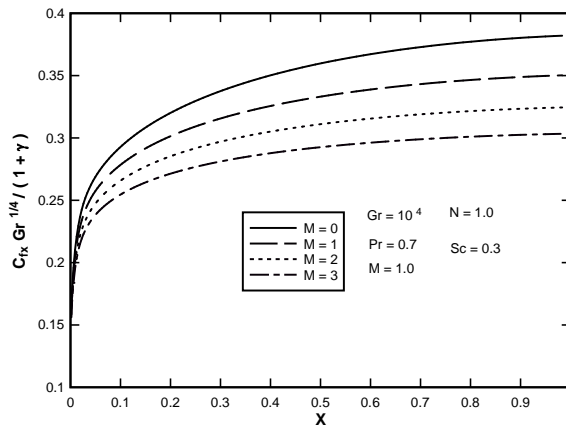
Figure18. Effect of magnetic parameter on Local skin-friction
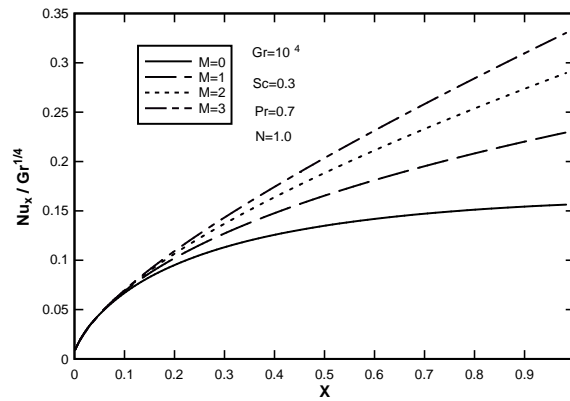
Figure19. Effect of magnetic parameter on Local Nusselt number
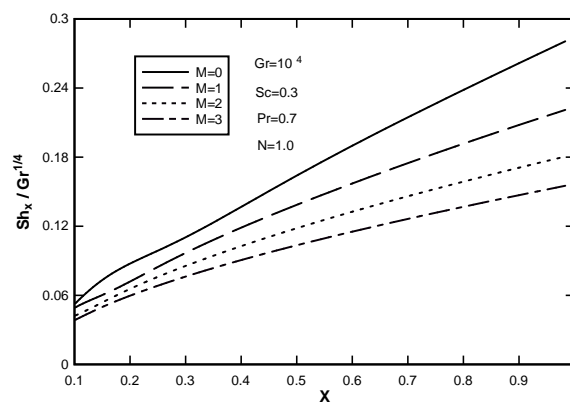
Figure20. Effect of magnetic parameter on local Sherwood number

Rasool Alizadeh *et al.*
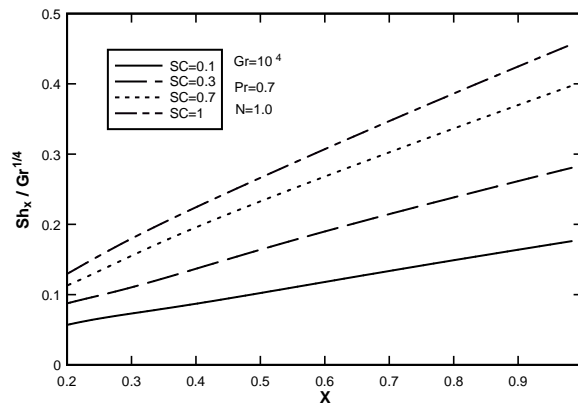
Figure21. Effect of Schmidth number (Sc) on local Sherwood number

RESEARCH ARTICLE

Breeding Managmental Practices and Calving Pattern of Buffaloes under Field Condition of Tamil Nadu

Balusami.C

Assistant Professor, Department of Livestock Production Management, College of Veterinary Science and Animal Science, Pookode, Wayanad District-673 576 Kerala, India.

*Address for correspondence
Balusami.C
Assistant Professor,
Department of Livestock Production Management,
College of Veterinary Science and Animal Science, Pookode,
Wayanad District-673 576 Kerala, India
E-mail: balusamic@gmail.com
Mobile: 09445610821

ABSTRACT

The present study was conducted to find out the breeding management practicesand calvingpatterns of buffaloes. A random sample of 250 buffalo owners were selected fromNorth East zone of Tamil Nadu comprisingChennai, Kancheepuram, Thiruvallur, Thiruvannamalai and Villupuram district. It was revealed that Majority of buffalo farmers (82.0 per cent) were able to identify the heat and inseminate the animal at the fertile heat. Majority of buffaloes (53.0 per cent) came to estrous. Among buffalo farmers studied, one-half of the farmers (54.0 per cent) adopted the practice of artificial insemination and almost half (46.0 per cent) of the farmers adopted natural service. Almost two-third (69.2 per cent) of the farmers adopted the practice of getting pregnancy diagnosis done by qualified veterinarian and one third (30.8 per cent) of the farmers confirmed pregnancy by their experience.The main period of calving were from September to December and Peak calving (22.0 per cent) were occurred in October and March to May was leanest period.

Key words: Heat detection, Breeding methods, Pregnancy diagnosis, Breeding pattern, Calving pattern.

INTRODUCTION

Livestock farming is the backbone of Indianeconomy and also an important sub sector ofagriculture. Currently dairying provides 70-80 millionfarm families the triple benefits of nutritive food, supplementary income and productive employment, while setting right the seasonal imbalance in employment. (Tanwar *et al.*, 2012). Dairy animals, apartfrom milk production, contribute huge quantity of organic manure. India is blessed with huge buffalo population of 108.7million accounting 56.90 percent world bovine population and stand first in the world in bovine population (Livestock Census-2012).Around 56 per cent of the total milk produced in the country comes from buffaloes, which constitute nearly 34.59 per cent of the national bovine population. The shift towards more productive cows and larger herds is associated with a decrease in reproductive efficiency (Lucy, 2001).Buffaloes calving during unfaourable season may not resume cyclic ovarian activity until the next favorable season (Jalatge and Buvanendran, 1971). This results is longer calving interval. The biggest limiting factor influencing the productivity of the buffalo is the seasonality of breeding, which may be due to either anestrus or silent estrus during hot, dry months of summer (ZulfiqarHussain, 2007).The seasonal trends in breeding and calving in buffaloes have been extensively studied under farm conditions but in field the study is very scanty.Hence,the present study was undertaken to find out the breeding practices followed by buffalo farmersand influence of month on breeding and calving patterns of buffaloes in North East zone of Tamil Nadu

MARTIALS AND METHODS

The study was conducted in north east zone of Tamil Nadu, India comprising Chennai, Kancheepuram, Thiruvallur, Thiruvannamalai and Villupuram district. Selection of the respondents was made using stratified random sampling technique according to the land holding viz, landless, marginal (<2.5 acres), small (2.6-5.0 acres) and large (>5.0 acres) farmers. A total of 250 respondents comprising 45 large, 51 small, 54 marginal and 100 landless farmers were selected from villages of the above districts. The total households were post stratified (Maheswaran, 1993) to study the various breeding practices, viz., heat detection, pregnancy diagnosis and breeding methods followed under different socio economic situations. While deciding population for selection from each village, only those buffalo farmers having at least one milch buffalo at the time of survey were considered.A data on breeding and calving pattern of graded Murrah and non-descript buffaloes used in the study were collected from buffalo farmers of North east zone Tamil Nadu.Total of 937 and 412 buffaloes were utilized to assess thebreeding and calving pattern in these animals respectively.

RESULTS AND DISCUSSION

Breeding practices followed in study area

Buffalo breeding practices observed in the study area is presented in Table-I and Fig.1, 2 and 3.Chi square test revealed that there was no significant association between heat, pregnancy diagnosis and breeding methods. Majority of buffalo farmers (82.0 per cent) were able to identify the heat and inseminating the animal at the fertile heat.These finding approximate similar to earlier findings of Malik and Nagpaul (2000), Yadav*et al.* (2007). It indicates that farmers belonging to member families were more aware regarding appropriate time of breeding resulting rate of conception was higher. Among buffalo farmers studied, one-half of the farmers (54.0 per cent) adopted the practice of artificial insemination and almost half (46.0 per cent) of the farmers adopted natural service. Almost two-third (69.2 per cent) of the farmers adopted the practice of getting pregnancy diagnosis done by qualified veterinarian and one third (30.8 per cent) of the farmers confirmed pregnancy by their experience. These findings are accordance with Malik and Nagpaul (2000), Bhardwaj *et al.* (2003), Singh *et al.* (2007) and Yadav*et al.* (2009).These finding were agreement with those observed by Agarwal and Pandey (1983) and Pundir*et al.* (2000).

Balusami

Breeding and calving pattern buffaloes

The breeding and calving pattern of buffaloes observed in the study are presented in Table.1 and Fig.4.The main of calving was from September to December and Peak calving (22.0 per cent)was occurred in October and March to May was leanest period.Majority of buffaloes (53.0 per cent)came to estrous and similar trends were also observed by Venkataratnam and Venkaih (1964).Similar to above findings (Hadi, 1965) also reported that most of the calving occurred during month of September to December in Marathwada buffaloes of Maharashtra.Majority of buffaloes (53.0 per cent) came to heat during November to Febrauary.These findings were in agreement with those observed by Majeed *et al. (*1961), Bhat*et al.* (1983) and Prasad *et al. (*2001)

CONCLUSION

Based on the results obtained in the present study it was concluded that 53 per cent of buffaloes came to heat regularly and majority of buffalo farmers (82.0 per cent) were able to identify the heat and inseminate the animal at the fertile heat. One-half of the farmers (54.0 per cent) adopted the practice of artificial insemination and almost two-third (69.2 per cent) of the farmers adopted the practice of getting pregnancy diagnosis done by qualified veterinarian.The main period of calving were from September to December and Peak calving (22.0 per cent) were occurred in October.

ACKNOWLEDGEMENTS

REFERENCES

1. Tanwar, P.S, Yogendra Kumar and Gopal Sankhala.2012. Study on breeding and feeding management practices followed by members and non-members of dairy cooperatives in Jaipur district of Rajasthan. Indian J Dairy Sci.65 (6)- 508-513.

2. Lucy, M.C.2001.Reproductive loss in high-producing dairy cattle; where will it end? J.Dairy Sci.84 (60):1277-93

3. Jalatge, E.F.A and V.Buvanendran.1971.Statistical studies on characters associated with reproduction in the Murrah buffalo in Ceylon.Trop.Hlth.Prod.J.3-114-124.

4. Zulfiqar Hussain.2007.Seasanal variations in breeding and calving patterns of Nili-Ravi buffaloes in Azad Kashmir, Pakistan. Buffalo Bulletin.26-127-130.

5.Maheshwaran A .1993.Adoption behaviour of sheep farmers in Salem district.M.V.Sc. Thesis submitted to Tamil Nadu Veterinary and Animal Sciences University. Madras.

6. Malik, D.S. and Nagpaul, P.K. 2000. Breeding and Health Management of Murrah Buffaloes in Rural Area of Haryana. Indian J. Anim. Prod. & Mgmt.16 (4):145-146.

7. Yadav, R. S., Malik, R. K. and Singh, S. 2007. Buffalo management practices Followed in Hisar and Sonipat District of Haryana. In Proc. National Symposium on Recent Trends in Policy Initiatives and Technological intervention for Rural Prosperity in Small Holder Livestock Production System. Sri Venkateswara Veterinary University, Tirupati, pp .211.

8. Bhardwaj, S.R., Bhardwaj, A., Yadav, M. C. and V. B Dixit.2003. Adoption of Buffalo Husbandry Practices by Members and Non-members of Dairy Milk Cooperative Societies in Haryana. Proceeding 4th Asian Buffalo Congress, New Delhi, pp. 69.

9. Singh, M., Chauhan, A., Chand, S. and M. K .Garg. 2007. Identifying Existing Breeding and Feeding Practices Followed by the Dairy Owners in Rajasthan. Indian J Anim Res. 41:9-15.

10. Agarwal,S.K and L.W .Purbey,1983.Conception rate in buffaloes under field condotions.Indian Vet. Journal.60:894-896

11.Pundir,R.K.,Sahana,G..,Navani,N.K.,Jain,P.K.,Singh,D.V.,Satish Kumar and A.S. Dave.2000.Characterisation of Mehsana buffaloes in India. Animal Genetic Resources Information.28:53-62

12. Venkataratnam, G and Venkaiah, D.1964.Some observations on the production on the production characterisis of Murrah buffaloes (ii) Seasons of calving. Indian Vet.J.41:507-512

13. Hadi, M.A.1965.A preliminary study of certain productive and reproductive characters of Marathwada buffaloes in Maharashtra state.Indian Vet. J.42:692-699.

14. Majeed.M.A., Garlick.G.K and I.R Khan.1961.Seasanal trends in frequency of estrous of buffaloes and cows. Agriculture Pakirt.12:181-193(Animal abstr.30.No.2496).

15. Bhat.P.N, Kumar.R and K.S.L.Raheja.1983.Breeding behaviour of Murrah buffaloes. In Proc.IV International congress of SABROA.pp.91-97.

16. Prasad.S, Prasad, R.B and S.C.Tirupathi 2001Trends in reproductive behaviour of buffaloes in varying categories of farmers under Village condition. Indian Vet. J.78:157-158.

Table .I Buffalo breeding practices followed in the study area

Parameters	Farmers category				
	Large farmer	**Small farmer**	**Marginal farmers**	**Landless labourers**	**Total**
No.of observation (Per cent)	45 (18)	51 (20.4)	54 (21.6)	100 (40)	250 (100)
Heat detection					
Able to identify	36 (14.4)	41 (16.4)	41 (16.4)	87 (34.8)	205 (82.0)
Not able to identify	9 (3.6)	10 (4.0)	13 (5.2)	13 (5.2)	45 (18.0)
Pregnancy diagnosis					
By qualified person	34 (13.6)	35 (14.0)	33 (13.2)	71 (28.4)	173 (69.2)
By experience	11 (4.4)	16 (6.4)	21 (8.4)	29 (11.6)	77 (30.8)
Breeding methods followed					
Artificial insemination	27 (10.8)	29 (11.6)	23 (9.2)	56 (22.4)	135 (54.0)
Natural service	18 (7.3)	22 (8.8)	31 (12.4)	44 (17.6)	115 (46.0)

(Figures in parentheses indicate per cent to total)

X^2(Chi square value):3.255[NS] (between heat detection and farmers category)

X^2(Chi square value):2.670[NS] (between pregnancy diagnosis and farmers category)

X^2(Chi square value):3.810[NS] (between breeding methods and farmers category)

NS   Non significant

Balusami

Table .II Breeding and calving pattern of buffaloes observed in study areas

Month	Parameter	
	Animals in estrus	**Animals calved**
January	15.00(139)	6.00(24)
February	9.00(85)	4.00(17)
March	7.50(71)	3.00(13)
April	4.00(39)	2.50(11)
May	3.50(34)	2.00(7)
June	4.00(38)	2.00(7)
July	5.50(53)	4.00(17)
August	7.00(65)	9.00(39)
September	7.50(69)	15.00(61)
October	8.00(75)	22.50(93)
November	14.00(130)	16.00(66)
December	15.00(139)	14.00(57)
Total	100(937)	100(412)

(Figure in parenthesis indicate number of observation)

Fig. 1 Heat detection (per cent)

Pregnancy diagnosis (per cent)

Fig. 3 Breeding methods followed (per cent)

Fig.4 Breeding and calving patterns of buffaloes (per cent)

RESEARCH ARTICLE
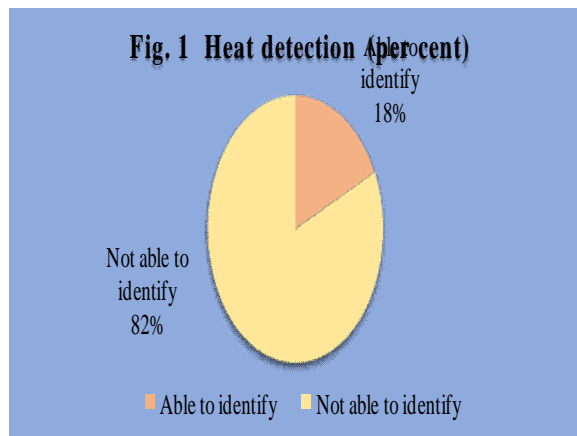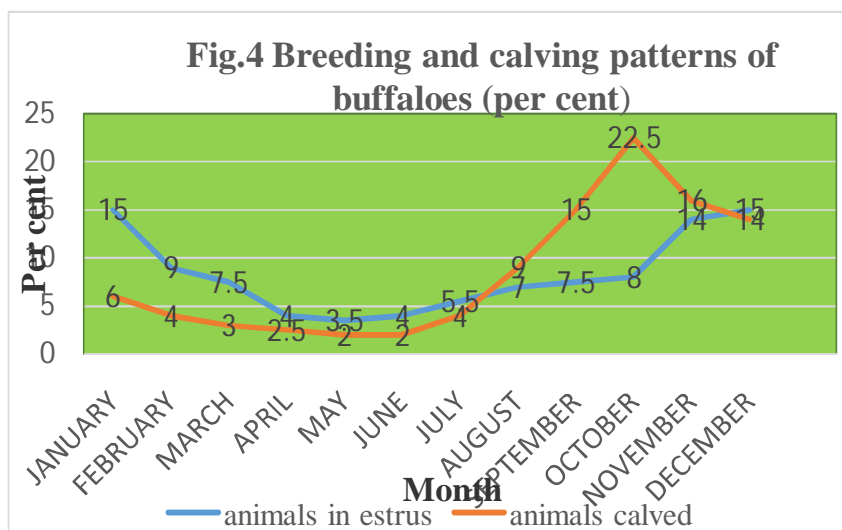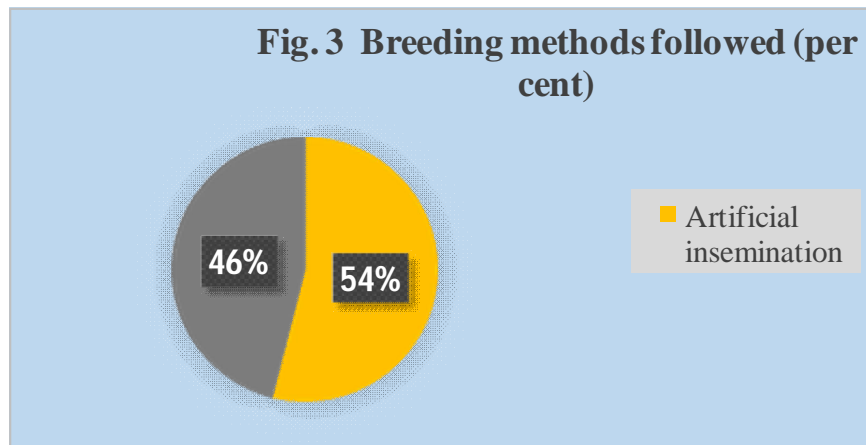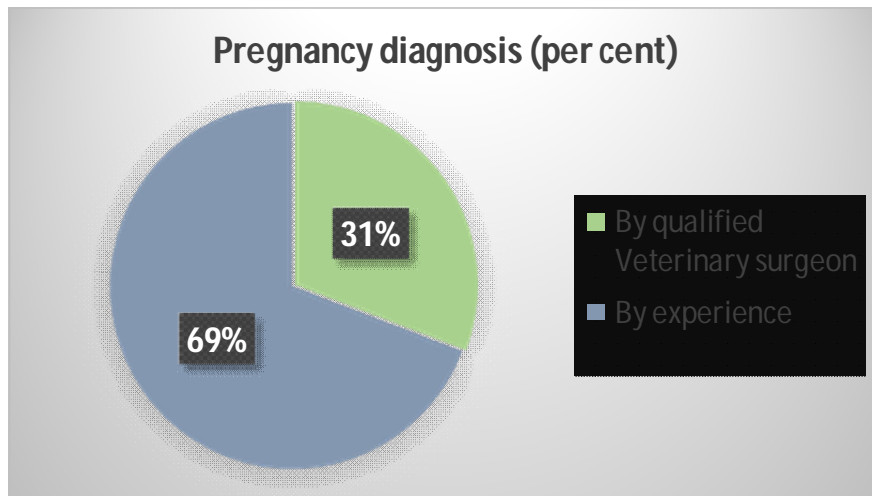
Biosensor for the Detection of Herbicides using Whole Cells of *Nostoc muscorum*

Ashutosh Tripathi[1], Md.Akhlaqur Rahman[1], Swati Mohan[2], Rajiv Prakash[2] and Shanthy Sundaram[1*]

[1]Centre of Biotechnology, University of Allahabad, Allahabad, India.
[2]School of Materials Science and Technology, Institute of Technology, Banaras Hindu University, Varanasi, India.

*Address for correspondence
Prof.Shanthy Sundaram
Centre of Biotechnology,
University of Allahabad,
Allahabad, India.
E-mail: shanthy.cbt@gmail.com,
Mobile: 919956359786

ABSTRACT

Fast and sensitive sensing of 3-(3,4-dichlorophenyl)-1,1-dimethylurea (DCMU) based on whole cells of cyanobacterium, *Nostoc muscorum*, from paddy fields is reported. The cells were immobilized in a bovine serum albumin glutaraldehyde matrix on the surface of a gold disc electrode and the photoreaction is exploited for direct determination of the concentration of DCMU based on p-benzoquinone mediator redox process. The principle of the detection is based on the fact that herbicide selectively blocks electron transport activity in a concentration-dependent manner. The change in the activity or inhibition due to DCMU is observed over the reduction process of p-benzoquinone which is quantitatively detected by re-oxidation of p-benzoquinone. This simple concept shows excellent detection of DCMU in the concentration range of 10^{-9} to 10^{-4} mol L^{-1}. Detection is fast as response is obtained within 70 seconds.

Key words: *Nostoc muscorum*, Cyanobacterial whole cell biosensor, herbicide, Photo reaction, Electrochemistry, p-benzoquinone, Differential pulse voltammetry

INTRODUCTION

Herbicides like DCMU may produce a wide range of toxic side effects that may cause potential hazards to the environment [1]. These chemicals are originating from sources such and agricultural run-off which can contaminate

soils and surface and ground water bodies [2]. Their slow degradation and accumulation in animal and human tissues may result in serious health risk [1]. Therefore, there is a need to develop highly sensitive, fast, and economic methods of analysis of these chemicals [2]. Several methods are known for detection of such toxicants like HPLC, GC-MS and ELISA [3,4,5,6]. Electrochemical biosensors based on whole bacterial cells received much attention for detection of toxic chemicals due to their quick and significant effects on cells or metabolic process [7]. DCMU is affecting photosynthetic processes by targeting the photosystem II (PSII) complex [8,9,10]. In this present work we report fast and sensitive sensing of DCMU based on whole cells of cyanobacterium, *Nostoc muscorum*, from paddy fields [9]. Whole cells were immobilized with an albumin-glutaraldehyde (BSA-GA) matrix [11] on the surface of a modified gold-disk electrode and p-benzoquinone artificial electron acceptor was used for electrochemical detection [12].

MATERIALS AND METHODS

Bovine serum albumin (BSA), glutaraldehyde (GA), DCMU, and p-benzoquinone were obtained from Sigma-Aldrich (Haverhill, Massachusetts, MA, USA). Cyanobacteria *Nostoc muscorum* were obtained from the National Phytron Facility Centre (IARI, New Delhi, India). Tris buffer (tris -(hydroxymethyl)-aminomethane) and phosphate buffer (potassium dihydrogen phosphate and dipotassium hydrogen phosphate mixture) were obtained from Spectrochem Chemicals (Mumbai, India). All stock solutions were prepared in deionized and autoclaved water. Tris-HCl buffer prepared for the experiment was of a concentration of 1 mmol L^{-1} and pH 6.5, the phosphate buffer was 60 mmol L^{-1} and pH 7.4.

A three electrode cells assembly was used for analysis, with a modified gold disc as working electrode, platinum counter electrode, and Ag/AgCl reference electrode. An electrochemical workstation (17041C, CH Instruments Inc., Tennison Hill Dr, Bee Cave, TX 78738, United States,, USA) was used for voltammetric and impedance spectroscopy. A UV-visible spectrophotometer (Lambda-25, Perkin-Elmer, Hamburg Germany) was used for UV-visible analysis, while Nostoc muscorum cells were observed using a Leica optical microscope (Hyderabad, India). All measurements were performed at room temperature 26 ± 1°C.

Preparation of culture and optimization of growth conditions

All the culture flasks were continuously bubbled with air using air pumps. The cultures were maintained in axenic condition by regularly transferring the exponentially growing cultures to fresh sterile growth medium. The cell medium was used in our experiment at20 µg mL^{-1} of chlorophyll a [12].

Immobilization of whole cells

The cells were immobilized in albumin-glutaraldehyde matrix [11]. The procedure consisted of mixing of 0.15 gm of BSA and 1.5 ml of glutaraldehyde with 10 ml of 60 mmol L^{-1} phosphate buffer, pH 7.4. 100µL of whole cells of Nostoc muscorum were added to the above mixture (10 ml of albumin-glutaraldehyde solution) followed by agitation and shaking. 10 µL aliquot of cell suspension was immediately coated over gold disc electrode (2 mm diameter) and electrode was kept at low temperature (4⁰C) for 3 hours and was optimized for the response. Electrodes, immobilized with Nostoc muscorum whole cells were kept at 4°C when not in use and were found stable up to 3 days.

RESULTS AND DISCUSSION

The cyanobacterial photocurrent is inhibited by the herbicide DCMU, which is a known photosynthetic inhibitor [13]. To illustrate the potential application of this type of cyanobacterium whole cells-based bioassay for herbicides, we

Shanthy Sundaram *et al.*

first analyzed the effect of herbicide DCMU on the cyanobacterium whole cells. The cyanobacterium whole cells were immobilized in BSA-GA matrix and UV-visible study was performed before and after the treatment of this film with herbicide DCMU. BSA-GA matrix coated over transparent glass slide did not give any absorption peak in the range of 500 nm to 750 nm, However, two weak absorption peaks at 629 nm (phycocyanine) and 687 nm (chlorophyll a) were observed when cyanobacterium whole cells were immobilized in BSA-GA matrix [11]. These absorbance peaks diminished when the film was treated for 10 minutes in DCMU herbicide solution (1µM) in 60 mM phosphate buffer at pH 7.4 as shown in figure 1. This experiment indicated that some change in the cyanobacterium whole cells took place on interaction with DCMU. It was further confirmed when the whole cells of Nostoc muscorum were observed under microscope before and after the treatment with DCMU.

Whole cells of cyanobacterium *Nostoc muscorum* containing beaded structure along with nitrogen fixing area (Heterocyst) is shown in figure 2A, which is destroyed and separated in individual beads after treatment of 1µM concentration of herbicide DCMU as shown in fig 2B.

This interrupts the photosynthetic electron transport chain in photosysnthesis and thus reduces the ability of the plant to turn light energy in to chemical energy and in that case the cells started defragmenting and dying. The effect of DCMU on the photoreaction was studied using electrochemical techniques. Differential pulse voltammetry (dpv) was performed using modified gold disc electrode with whole cells of *Nostoc muscorum* immobilized in BSA-GA matrix in 1mM Tris-buffer at pH 6.5 before and after the addition of various concentrations of DCMU as shown in figure 3. Further dpv was carried out in presence of mediator, p-benzoquinone (0.5mM) in the range of -0.6 to 0.8V vs. Ag/AgCl as shown in figure 4. The effect of DCMU on photoreaction was observed and it was quantified using dpv as shown in figure 5 and its calibration in figure 6.

The inhibition of photosystem may be easily quantified by considering the photo reaction and transfer of electrons during this process [11]. It was clearly observed that the herbicide DCMU is affecting the photosystem therefore it is possible to estimate DCMU by observing the photo reaction [9]. Once the system is illuminated, the photosynthetic reaction takes place releasing electrons which may be used for the electrochemical detection of DCMU [9]. However, transfer of electrons from a bio-system to the electrode is not easy and often requires some mediator [14]. In presence of mediators like p-benzoquinone the photosystem reaction may be written as [15]

$$E_{Red} + Med_{Ox} = E_{Ox} + Med_{Red}$$
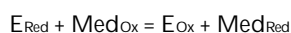
Photosynthetic reaction reduced the mediator and the reduced mediator can be oxidized back to oxidized state (p-benzoquinone) by applying a suitable oxidation potential [15]. The oxidation step involved a transient electron flow; in this way, a current peak may be recorded proportional to the PSII activity [11]. However, in the presence of herbicide photosynthetic activity should significantly decrease, resulting in a lower peak current due to inhibition effect of herbicide to PSII system [11]. This is supported in our experiments when we studied whole cells of cyanobacterium, *Nostoc muscorum* modified electrode in absence and presence of DCMU for the electro-oxidation of p- benzoquinone. In this experimental work, we have used whole cells of cyanobacterium *Nostoc muscorum* where as, most of the workers had used isolated PSII or thylakoid fragments.

Differential pulse voltammetry of cyanobacterium, *Nostoc muscorum* whole cells immobilized in BSA-GA matrix (modified over gold disc electrode) in 1mM Tris-buffer at pH 6.5 before and after the addition of 5mM concentration of DCMU did not show significant difference in the range of -0.6 to 0.8V vs. Ag/AgCl (http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/L/LightReactions.html)[16]. However, a broad hump was observed in the positive potential range along with two peaks in –ve potential range as shown in the fig. 3. Probably it showed the oxidation process due to presence of whole cells of cyanobacterium, *Nostoc muscorum,* which was not very much informative in this case. The motto of this work was to capture the oxidation process, however, it was not lucid over the electrode and no significant difference was observed in presence and absence of the herbicide.

Shanthy Sundaram *et al.*

Further differential pulse voltammetry was performed in the range of -0.6 to 0.8 V vs. Ag/Ag/Cl for the electrodes having whole cells of cyanobacterium, *Nostoc muscorum* immobilized in BSA-GA matrix in presence of mediator p-benzoquinone (0.5mM) in 1mM Tris-buffer at pH 6.5. A negative potential (-0.6 V) was sufficient to reduce the mediator and further +ve potential scan oxidized the reduced form of mediator and showed a sharp oxidation peak at 0.44V vs. Ag/AgCl as shown in the fig 4. When a trace amount of herbicide DCMU was added in the same solution a decrease in the peak current was observed at 0.44V. It was reproducible and showed the effect of herbicide on the photosynthetic reaction, which resulted in a significant change on the oxidation of mediator (p-benzoquinone) due to inhibition of photoreaction.

Differential pulse voltammetry of electrode having whole cells of cyanobacterium, *Nostoc muscorum* immobilized in BSA-GA matrix in presence of mediator p-benzoquinone (0.5mM) and its response from 1nM to 100µM concentration of herbicide (DCMU) in 1mM Tris buffer pH 6.5 was studied in the potential range 0 to 0.8V vs. Ag/AgCl as shown in the fig 5. Now in this case no negative potential was applied so no electrochemical reduction of p-benzoquinone (mediator) should take place. The oxidation peak at 0.44V vs. Ag/AgCl was observed which was due to reduction of mediator during photo reaction over the electrode as shown in fig 5 curve (a). Therefore the curve (a) showed the response of whole cells of cyanobacterium, *Nostoc muscorum* photo reaction and reduction of mediator benzoquinone over the electrode in an optimum time 70 seconds [11]. When varying concentrations of the herbicide was added in the range of 1nM to 100 µM a decrease in the oxidation current was observed as shown by the curves (b) to (g). This clearly showed that due to inhibition action of DCMU, further reduction of mediator decreased and less amount of reduced mediator was formed therefore a decrease in electrochemical oxidation current at 0.44V vs. Ag/AgCl was observed. This reduction in oxidation current was plotted with the concentration of DCMU and showed linearity as shown in the fig 6.

CONCLUSION

The developed electrochemical biosensor offers a sensitive detection of DCMU herbicide [11]. The developed scheme for biosensor is simple and cost effective based on whole cells of the cyanobacterium, *Nostoc muscorum* unlike the other reported sensors using isolated PS II or thylakoids as sensing elements [17]. The detection time is fast as response is obtained within 70 seconds [11]. The immobilization of whole cells in cross-linked BSA-GA matrix provides stability and reproducibility of the measurement [18]. Biosensor shows sensitive detection of DCMU in wide range of concentration from 1 nM to 0.1mM.

ACKNOWLEDGEMENTS

REFERENCES

1. Aktar, Sengupta and Chowdhury. 2009. Impact of pesticides use in agriculture: their benefits and hazards. Interdisciplinary Toxicology 2: 1–12.
2. Giardi, M.T., and E. Pace. 2005. Photosynthetic proteins for technological applications. Trends in Biotechnology 23: 257-263.
3. Šetlíková, E., D. Sofrová, O. Prášil, P. Budáč, M. Koblížek, and I. Šetlík. 1999. Integrity and activity of photosystem 2 complexes isolated from the thermophilic cyanobacterium Synechococcus elongatus using various detergents. Photosynthetica 37: 183–200.

4. Bushway, R. J., L. B. Perkins, L. Fukal, R. O. Harrison, and B. S. Ferguson. 1991. Comparison of enzyme-linked immunosorbent assay and high-performance liquid chromatography for the analysis of atrazine in water from Czechoslovakia. Archives of Environmental Contamination and Toxicology 21: 365-370.

5. Van der Hoff, G. R., and P. van Zoonen. 1999. Trace analysis of pesticides by gas chromatography. Journal of Chromatography A 843: 301-322.

6. Hogendoorn, E., and P. van Zoonen. 2000. Recent and future developments of liquid chromatography in pesticide trace analysis. Journal of Chromatography A 892: 435-453.

7. Hogendoorn, E., and P. van Zoonen. 2000. Recent and future developments of liquid chromatography in pesticide trace analysis. Journal of Chromatography A 892: 435-453.

8. Draber, W., K. Tietjen, J.F. Kluth, and A. Trebst. 1991. Herbicides in Photosynthesis Research. Angewandte Chemie International Edition 30: 1621–1633.

9. Good, N. E. 1961. Inhibitors of the Hill reaction. Plant Physiology 36: 788-803.

10. Wessels, J.S., and R.Van der Veen. 1956. The action of some derivatives of phenylurethan and of 3-phenyl-1,1-dimethylurea on the Hill reaction. Biochimica et Biophysica Acta 19: 548-9.

11. Koblížek, M., J. Malý, J. Masojídek, J. Komenda, T. Kučera, M. T. Giardi, A. K. Mattoo, and R. Pilloton. 2002. A biosensor for the detection of triazine and phenylurea herbicides designed using photosystem II coupled to a screen-printed electrode. Biotechnology and Bioengineering 78: 110–116.

12. Rouillon, R., M. Sole, R. Carpentier, and J. L. Marty. 1995. Immobilization of thylakoids in polyvinylalcohol for the detection of herbicides. Sensors and Actuators B: Chemical 27: 477-479.

13. Wilfried Draber, Klaus Tietjen, Joachim, Kluth, F., and Achim Trebst. 1991. Herbicides in Photosynthesis Research. Angewandte Chemie. 30: 1621-1633

14. Pascal Pandard, Paule Vasseur, David M. Rawson. 1993. Comparison of two types of sensors using eukaryotic algae to monitor pollution of aquatic systems. Water Research. 27: 427-431

15. Dzyadevych, S.V. , V.N. Arkhypova, A.P. Soldatkin, A.V. El'skaya, C. Martelet and N. Jaffrezic-Renault. 2008. Amperometric enzyme biosensors: Past, present and future. ITBM-RBM 29: 171–180. doi:10.1016/j.rbmret.2007.11.007

16. John W. Kimball, Photosynthesis: The Role of Light,http:// users.rcn.com/ jkimball.ma.ultranet/ BiologyPages/L/ LightReactions.html .

17. Touloupakis, E., L. Giannoudi, S.A. Piletsky, L. Guzzella, F. Pozzoni and M.T. Giardi. 2005. A multi-biosensor based on immobilized Photosystem II on screen-printed electrodes for the detection of herbicides in river water. Biosensors and Bioelectronics 20: 1984-1992.

18. Rouillon, R. 2006. Comparison of the immobilization techniques for photosystem II. In Biotechnological Applications of Photosynthetic Proteins, Biochips, Biosensors and Biodevices, ed. Sergey A. Piletsky, Elena V. Piletska, Euzet Pierre and Robert Carpender, 73-83. Biotechnology Intelligence Unit.

Shanthy Sundaram *et al.*
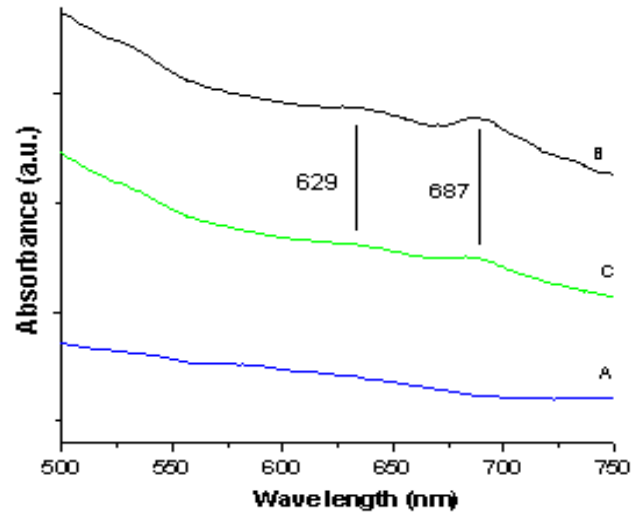
Fig 1. UV-visible absorption of (A) BSA-GA, (B) BSA-GA matrix containing whole cells of *Nostoc muscorum*, and (C) 10 minutes after addition of 1 µmol DCMU in 60 mmol L^{-1} phosphate buffer pH 7.4.
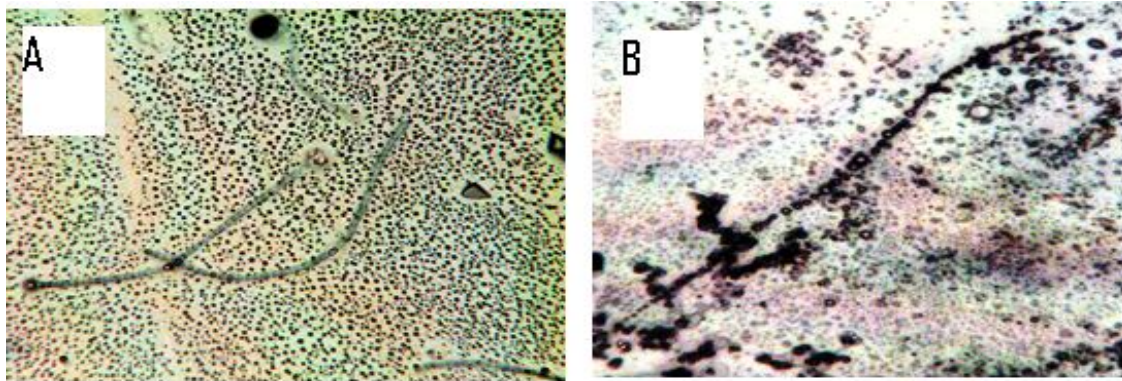
Fig 2. Optical microscopic images of BSA-GA containing whole cells of cyanobacterium, *Nostoc muscorum* (A) before and (B) after treatment with DCMU herbicide at a concentration of 1 µmol L^{-1}.
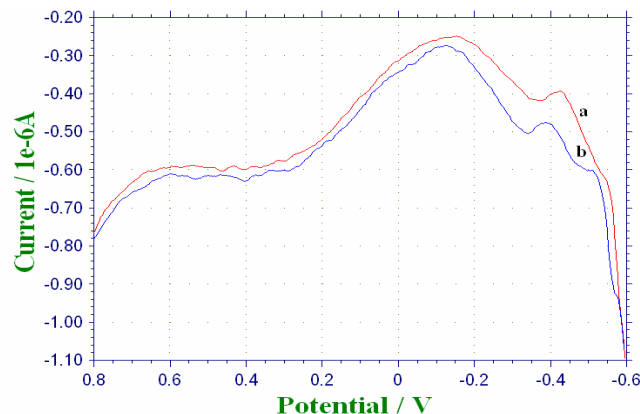
Fig 3. Differential pulse voltammetry of electrode having (a) alone BSA-GA matrix in 1mM Tris-buffer at pH 6.5 (b) after addition of 5mM concentration of herbicide DCMU.

Shanthy Sundaram *et al.*
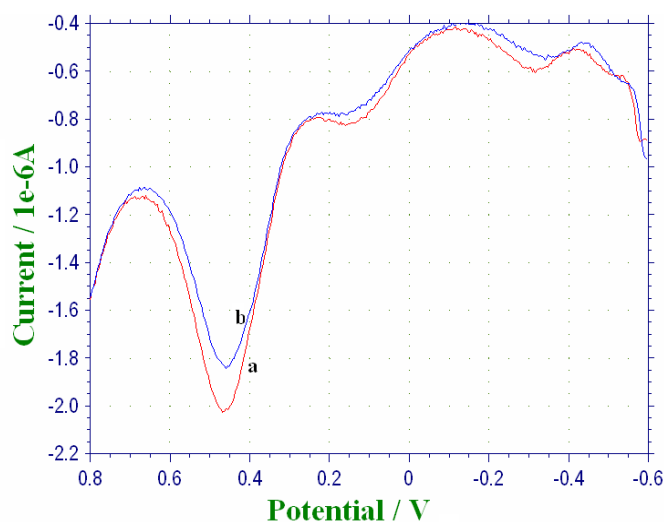
Fig 4. Differential pulse voltammetry of electrode having alone BSA-GA matrix in presence of (a) mediator p- benzoquinone 0.5mM concentration in 1mM Tris-buffer at pH 6.5 and (b) herbicide DCMU in presence of same solution of mediator p-benzoquinone.
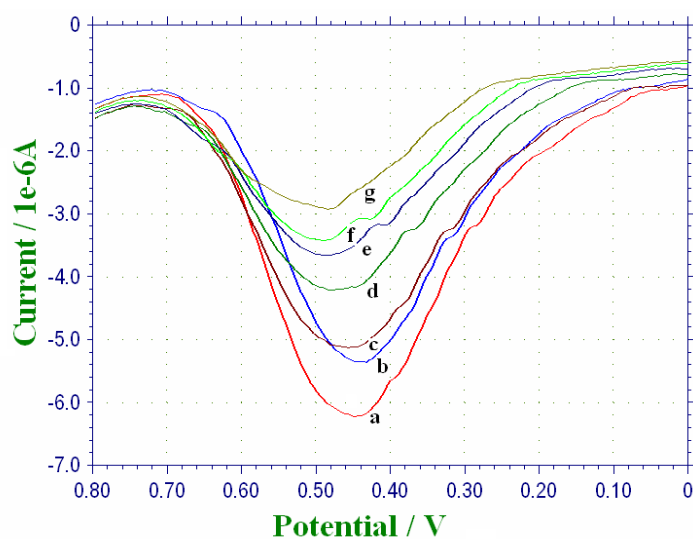
Fig 5. Differential pulse voltammetry of electrode having BSA-GA matrix immobilized with whole cells of cyanobacterium, *Nostoc muscorum* in presence of mediator p-benzoquinone (0.5mM) and its response herbicide DCMU (from 1 nM to 100 µM concentration) in 1 mM Tris buffer pH 6.5. Curve (a) shows the response of mediator p-benzoquinone (0.5 mM) without herbicide while curves (b) to (g) show the response when 1 nM to 100 µM herbicide DCMU added in the same solution.

Shanthy Sundaram *et al.*
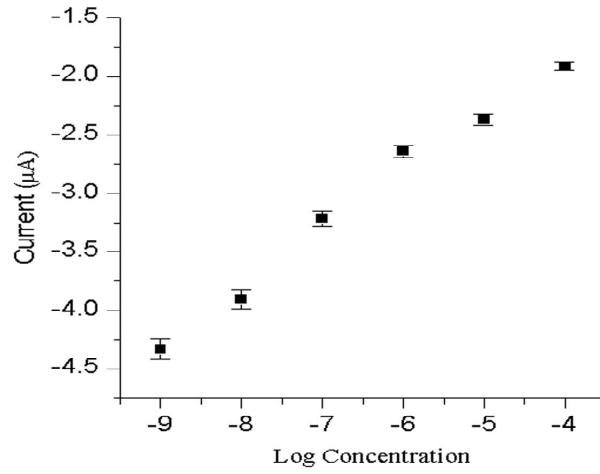
Fig 6. Calibration curve for 1 nM to 100 µM herbicide (DCMU) based on figure 5.

RESEARCH ARTICLE

Effect of Incorporation of Flaxseed Flour on Sensory and Rheological Quality of Yoghurt

S.Sivakumar[1]*, BV Balasubramanyam[2], K Jayaraj Rao[2], P Heartwin Amala Dhas[2] and B Surendra Nath[2]

[1]College of Dairy Science and Technology, Guru Angad Dev Veterinary and Animal Sciences University Ludhiana-141004,India.
[2]National Dairy Research Institute, Southern Regional Station, Bangalore, Karnataka-560030. India.

*Address for correspondence
Dr.S.Sivakumar
Assistant Scientist (Dairy Technology)
College of Dairy Science and Technology,
Guru Angad Dev Veterinary and Animal Sciences University,
Ludhiana-141004, India.
E-mail: drshiva2003@yahoo.com
Phone: 01612553308

ABSTRACT

Flaxseed is considered as a source of functional ingredients. In order to select the variant of milk, the yoghurt prepared by incorporating 1 and 2% flaxseed flour in Double Toned Milk (DTM), Toned Milk (TM) and Standardized milk (STM) were analyzed for the sensory parameters on 9 point hedonic scale. The statistical analysis shows that the colour and appearance of yoghurt prepared by using DTM was significantly different from that made from TM and STM. Statistical analysis of body and texture showed yoghurt from TM was significantly better than DTM and STM. The statistical analysis indicates that the flavour of yoghurt made from TM was significantly better than that made by using DTM or STM at $P \leq 0.05$. Similarly amongst the different levels of flaxseed flour used, the flavour of yoghurt made with 2% flour incorporation was significantly different from control yoghurt. The sedimentation increased with increased addition of flaxseed flour in the product. The overall acceptability score indicates that the yoghurt made from TM was significantly better than that made by using DTM or STM at $P \leq 0.05$. No significant difference was observed between control and yoghurt made with 1% flour. The pH of the samples with flaxseed flour showed slightly higher pH due to lower acid development. The addition of sugar decreased the viscosity of the product in both the flaxseed flour incorporated yoghurt. The incorporation of flaxseed significantly increased the viscosity of the yoghurt and the addition of sugar reduced the viscosity.

Key words; Flaxseed flour, Milk, Sensory parameters, pH, Acidity, Viscosity, yoghurt

INTRODUCTION

The growing awareness amongst Indian consumers regarding several ingredients and their associated health benefits is making them more inclined to use nutritional information very often to make product choices. Hence, there is a demand for food and beverages with health benefits and Indians are making a conscious attempt to include them in their diet, with the hopes of maintaining or enhancing quality of life. Yoghurt is aimed at reducing human ailments such as constipation and diarrhea, by restoring the beneficial microbial population in the colon. It is beneficial to our digestive system, especially stomach and colon. Yoghurt is a source of natural proteins; it is safer for those having problem of lactose intolerance. Yoghurt is rich in calcium, and hence, it protects the bones against osteoporosis and arthritis. By daily consumption of yoghurt, disease causing bacteria are flushed out from the colon and thus offer protection against colon cancer. Flaxseed is the seed with the highest Omega 3 fatty acid (alpha-linolenic acid) content. Around 48% of the total lipids correspond to this essential fatty acid. Flaxseed is considered a functional food or source of functional ingredients, because it contains alpha-linolenic acid, lignans and polysaccharides (other than starch), all of which have positive effects in disease prevention (Coskuner and Karababa 2007). One of the most interesting characteristics of flaxseed is its content of complex phenols, such as lignans. The most remarkable one is secoisolariciresinol diglucoside (SDG), although isolariciresinol, pinoresinol, mataresinol and other derivatives of ferulic acid are also present (Daun et al. 2003). Lignan consumption reduces cardiovascular risk and inhibits the development of some types of diabetes (Mueller et al. 2010). In the present investigation attempt were made to incorporate the flaxseed flour in yoghurt and study its effect on the sensory and rheological properties o yoghurt.

MATERIALS AND METHODS

Milk: The cow milk received from the experimental dairy of National Dairy Research Institute, Bangalore was standardized to Fat 1.5% and SNF 10.0%, Fat 3%, SNF 10.0% and Fat 4.5%, SNF 10.0% with the help of skim milk and cream obtained by the same whole milk.

Flax seeds: The flaxseed of good quality was obtained from local market and used for yoghurt preparation. The flax seeds were manually cleaned to remove dust and extraneous matters. The cleaned flax seeds were ground in a dry mixer to powder, before it was used in experimental trials.

Preparation of yoghurt

The yoghurt was prepared as per the procedure described by Tamime and Deeth (1980) with slight modifications. The ground flaxseed flour was added into milk (w/w) at 1 and 2%. The flour was added to milk before heating the milk to final temperature. Sugar was used at 10% levels for preparation of the experimental yoghurt. The sugar was added to milk prior to final heat treatment to eliminate the osmophilic yeasts coming from sugar.

Sensory Evaluation

The experimental yoghurt samples were served to a panel of trained judges (Scientist) selected from the Institute judged for their sensory parameters to select the optimized level of the flaxseed extract. The sensory evaluation of the experimental yoghurt samples were carried out with the help of 9 point hedonic scale (Shone et al. 1977).

Analysis of Milk

Fat: The fat content in the experimental milk before it was used for preparation of the yoghurt was estimated by the Gerber method as procedure described in IS: 1224(Part I), (1997).

SNF: After estimating the fat content in milk, its SNF content was estimated by using the Richmond formula of CLR/4 + 0.25xF+0.44 wherein CLR is Corrected Lactometer Reading at 29^0C and F represents fat content of milk.

pH: The pH of the milk samples were estimated by using the digital pH meter. The pH meter was standardized by using 4.0 and 7.0 buffer solutions before it was used for the estimation of pH.

Titratable acidity: The titratable acidity of the samples was estimated as per the procedure described in IS: SP: 18(Part XI) 1981.

Analysis of Yoghurt

Titratable Acidity: Titratable acidity of the yoghurt samples was estimated according to the standard AOAC procedure (Helrich, 1990).

pH: About 10 g of yoghurt sample was taken in a 50 ml glass beaker and mixed well in 10 ml of lukewarm distilled water using a glass rod. The electrode assembly was cleaned in distilled water, wiped with tissue paper and then dipped into sample. The pH and the temperature of the sample was directly read on the displayed was recorded.

Viscosity of yoghurt – Viscometer of Brookfield RV-DV model was used to estimate the viscosity of the yoghurt samples. Sample (with 600ml beaker) was taken directly from the refrigerator at 5ºC. The viscometer was run with spindle RV-6 with from 10-100 rpm as per the manufacturer's directions, then reading was taken and values are expressed as centipoises (cp).

Statistical Analysis

Data obtained from various experiments during standardization, was statistically analysed by using statistical software SPSS 15.0 for Windows Evaluation Version.

RESULTS AND DISCUSSION

Preliminary trials were conducted to incorporate available flaxseed extracts into milk for preparation of yoghurt. The nutritional guidance value and the sensory attributes were considered for conducting the preliminary trials. In trials, flaxseed flour up to 4%, were incorporated in milk for preparation of yoghurt. Based on the sensory evaluation, incorporation of flaxseed flour up to 2% were selected for further trials. The use of flaxseed flour at the level more than 2% of milk imparted increased dark brown colour and more amount of flaxseed particles were observed on the surface of the yoghurt. Further, use of higher level of flour also resulted in more slimy and biting sensation in the mouth. Hence, the judges rejected the use of more than 2% flaxseed flour in yoghurt preparation. The increase in SNF content in milk from 8.5% to 10% was found to improve the flavour and body & texture of the yoghurt and hence the SNF content in milk was increased to 10% for the experimental trials. Based on the preliminary trials, 10% sugar in flaxseed flour incorporated yoghurt was maintained in the experimental trials.

In order to select the variant of milk, the yoghurt prepared by incorporating 1 and 2% flaxseed flour in Double Toned Milk (DTM), Toned Milk (TM) and Standardized milk (STM) were analyzed for the sensory parameters on 9 point hedonic scale. The colour & appearance and body & texture scores are presented in Table 1.

The scores for control yoghurt prepared by using DTM, TM and STM varied marginally between 7.82 and 7.98. The slight variation was due to fat content in the milk. The yoghurt prepared by using DTM was whitish in colour due to lesser fat content and that made form STM was yellowish in colour which was due to higher fat content in STM. The

scores with 1% flaxseed flour incorporated yoghurt prepared by using DTM, TM, and STM were 7.32, 7.42 and 7.37 respectively and the corresponding scores for the yoghurt prepared by incorporating 2% flaxseed flour were 6.24, 6.43 and 6.31. The statistical analysis shows that the colour and appearance of yoghurt prepared by using DTM was significantly different from that made from TM (at P<0.05), while no significant difference was observed between the yoghurts made from TM and STM. The two way ANOVA statistical analysis indicate that significant differences were found between the control yoghurt and yoghurt with 2% flaxseed flour. Hussain et al. (2006) reported that more darkness in the colour of the cookies was observed as the level of the supplementation of the flaxseed flour was increased in the wheat flour that may be subjected to the dark brown colour of the flaxseed.

Similarly, the results indicate that the body and texture scores for control yoghurt made from DTM was 7.73 and it increased to 7.86 and 7.90 for that made from TM, STM respectively. The increased milk solids content in TM and STM has improved the firmness of the products. The use of flaxseed flour reduced the corresponding body and texture scores of the yoghurt samples. Statistical analysis showed yoghurt from TM was significantly better than DTM and STM. Between the control yoghurt and the yoghurts with 1 and 2% flaxseed flour, judges liked the yoghurt with 1% flaxseed flour with slight reduction in score as compared to control. The yoghurt with 2% flaxseed flour was significantly inferior to the other two samples. The use of 2% flaxseed flour drastically reduced the scores with an average score of 6.41 due its mottled appearance, slimy body and increased brown sedimentation of the flour. The effect of type of milk and flax seed incorporation was found to be significant for body and texture at (P<0.05). Similar observations were observed during preparation of cookies (Carter 1993; Hussain, et al. 2006).

The sensory scores for flavour, sedimentation and overall acceptability of yoghurt prepared by incorporating flaxseed flour in different variants of milk are presented in Table-2. It was observed that the flavour score for control yoghurt made from DTM was 7.83 and it increased to 7.90 and 7.95 for yoghurt made from TM and STM respectively. The increase in the flavour score was mainly due to increased fat level in the milks. The addition of flaxseed flour significantly reduced the flavour scores. The flavour scores for 1% flaxseed flour incorporated yoghurt prepared from DTM, TM and STM were 7.32, 7.50 and 7.37 respectively and the corresponding values for yoghurt prepared by incorporation of 2% flaxseed flour were 6.52, 6.76 and 6.59. The findings indicate that the variation in quality of milk had marginal effect on the flavour of the product while level of incorporation of flaxseed flour had significant effect on the flavour. The statistical analysis indicates that the flavour of yoghurt made from TM was significantly better than that made by using DTM or STM at P≤0.05. Similarly amongst the different levels of flaxseed flour used, the flavour of yoghurt made with 2% flour incorporation was significantly different from control yoghurt, at P≤0.05. However, the judges liked the yoghurt with 1% flour with no significant reduction in the flavour score compared to control yoghurt. The score reduced to 6.62 when 2% flaxseed flour was incorporated in the product due to tinge and biting flavour. Shahzad Hussain, et al. (2006) reported that incorporating flaxseed into a diet is simple and can add a tasty twist to routine dishes. Flaxseed can be ground (milled) prior to consumption to obtain the potential health benefits from the Omega-3 fatty acids and lignans.

The sedimentation score for control yoghurt prepared by using DTM, TM and STM were 7.97, 8.03 and 8.07 respectively. The scores significantly reduced to 7.20, 7.49 and 7.36 respectively for the yoghurt prepared with incorporation of 1% flaxseed flour. The sedimentation increased with increased addition of flaxseed flour in the product. The scores for 2% flaxseed flour incorporated yoghurt prepared by using DTM, TM, and STM were 6.13, 6.29 and 6.16 respectively.

The overall acceptability score also showed the similar trend indicating that use of flaxseeds flour in yoghurt preparation had significant effect, and the variation in milk quality (milk fat and milk SNF) also had significant effect on the overall sensory qualities of yoghurt. The statistical analysis for overall acceptability score indicates that the overall acceptability of yoghurt made from TM was significantly better than that made by using DTM or STM at P≤0.05. No significant difference was observed between control and yoghurt made with 1% flour, while the yoghurt with 2% flour was significantly different from control and the yoghurt with 1% flour (P≤0.05). Further, the interaction

between sugar and flaxseed flour was not significant for flavour, sedimentation and over all acceptability indicating that both effects were independent from each other

Acidity and PH Development in Yoghurt Prepared by Using Flaxseed Flour during Fermentation

The rate of change in acidity development and pH in yoghurt prepared by incorporating flaxseed flour was studied and the results are presented in Table 3. The initial acidity of the milk before inoculation was 0.17% LA. The acidity in all the samples after addition of culture increased immediately and ranged between 0.18 and 0.19%. The use of high amount of inoculum (4% of milk taken) resulted in immediate increase in the acidity of the samples. At the end of 2 hours of incubation at 42^0C, the control sample showed an acidity of 0.48%.

It was observed that the acidity of samples containing flaxseed flour varied between 0.39 and 0.42 which were less than that in control sample. The samples containing flaxseeds were ropy in texture and the ropiness increased with increased level of flaxseed flour incorporation which could be related to the decreased acidity. The development of ropiness could be due to the binding of water which might have affected the bacterial activity. At the end of 4 h of incubation, the control yoghurt has shown the acidity of 0.76% which was ideal acidity for the yoghurt to be shifted to cold store (about 5^0C). However, the addition of sugar (8%) has slightly inhibited the bacterial activity as indicated by lower acid development in the sweetened control yoghurt. The control yoghurt with sugar could attain the desirable acidity of 0.77% at the end of 4hr 30 min. of incubation. Tamime and Robinson (2000) also reported the similar period of incubation for production of sweetened yoghurt.

At the end of 4 hour of incubation the flaxseed flour incorporated yoghurt has shown the acidity ranging between 0.56 and 0.60%. Even at the end of 4h 30min of incubation, the acidity of the samples ranged between 0.65 and 0.68%. These acidity values were comparable to other experimental samples and control yoghurt samples at the end of 4 h of incubation. The desired acidity of about 0.75% could be attained at the end of 4h 45 min of incubation. The incorporation of flaxseed flour might have significantly inhibited the bacterial activity due to binding of water as indicated by the lower acid development. The final acidity of the samples after overnight storage at 5^0C was estimated. It was observed that the acidity of control yoghurt samples was 0.86% and that in all the experimental samples including those with flaxseed flour were in the range of 0.85- 0.88%. This shows that, though the rate of acid development in experimental samples significantly varied during the incubation period, at the end of overnight storage at refrigerated temperature, all the samples could attain a uniform acidity. Oakenfull (2001) reported that the metabolic activity of lactic mixed cultures caused the formation of lactic acid and pH decreasing through the storage. The presence and type of fiber contributed to increase the pH value of the yoghurt samples that is attributed to a reaction of the linked monosaccharide units that constitute the soluble fiber or polysaccharide, whereas higher calcium and fiber levels were significantly associated with lower titratable acidity.

The changes in pH of yoghurt prepared by using flaxseed flour and their combinations during the incubation period were studied and the results are presented in Table 4. The initial pH of the milk used for yoghurt preparation was 6.68. The pH of the samples reduced immediately after inoculation of lactic cultures to 6.54 and 6.58. At the end of 2 h of incubation, the control samples with and without sugar showed the pH of 5.48 and 5.54 respectively. On the other hand, the flaxseed flour incorporated yoghurt samples showed higher pH at the end of same incubation period. The pH of these yoghurt samples ranged between 5.58 and 5.62. Similar trend in pH change was observed at the end of 4 h of incubation.

The pH of the flaxseed flour incorporated yoghurt samples were slightly higher than those of control. At the end of 4 h of incubation period the control attained an optimum pH of 4.36. The pH of the samples with flaxseed flour showed slightly higher pH due to lower acid development. It was observed that the sweetened yoghurt samples including control attained desirable pH at the end of 4h 30 min of incubation. The flaxseed flour added yoghurt samples attained the pH of 4.30 at the end of 4h 45min of incubation. At the end of 24 h of storage at 5^0C, all the

3488

samples showed a uniform pH ranging between 4.22 and 4.24. All the above pH values match with the corresponding acidity values of the control and experimental yoghurt samples. Oztürk and Oner (1999) reported that after 4h of incubation, at 42–45ºC, the pH of the control was 4.26 while the 5, 10 and 15% concentrated grape juice (CGJ) yoghurts were pH 4.44, 4.98, 5.90, respectively. CGJ addition delayed acid development and so pH reduction rate slowed. The 15% CGJ addition increased fermentation time compared to 5 and 10% CGJ. The slow fermentation is not desirable for yoghurt because of typical increase in syneresis (Tamime and Deeth 1980) and a breakdown of symbiotic relationship between starter bacteria (Tamime and Robinson 1980).

Viscosity of flaxseed flour incorporated yoghurt

Food rheology is the study of the deformation and flow of food materials (Rao 1999). Yoghurt can be classified as pseudoplastic material (contains no yield stress that has to be exceeded for flow to be initiated) that can be either a viscoelastic fluid if we are dealing with stirred or drinking yoghurt or a viscoelastic solid if we are dealing with set yoghurt. Viscoelasticity indicates the material has some of the elastic properties of an ideal solid and some of the flow properties of an ideal (viscous) liquid. Yoghurt also exhibits time-dependent shear thinning behavior but yoghurt is not a true thixotropic material since structural breakdown due to shear is not completely reversible once the shear stops.

Attempts were made to incorporate flaxseed flour at 1 and 2% levels and the effect of flaxseed flour and on viscosity of yoghurt was studied .The results were presented in Figure-1. The viscosity values for the control yoghurt prepared by using toned milk (TM) and toned milk with addition of sugar (TMS) were initially at (10 rpm) 30000 and 26933 mPa S respectively. Addition of sugar decreased the values in the product. As the RPM speed of spindle speed increased, the corresponding values for the yoghurt decreased. The values at 100 rpm were 1885 mPa S for TM and 1516.67 mPa S for TMS which indicated, the shear thinning behavior of yoghurt. Further, the viscosity values for the 1% flaxseed flour incorporated plain yoghurt and flaxseed flour incorporated yoghurt with sugar were 47933 and 38066 mPa S respectively at 10 rpm. As the RPM speed was increased, the corresponding values for the yoghurt decreased, the values at 100 rpm were 2400 mPa S and 2233 mPa S. The addition of 2% flaxseed flour incorporated yoghurt further increased the viscosity of yoghurt (10 rpm) to 54000 mPa S and at 100 rpm the values were reduced to 1963 mPa S.

All the analyzed yoghurts exhibited shear thinning behavior, in which the time dependency was not considered. In most of the coupled samples (same formulation, different flaxseed), the type of fiber favored a measurable resistance to flow. As the levels of flaxseed flour increased the total solid content also increased, viscosity also increased Further, in flaxseed flour, major insoluble fiber fraction consists of cellulose and lignin, and the soluble fiber fractions are the mucilage gums (Vaisey Genser and Morris 2003; Mazza and Biliaderis 1989).The mucilage can be extracted by water and has good foam-stability properties. Owing to the high mucilage content, the flaxseed hull has high-water absorption, moisture–binding capacity, as well as lubricity (Mazzav and Biliaderis 1989). Flaxseed lignans and gums (viscous soluble fiber) located mainly in the hulls enclosing the seeds increased the viscosity of yoghurt, while the majority of the proteins and oils are in the kernel/embryo. The results correlated with the findings of Pandhya (2002), who said that increase in fat resulted in increase in viscosity of dahi. Addition of sugar in fruit dahi preparation resulted in decrease in viscosity as compared to control without sugar. Low viscosity of dahi with increase levels of sugar could be due to the reason that sugar impedes the swelling of protein micelles thus affecting the gel strength.

CONCLUSION

The studies show that yoghurt from TM was significantly better than DTM and STM. The flavour of yoghurt made from TM was significantly better than that made by using DTM or STM at P≤0.05. Similarly amongst the different levels of flaxseed flour used, the flavour of yoghurt made with 2% flour incorporation was significantly different from control yoghurt. The sedimentation increased with increased addition of flaxseed flour in the product. The

Sivakumar *et al.*

statistical analysis for overall acceptability score indicates that the overall acceptability of yoghurt made from TM was significantly better than that made by using DTM or STM. No significant difference was observed between control and yoghurt made with 1% flour. It was observed that the incorporation of flaxseed flour has inhibited the bacterial activity as indicated by lower acid development. The pH of the samples with flaxseed flour showed slightly higher pH due to lower acid development. The addition of sugar decreased the viscosity of the product in both the flaxseed flour incorporated yoghurt, it was understood that as the RPM speed was increased, the corresponding values for the yoghurt decreased.

ACKNOWLEDGEMENTS

REFERENCES

1. Carter JF (1993) Potential of flaxseed and flaxseed oil in baked goods and other products in human nutrition. Cereal Foods World. 38(10): 753–759.
2. Coskuner Y, Karababa E (2007). Some physical properties of flaxseed (Linum usitatissimum L.). J. Food Eng, 78: 1067–1073.
3. Daun JK. Barthet JV, Chornick TL, Duguid S (2003) Structure, composition, and variety development of flaxseed. In ''Flaxseed in Human Nutrition'' (S.C. Cunnane and L.U. Thompson, eds), 2nd Ed., pp. 1–40. AOCS Press, Champaign, IL.
4. IS: SP- 18, (1981) ISI Handbook of food analysis, partXI Dairy Products, Indian Standards Institution, New Delhi.
5. IS: SP- 18, (1997) ISI Handbook of food analysis, partXI Dairy Products, Indian Standards Institution, New Delhi.
6. Helrich K (1990) Official methods of analysis of the association of official analytical chemists (15th edn.) Arlington: Association of Official Analytical Chemists Inc.
7. Hussain S, Anjum F M, Butt M S, Khan M I, Asghar A (2006) Physical and Sensoric Attributes of Flaxseed Flour Supplemented Cookies. Turk J Biol ,30 :87-92.
8. Mazza G ,Biliaderis C G (1989). Functional properties of flax seed mucilage. J Food Sci,54(5):1302–1305
9. Mueller K, Eisner P, Yoshie-Stark Y, Nakada R, Kirchhoff E (2010) Functional properties and chemical composition of fractionated brown and yellow linseed meal (Linum usitatissimum), J. Food Eng, 98(4): 453-460.
10. Ozturk BA , Oner MD (1999) Production and Evaluation of Yoghurt with Concentrated Grape Juice. J Food Sci, 64(3): 1999
11. Pandhya Nirav Chandrakant (2002).Development of Technology for fruit Dahi .Thesis submitted to NDRI,Karnal.
12. Rao MA (1999). Rheology of fluids and semisolid foods. Aspen Publishers, Inc., Maryland.
13. Shone H, Sidel H, Oliver S, Wood Sey A, Singlehon RC (1977) Sensory evaluation by quantitative descriptive analysis. Food Technol, 28(1):24-26.
14. Tamime AY, Deeth HC (1980) Yoghurt: technology and biochemistry. J Food Protc, 43: 939-977.
15. Tamime AY, Robinson RK (2000) Yoghurt: Science and Technology Second edition 19, 20 375.
16. VaiseyGenser M, Morris DH (2003). Introduction, history of the cultivation and uses offlaxseed. In: Muir AD, Westcott ND (eds) Flax, the Genus Linum. Taylor and Francis, London, pp 1–21

Table 1: Effect of milk variation on Colour and appearance and Body and texture of flaxseed flour incorporated yoghurt

Flaxseed flour level	Colour and appearance				Body and texture			
	Milk				Milk			
	DTM	TM	STM	AVG*	DTM	TM	STM	AVG *
0% Control	7.82	7.90	7.98	7.90[a]	7.73	7.86	7.90	7.83[a]
1%	7.32	7.42	7.37	7.37[a]	7.30	7.47	7.38	7.38[a]
2%	6.24	6.43	6.31	6.33[b]	6.31	6.53	6.38	6.41[b]
AVG *	7.13[b]	7.25[a]	7.22[a]		7.12[c]	7.28[a]	7.21[b]	

DTM = Double Toned Milk, TM = Toned Milk, STM = Standardised milk
Mean values with different Superscript [abc] in a row/column differ significantly at (P≤0.05)
Sugar level 10%. *Statistical Mean

Table 2: Effect of milk variation on Flavour, Sedimentation and Overall acceptability of flaxseed flour incorporated yoghurt

Flaxseed Flour level	Flavour				Sedimentation				Overall acceptability			
	Milk				Milk				Milk			
	DTM	TM	STM	AVG*	DTM	TM	STM	AVG	DTM	TM	STM	AVG*
0% Control	7.83	7.90	7.95	7.89[a]	7.97	8.03	8.07	8.02[a]	7.84	7.99	8.03	7.95[a]
1%	7.32	7.50	7.37	7.39[a]	7.20	7.49	7.36	7.35[b]	7.37	7.58	7.43	7.46[a]
2%	6.52	6.76	6.59	6.62[b]	6.13	6.29	6.16	6.19[c]	6.43	6.67	6.58	6.56[b]
AVG *	7.22[c]	7.39[a]	7.30[b]		7.10[b]	7.27[a]	7.19[a]		7.21[c]	7.41[a]	7.32[b]	

DTM = Double Toned Milk, TM = Toned Milk, STM = Standardised milk
Mean values with different Superscript [abc] in a row/column differ significantly. (P≤0.05)
Sugar level 10% , *Statistical Mean

Sivakumar *et al.*

Table 3: Acidity development in yoghurt prepared by using flaxseed extracts during fermentation

Product Code	Incubation period in hours*					
	0h (immediately after inoculation)	2h	4h	4.30 h	4.45 h	After 24h of storage at 5ºc
Control (C)	0.18	0.48	0.76	-	-	0.85
C+ Sugar (8%)	0.18	0.45	0.67	0.77	-	0.86
1% Flaxseed Flour (FF)	0.18	0.42	0.60	0.68	0.76	0.86
1% FF +10%S	0.18	0.40	0.59	0.66	0.74	0.85
2% FFC	0.19	0.40	0.57	0.66	0.75	0.85
2%FF +10%S	0.18	0.39	0.56	0.65	0.74	0.85

*Mean values

C-Control -Toned milk (3.0% fat and 10% SNF) was used for the trials

Incubation Temperature = 42 ± 1^0C

Table 4: Change of pH in yoghurt prepared by using flaxseed extracts during fermentation

Product Code	Incubation period in h*					
	0h(immediately after inoculation)	2 h	4 h	4.30 h	4.45 h	After 24h of storage at 5ºC
C	6.60	5.45	4.36	-	-	4.24
C+S(8%)	6.62	5.48	4.40	4.32	-	4.23
1FF	6.57	5.58	4.45	4.36	4.30	4.23
1FF+ S(10%)	6.58	5.60	4.47	4.38	4.32	4.24
2FF	6.55	5.61	4.48	4.37	4.31	4.22
2FF+S(10%)	6.56	5.62	4.49	4.36	4.33	4.23

*Mean values

C-Control -Toned milk (3.0% fat and 10% SNF) was used for the trials

Incubation Temperature = 42 ± 1^0C

Sivakumar *et al.*
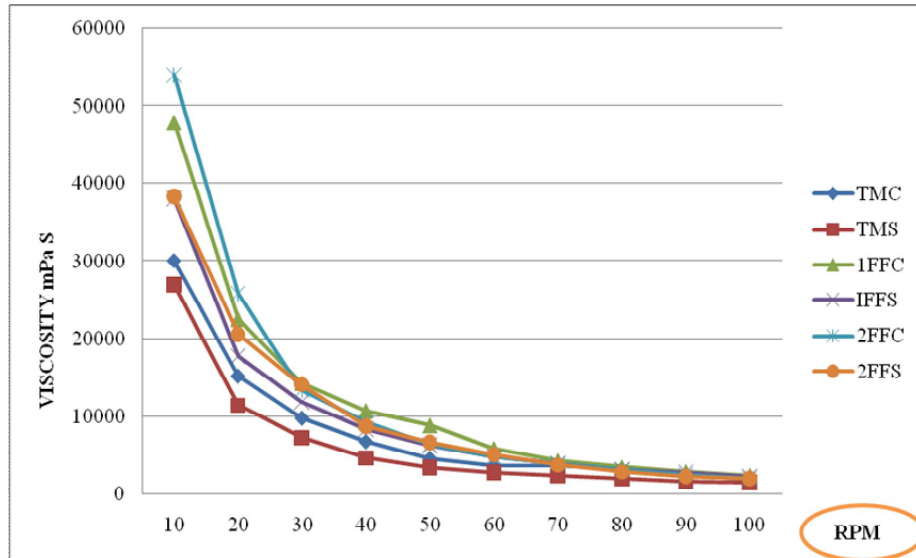
Fig 1. Viscosity of flaxseed flour incorporated yoghurt

Mean of 5 trials

TMC-Toned milk (3.0% fat and 10% SNF) was used for the trials.

TMS-Sugar level 8%

IFFC-1% flaxseed flour (control)

1FFS-1% flaxseed flour, Sugar level 10%

2FFC-2% flaxseed flour (control)   2FFS-2% flaxseed flour, Sugar level 10%

2FFS-2% flaxseed flour, sugar level 10%

RESEARCH ARTICLE

Milk Productivity of Crossbred Cattle in Small Dairy Holdings of Wayanad District

Nija George[1] and Senthilkumar.R[2]*

[1]Department of Veterinary and Animal Husbandry Extension, CV & AS, Mannuthy, Kerala,India.
[2]Department of Veterinary and Animal Husbandry Extension, CV & AS, Pookode,Kerala,India.

*Address for correspondence
Senthilkumar, R
Assistant Professor & Head,
Department of Veterinary and Animal Husbandry Extension,
CV & AS, Pookode,Kerala,India.
E-mail: rsenthilvet@gmail.com
Mobile: 09645675500

ABSTRACT

A study was conducted to analyze the milk production pattern and milk productivity of cattle in small dairy holdings of Wayanad. The measurement tool employed was a well-structured pretested interview schedule. Milk productivity of small dairy holdings was operationalized as Livestock production index (Milk yield. The average milk production of cross bred cattle of the study area was found to be 2481.677±837.17 liters. Milk productivity of nearly half of the small dairy holdings studied was on the medium category and only just over one fourth were comparatively high.

Key words: small dairy holdings, cross bred cattle, milk productivity, Livestock production index (Milk yield)

INTRODUCTION

Improving the livestock sector has paramount importance since the demand for food of animal origin is growing day by day due to changing food habits and trends in income utilization. With 22 million tons of milk and 90 billion dairy animals, now, India has attained the numero uno status in milk production. In Indian livestock sector milk contribute 66.7 per cent of the total value of output from livestock sector. The per capita availability of milk has increased from 128g/day in 1980-81 to 267 g/day in 2010-11 and the average annual milk yield of Indian cattle stands at 1172 kg which is well below the global average of 2500 kg. The daily average milk yield of Indian animals is between 1.5 Kg to 5.0 Kg. (Report of The Working Group on Animal husbandry & Dairying, 12th five year plan, 2012). One of the

3494

Nija George and Senthilkumar

overarching goals of animal husbandry development programmes and policies has been the consistent improvement of livestock productivity for accelerated economic growth. This is in view of the fact that majority of the livestock keepers in India depend on animal husbandry for their survival. Thus this sector has been recognized as a key fundamental for spurring growth, overcoming poverty and enhancing food security. Productivity increases in agriculture can reduce poverty by augmenting farmer's income, reducing food prices and thereby enhancing investments in consumption (Diagneet al., 2009). Consistent with this argument, in the year 2003 the Department For International Development (DFID) had estimated that a one per cent increase in agricultural productivity could reduce the percentage of poor people having less than one dollar a day by between 0.6 and two per cent. With this in mind, a study has been conducted among the small dairy holders of Vythiri Taluk in Wayanad district to explore the productivity pattern of crossbred cattle of the region.

MATERIALS AND METHODS

The present study was conducted in the Vythiri taluk of Wayanad district among 120 small dairy holdings selected by applying multistage random sampling. Here small dairy holding meant farms with one or two milch animals. Vythiri taluk was purposively selected for being the largest taluk and with the least milk production among the three taluks of Wayanad district. There were a total of eighteen villages in Vythiri taluk of which the following six villages were selected randomly. From each village, an equal number of twenty respondents were selected at random. With the help of key informants and stakeholders including the government veterinary surgeon, livestock inspector and office bearers of the co-operative societies, a list of small dairy holders of each village was prepared and the respondents of the study were selected randomly from that list.

For the present study the productivity was measured by Livestock production index (Milk production) as recommended by Yang in 1980.The lactation yield of the animals was estimated using the approximated milk yield during early, mid and late lactation, as recalled by the respondent. The average lactation yield of milch animals of that particular region was found out as first step. Then by dividing the average yield per animal of a particular dairy farm by the average yield of a cow in the study area, a percentage figure was obtained which when multiplied by 100 gave the Livestock production index (Milk yield). The respondents were classified into three categories as low, medium and high according to the Livestock production index (Milk yield).

Calculation of Livestock production index (Milk yield)

The average yield of milch animals of the study area has to be found out. Then by dividing the average yield of cow/cows of an individual holding by the average yield for the area /region, a percentage figure was obtained which when multiplied by 100 gave the Livestock production index (Milk yield).For the present study, since small holders only were studied, the household production was taken as individual cow production for single milch cow holdings and average of the milk production where there was more than one milch cow.

RESULTS AND DISCUSSION

The average milk production of cross bred cattle of the study area was found to be 2481.677±837.17 litres. This was greater than that reported by Shyjuet al. (2002), Stephen et al. (2007) and Radhikaet al. (2012) and the milk yield reported were 2295 kg, 1810 ± 464 kg and 2118.796±139.578 kg respectively. Higher estimates observed could be on account of high producing cross bred animals in the study area as evidenced from the fact that this area contained the highest number of milk co-operative societies despite having the least cattle population when compared to other Taluks of Wayanad. Staal et al (2008) expressed that dairy co-operatives have had impact on the supply side, in fostering the introduction of new technology, particularly improved dairy cattle and the role of co-operatives might have been more in terms of supporting technology development and uptake. Despite the productivity much more

Nija George and Senthilkumar

which is ranging from 5000 litre to around 9000 litres per cow per annum, the milk productivity of dairy cows in the region is not up to the desired level. The respondents were then classified into three categories as low, medium and high according to the Livestock production index (Milk yield).Data in Table 2 indicate the distribution of respondents with respect to the livestock production index which reveals that 47.5 per cent of the respondents were having medium milk productivity followed by 30.00 per cent with low and 22.50 per cent with high milk productivity. Milk productivity was observed to be medium for nearly half of the respondents. This finding is in line with that of RajKamal (1994). As Kapoor (2015) rightly pointed out India's success in attaining leadership and contributing 17 per cent to the global milk production has been achieved more on the strength of milch animal numbers and less on the back of yield improvements. But in order to meet the impending supply demand gap, it has become imperative to focus on improving productivity. A significantly spruced up breeding programme, efficient feed management interventions, broad-basing the scale and scope of veterinary services, adoption of superior farm management practices and an efficient extension network are the five pillars on which the dairy sector shall be efficiently poised to achieve the full potential of the Indian dairy herd.

CONCLUSION

The study revealed that the milk productivity in the hilly tract was from low to medium in which calls for more interventions in many areas of small holder dairy farming such as improved breeding, increased conventional inputs, remunerative prices for the milk, well knitted information system, etc. Since the agricultural productivity has direct impact on alleviating the rural poverty and significantly contribute to livelihood security, efforts are to be focused on attaining the goal of improving livestock productivity to complement the primary sector.Furthermore the augmented production would help in catering the increased demand of high quality animal protein.

REFERENCES

1. Anonymous. 2006. Department of agriculture. Government of Kerala.
2. Anonymous. 2012. Report of the working group on animal husbandry & dairying 12th five year plan (2012-17). 130 p.
3. Diagne, A.,Stide Kambi, S.A., Sintowe, F.P. and Biaou, G. 2009. The impact of agricultural technology adoption on poverty: the case of Nerica rice varieties in Benin. 27 conference f IAAF.Aug:16 - 22. Beijing.
4. Kapoor, R (2015). Indian cow, may your yield increase, Url: http://www.thehindubusinessline.com/ opinion/indian- cow-may-your-yield-increase/article5835726.ece
5. Radhika, G., Ajithkumar, S., Rani, A., Sathian, C. T., Anilkumar, K., Usha, A.P. and Dinesh,C.N. 2012. Milk yield and composition of crossbred cows in the hilly Wayanad district of Kerala, India. Indian J. Anim. Sci. 82 (10): 1251–1254.
6. Rajkamal, P.J. 1994. Livestock enterprise among tribal's as antecedent to income, employment and productivity. PhD Thesis, IVRI, Izatnagar, 253p.
7. Shyju, C.S., Gopakumar, C.P. and Sajeevkumar, T. 2002. Relationship of first lactation and lifetime production of Sunandini in Kerala farms. Proceeding of National Seminar on 'Sire Selection for Milk Production Enhancement in Tropics'. pp 59-64.
8. Steven J. Staal, Alejandro Nin Pratt, and Mohammad Jabbar 2008. Dairy Development for the Resource Poor Part 3: Pakistan and India Dairy Development Case Studies. 44th of a series of Working Papers prepared for the Pro-Poor Livestock Policy Initiative (PPLsPI). Pp 60
9. Stephen, S., Peter, K.A., Ajithkumar, C. B. and Reghunandan, K. V. 2007. Significance of socio-economic factors of farmers on the milk production of crossbred cows in Thrissur district of Kerala. Indian J. Anim. Sci. 77 (6): 500-503.

10. Yang, W.Y. 1980. Method of farm management investigations. FAO Agricultural Development Paper, Rome. 80p.

Table 1: Computation of milk yield index for cross-bred cow

Genetic Group	Average milk production of lactating cows of the ar (A)	Average household milk yield (B)	No. of dairy cows (C)	House hold Milk productivity (D) = (A)/ (B) * 100
Cross Bred	2481.677	2711.69	1	109.27
Cross bred	2481.677	3027.5= (2830+ 3225)/2	2	121.99

Table 2. Distribution of respondents based on livestock production index (milk production) n = 120

Sl. No.	Category	Frequency	Percentage
1	Low (<80.00)	36	30.00
2	Medium (80-119.99)	57	47.50
3	High (≥119.99)	27	22.50
	Total	120	100

RESEARCH ARTICLE

Adoption of Scientific Dairy Farming Practices by Smallholder in a Hilly District of Kerala

Nija George[1] and Senthilkumar, R[2]*

[1]Department of Veterinary and Animal Husbandry Extension, CV & AS, Mannuth,Kerala,India.
[2]Department of Veterinary and Animal Husbandry Extension, CV & AS, Pookode,Kerala,India.

*Address for correspondence
Senthilkumar, R
Assistant Professor & Head,
Department of Veterinary and Animal Husbandry Extension,
CV & AS, Pookode
E-mail: rsenthilvet@gmail.com
Mobile: 09645675500

ABSTRACT

A study was conducted to analyze the adoption of various dairy farming practices by small holding dairy farmers of Wayanad district in Kerala. The measurement tool employed was a well-structured pretested interview schedule. The study implies that the overall adoption of scientific dairy farming practices were low to medium and domain-wise content analysis revealed that the adoption of practices such as calf rearing, feeding, breeding, housing and management were found to be medium to high level

Key words: small dairy holdings, Adoption index, scientific dairy farming,

INTRODUCTION

Dairy farming assumes important position among the farming community in India where majority of them are smallholders possessing few acres of land having few dairy animals contribute more than 90 per cent of its total milk production. Majority of the smallholder farmers depend on these animals for their livelihood and nutritional security and integral component for practicing mixed farming paving the way for sustainable agricultural production system. With 22 million tons of milk and 90 billion dairy animals, now, India has attained the numero uno status in milk production. In Indian livestock sector milk contribute 66.7 per cent of the total value of output from livestock sector. The per capita availability of milk has increased from 128g/day in 1980-81 to 267 g/day in 2010-11 and the average annual milk yield of Indian cattle stands at 1172 kg which is well below the global average of 2500 kg. The daily

3498

Nija George and Senthilkumar

average milk yield of Indian animals is between 1.5 Kg to 5.0 Kg. (Report of The Working Group on Animal husbandry & Dairying, 12th five year plan, 2012). One of the overarching goals of animal husbandry development programmes and policies has been the consistent improvement of livestock productivity for accelerated economic growth. This is in view of the fact that majority of the livestock keepers in India depend on animal husbandry for their survival. Increasing the production at the farm level on a sustained manner warrants moving the farmers to do scientific farming from the current practice of mere farming through adoption of changing practices and technologies. Hence a study was conducted in a hilly area, Wayanad district of Kerala, to assess the adoption level of various practices by the smallholding dairy farmers.

METHODOLOGY

The study was conducted in the Vythiri taluk of Wayanad district among 120 farmers selected applying multistage random sampling. Vythiri taluk was purposively selected being the largest taluk and with the least milk production among the three taluks of Wayanad district. There were a total of eighteen villages in Vythiri taluk of which the following six villages were selected randomly. From each village an equal number of twenty respondents were selected at random. With the help of key informants and stakeholders including the government veterinary surgeon, livestock inspector and office bearers of the co-operative societies, a list of small dairy holders of each village was prepared and the respondents of the study were selected randomly from it.

Adoption Index

The adoption of scientific dairy farming practices were measured using the adoption index as follows:

$$\text{Adoption index} = \frac{(\text{Respondent score}) \times 100}{\text{Total score}}$$

For the present study a total of 32 management practices were studied and the adoption index was calculated as the ratio of management practices adopted by the respondent to the total practices studied multiplied by 100.

RESULTS

Adoption of scientific calf rearing practices

Data in Table 1 shows that extent of adoption of calf rearing practices was high, medium and low respectively for 33.33, 29.17 and 37.5 per cent of the respondents.

Content analysis items regarding adoption of scientific calf rearing practices

Data in table 2 indicate that 95.0 per cent each of the respondents practiced colostrum feeding to the calves and milk feeding of calves up to three months of age. Frequent suckling of calves for first ten days was permitted by 59.17 dairy holdings. 25.00 per cent were practicing disinfection of naval cord while nose punching was practiced by 45.00 per cent. Only 11.67 per cent fed their calves with calf starter.

Extent of Adoption of scientific feeding practices

Data in table 3 indicate that 63.33 per cent of the respondents were medium adopters followed by high25 per cent and 11.67 per cent low adopters.

Content analysis items regarding adoption of scientific feeding practices

Data in table 4 indicate that 96.67 per cent of the respondents were providing their animals with sufficient water at frequent intervals. Daily roughage feeding and compounded concentrate feeding was practiced by 94.17 per cent and 81.67 per cent respectively. 37.5 per cent were feeding the animals according to production while 59.17 per cent were practicing feeding of unconventional feeds.

Extent of Adoption of scientific housing practices

Data in Table 5 indicate that54.17 per cent of the respondents were high adopters followed by 30.0 per cent medium and15.83 per cent low adopters.

Content analysis items regarding adoption of scientific housing practices

Data in table 6 indicate that enough floor space and enough slope for floor was provided by 85.00 and 77.50 per cent of respondents respectively. Separate manger space was provided by 91.67 per cent of the respondents. Periodic cleaning of the shed was done by 83.33 per cent while 21.17 per cent used disinfectants to clean the shed.

Extent of Adoption of improved breeding practices

Data in Table 7 indicate that 46.67 per cent of the respondents were medium adopters followed by 42.5 per cent high adopters and 10.83 per cent low adopters.

Content analysis items regarding adoption of scientific breeding practices

Data in table 8 indicate that 99.17 per cent of the respondents practiced artificial insemination for breeding while A.I within three months of calving, veterinary care for infertility case and feeding extra ration on pregnancy was practiced by 43.33, 76.67 and 23.33 per cent respectively.

Extent of Adoption of scientific milking practices

Data in Table 9 indicate that 64.17 per cent of the respondents were having a medium adoption regarding the milking practices followed by 21.67 per cent and 14.16 per cent with high and low adoption respectively.

Content analysis items regarding adoption of scientific milking practices

Data in table 10 indicate that pre milking cleaning of udder with antiseptics was practiced by 23.33 per cent and rest were using water to clean udder. Teat dipping, dry cow therapy and dry period was practiced by 34.17, 11.67 and 95.83 per cent respectively. Majority practiced milking twice daily and only 5. 83 per cent milked the animals more than twice. Full hand method of milking was followed by 59.17 rest practicing either knuckling or stripping method.

Extent of Adoption of scientific health care practices

It can be found from Table 11 that majority (39.17 per cent) of the respondents were medium adopters followed by 34.14 per cent high and 26.66 per cent low adopters of heath care practices.

Content analysis items regarding adoption of scientific healthcare practices

Data in table 12 indicate that 92. 5 per cent of the respondents were depending on veterinary care for ailments and 56.67 per cent insured their animals. Regular deworming, vaccination and control of external parasites were done by 79.17, 83.33 and 24.17 per cent of the respondents respectively.

Extent of Adoption of scientific management practices

Data in Table 13 indicate that 44.16 per cent, 38.34 per cent and 17.5 per cent of the respondents were low, medium and high category of adopters.

DISCUSSION

Adoption of scientific management practices is an important domain which has a direct bearing on the production performance of the dairy animals. It was a notable observation that nearly half of the dairy farmers were low adopters with respect to overall adoption of scientific management practices.

Regarding extent of adoption of calf rearing practices, majority were high adopters followed by nearly one third with low level of adoption. This finding is almost in accordance with that of Mohi and Bhatti (2006) who reported that regarding calf rearing practices, 40 per cent of the members of Punjab dairy farmers association were high adopters whereas 25 per cent and 35 per cent respectively were low and medium adopters. The low or medium adoption of calf rearing practices could be by virtue of the scarcity of green fodder and the high cost of concentrate besides the low level of knowledge on scientific calf rearing practices. The present study revealed that almost all of the respondents adopted colostrum feeding, milk feeding up to three months of age. Guptha et al. (2008) and Rathore et al. (2010) who studied Indian farmers had also reported similar findings regarding milk feeding to calves. The observation of Sabapara et al. (2010) differed from these findings. They studied the dairy farmers of tribal area of South Gujarat and found that the feeding of colostrum to new born calves within 1 to 2 hours of birth was being practiced by 52 per cent of the total farmers. None of the respondents studied reported the practice of weight recording at birth and only one fourth practiced disinfection of umbilical cord soon after birth. This low adoption of cutting of naval cord is due to the fact that by experience the farmers realized the separation of naval cord will happen naturally. And to act in emergencies when veterinary service is not available, the farmers must be trained in this skill. The practice of providing calf starter was adopted by only a few. This might be due to the high cost of feed ingredients and insufficient stock of calf starter in the market.

The extent of adoption of scientific dairy feeding practices was observed to be medium for majority of the respondents. Among the management practices studied, provision of ad libitum water and daily green feeding were practiced by almost all and a majority was found to be feeding concentrates daily. These findings are in agreement with that of Sabapara et al. (2010), Ahirwar et al. (2010) and Arora et al. (2006). The present study however revealed that only one third of the respondents were feeding their animals commensurate to production. It is high time that we gave sufficient awareness to the dairy farmers so that they feed their milch animals in accordance with milk production. Around seventy per cent made a deliberate attempt to reduce feed cost by feeding the animals with unconventional feeds. Welearegay et al. (2012) also reported that most of the farmers of southern Ethiopia commonly fed their animals with locally available unconventional feeds along with other feeds.Housing management is of great importance especially in areas like Wayanad with high humidity and cold weather. Regarding adoption of housing management practices, more than half of the respondents were high adopters. The study revealed that majority of the farmers studied provided their animals with enough standing space, enough slope, and separate manger. The findings on floor space is supported by those of Garg et al. (2005) and Ahirwar et al. (2010)who reported that majority of the respondents provided the animal with enough floor space. Only one third of respondents adopted cleaning of sheds at intervals and few used disinfectants to clean the animal sheds. The lower figures with regard to the adoption

Nija George and Senthilkumar

of shed cleaning could be on account of unavailability of labour coupled with health problems of old farmers who were a majority in the study area.

It was found that within the domain breeding management, scientific breeding practices were adopted to a medium level only by a majority of the respondents followed by high adopters. Artificial insemination was adopted by almost all of the respondents and this is on par with the findings of Welearegay et al. (2012) who studied among Ethiopian dairy farmers but it contradicts the observations of Guptha et al. (2008) and Rathore et al. (2010)who reported in their study that natural service was preferred by a majority of dairy farmers. The increased dependency on A.I by the respondents could be attributed to the accessibility of A.I services and the visible benefits of A.I, as perceived by the farmers when compared to natural service. With regard to inseminating the cow within three months of calving it was observed that nearly half of the respondents had adopted this practice. This is in line with that of Guptha et al.(2008). Lack of adoption of this practice could be due to the increased incidence of postpartum anestrum in cows coupled with the dairy farmers' poor awareness about suitable breeding strategies to overcome this problem. Feeding the pregnant animal with supplements and additional pregnancy feed allowance is crucial to ensuring better production performance and health of both dam as well as calf. In this context it was worth mentioning that the present study revealed a hard fact that only a few adopted feeding additional concentrate and supplements to the pregnant animals. This finding is in agreement with that of Garg et al. (2005).

Regarding milking practices, majority of respondents were found to be medium adopters. Inadequate knowledge of farmers and low motivation on account of lack of any incentives for clean milk products could have led to this situation. Further analysis of milking practices revealed that milking more than twice was practiced only by a few and majority followed twice a day milking schedule. Similar observations were made by Ahirwar et al. (2010) and Guptha et al. (2008). Dry cow therapy and teat dipping were practiced by a few and almost all provided the cows with sufficient dry period. Lower adoption of dry cow therapy and teat dipping could be on account of inadequate knowledge regarding these practices. Regarding the cleaning practices majority used only water to clean the udder before milking and only a few used antiseptics as well for washing the udder. The finding was in line with that of Rathore et al. (2010), Hossain et al. (2005) and Garg et al. (2005). Tassew and Seifu (2009) however observed that the farmers of north western Ethiopia washed their hands and milk vessels before milking cows but did not adopt the practice of washing the udder and the use of a towel to clean the udder. Full hand milking was practiced by more than half of the respondents. Rathore et al. (2010) however reported that majority of tribal dairy farmers of Rajasthan followed the knuckling method of milking.

Health care practices were adopted to a medium extent only by a majority.This might be due to insufficient knowledge of the farmers on health care practices. It was a pertinent finding that majority practiced vaccination against contagious diseases as well as deworming of animals. The high per cent of vaccination could be due to the compulsory vaccination programmes implemented by the government. This is in contrary to the findings of Schwalbach (2002) among the sheep and goat farmers of South Africa. The author observed that small ruminant farmers had adopted much less vaccines than any other livestock veterinary technology considered in that study and concluded that generally farmers preferred to adopt therapeutic rather than prophylactic interventions. Higher adoption rate in the present study indicate that farmers could move beyond the conventional thinking due to concerted efforts of various state agencies. Fairly larger numbers of farmers sought veterinary care for the animals in the study area which is due to the increased confidence in modern medicine. This finding is endorsed by the studies of Somda et al. (2004) among Gambian and Boz et al. (2011) among Mediterranean farmers. More than half of the respondents had availed insurance coverage for their animals. Only a few were found to adopt ecto-parasite control measures. This finding was similar to that of Gangasagare and Karanjkar (2009).Nevertheless Chinogaramombe et al. (2008) reported a higher adoption of deworming and dips against external parasites among Ethiopian farmers. The low adoption of ecto-parasite control practices could be due to lack of awareness.

CONCLUSION

The study explored the extent of adoption of scientific dairy management practices. Regarding calf rearing practices majority of the respondents were medium adopters. Almost all adopted colostrum feeding and milk feeding calves up to three months of age. Extent of adoption of calf starter feeding was very low. Nearly two third of respondents had adopted feeding practices to a medium extent. Readymade cattle feed and daily green feeding was practiced by a majority. However adoption of feeding in accordance with production was followed by a few. Though more than half of the respondents adopted scientific housing management to a high extent, only very few adopted the use of disinfectants for cleaning animal sheds. Scientific breeding practices were adopted to a medium level by majority of the respondents. Feeding of extra ration and supplement to pregnant animals was adopted by just over one fifth of the respondents. Insemination within three months postpartum was not adopted by nearly half of the respondents. This is an important area of intervention since reproductive management of dairy cattle is crucial to whole farm profitability.Regarding scientific milking practices nearlytwo third were medium adopter. Full hand milking was adopted by more than half of the respondents while teat dipping and washing the udder before milking using antiseptics was adopted by only few. Among health care practices seeking veterinary aid for ailments and preventive vaccination for animals were adopted by a majority.

REFERENCES

1. Ahirwar, R.R., Singh, A. and Qureshi, M.I. 2010. A study of managemental practices in water buffalo (Bubalus bubalis) in India. Buffalo Bulletin. 29 (1): 43-51.

2. Arora, A.S., Kumar, A., Bardhan, D. and Dabas, Y.P.S. 2006. Socio-economic and communication variables associated with level of knowledge and degree of adoption of improved dairy husbandry practices in U.S.Nagar district of Uttaranchal. Indian J. Dairy Sci. 59(5): 337 – 343.

3. Boz, I., Akbay, C., Bas. S. and Budak, D.B. 2011. Adoption of innovations and best management practices among dairy farmers in eastern meditteranian region. J. Anim. Vet. Adv. 10(2): 251-261.

4. Chinogaramombe, G.N.C., Muchenje, V., Mapiye, C., Ndlovu, T., Chimonyo, M. and Musemwa, L. 2008. Challenges for improving small holder dairy production in the semiarid areas of Zimbabwe. Livestock Res. For Rural Dev. 20 (3).

5. Gangasagare, P.T. and Karanjkar, L.M. 2009. Constraints in adapting animal husbandry practices by the dairy farmers in the Marathwada region of Maharashtra. Vet. World. 2(9):347-349.

6. Garg, M.K., Jain, N.S. and Chodhary, J.L. 2005. Studies on housing, feeding and milking management practices of Dairy cattle in Baren district of Rajasthan. Indian J. Dairy Sci. 58(2): 123-128.

7. Gupta, D.C., Suresh, A. and Mann, J.S. 2008. Management practices and productivity status of cattle and buffaloes in Rajasthan. Indian J. Anim. Sci. 78 (7): 769–774.

8. Hossain, M.M., Alam, M.M., Rashid, M.M., Asaduzzaman, M. and Rahman, M.M. 2005. Small Scale Dairy Farming Practice in a Selective Area of Bangladesh. Pak. J.Nutr.4 (4): 215-221.

9. Mohi, A.K. and Bhatti, J.S. Adoption of improved dairy farming practices by members of Punjab dairy farmers association. 2006. J. Dairying, Foods & Home Sci. 25 (1): 55-58.

10. Rathore, R.S., Singh, R., Kachwaha, R.N. and Kumar, R. 2010. Existing management practices followed by the cattle keepers in Churu district of Rajasthan. Indian J. Anim. Sci. 80 (8): 798–805.

11. Sabapara, G.P., Desai, P.M., Kharadi, V.B., Saiyed, L.H. and Singh, R.R. 2010. Housing and feeding management practices of dairy animals in the tribal Area of South Gujarat. Indian J. Anim. Sci. 80 (10): 1022–27.

12. Schwalbach, L.N. 2002. Adoption of veterinary technologies among sheep and goat farmers. Paper presented at 13nth International farm management conference.Wageningam.Netharlands. July 7-12.

13. Somda, J., Kamuanga, M., Munstermann, S., Keita, K. and Mendes, A.2004. Characteristics of the smallholder dairying farmers in West African countries: Economic viability and paths for improvement. Socio-economic research Working Paper - 2. International Trypanotolerance Centre. 55 p.

14. Tassew, A. and Seifu, E.2009. Smallholder dairy production system and emergence of dairy cooperatives in Bahir Dar Zuria and Mecha Woredas, Northwestern Ethiopia. World J. Dairy Food Sci. 4 (2): 185-192

15. Welearegay, H., Yilma, Z. and Tekle-Giorgis,Y. 2012. Challenges and opportunities of milk production under different urban dairy farm sizes in Hawassa City, Southern Ethiopia. Afr. J. Agric. Res. 7(26): 3860-3866.

Table1. Distribution of respondents based on adoption of calf rearing practices n = 120

Sl. No.	Category	Frequency	Percentage
1	Low (<40)	40	33.33
2	Medium (40-60)	35	29.17
3	High (≥ 60)	45	37.50
	Total	120	100

Table 2. Content analysis items regarding adoption of scientific calf rearing practices   n= 120

Sl. No.	Practice	Frequency (adopters)	Percentage (adopters)
1.	Weight recording at birth and Periodical weight recording	0	0
2.	Colostrum feeding to calves	114	95.00
3.	Milk feeding to calves up to 3 months	114	95.00
4.	Feeding calf starter	14	11.67
5.	Nose punching in calves	54	45.00
6.	Anti-septic application to naval at birth	30	25.00
7.	Frequent suckling of calves for first ten days	71	59.17

Table 3. Distribution of respondents based on adoption of feeding practices   n = 120

Sl. No.	Category	Frequency	Percentage
1	Low (<60)	14	11.67
2	Medium(60-90)	76	63.33
3	High(≥-90)	30	25.00
	Total	120	100

Table 4. Content analysis items regarding adoption of scientific feeding practices

Sl. No.	Practice	Frequency (adopters)	Percentage (adopters)
1.	Feeding readymade cattle feed	98	81.67
2.	Feeding in relation to production	45	37.5
3.	Feeding enough roughages daily	113	94.17
4.	Sufficient water at frequent intervals	116	96.67
5.	Unconventional feeds	71	59.17

Nija George and Senthilkumar

Table 5: Distribution of respondents based on adoption of housing and management practices

n = 120

SI. No.	Category	Frequency	Percentage
1	Low (<70)	19	15.83
2	Medium(70-90)	36	30.00
3	High(≥-90)	65	54.17
	Total	120	100

Table 6. Content analysis items regarding adoption of scientific housing practices

SI. No.	Practice	Frequency (adopters)	Percentage (adopters)
1.	Enough floor space in the shed	102	85.00
2.	Enough Slope For The Floor	93	77.5
3.	Separate manger space	110	91.67
4.	Cleaning shed periodically	100	83.33
5.	Preventive disinfectants	35	21.17

Table 7: Distribution of respondents based on adoption of breeding practices

n = 120

SI. No.	Category	Frequency	Percentage
1	Low (<50)	13	10.83
2	Medium (50-70)	56	46.67
3	High (≥- 70)	51	42.50
	Total	120	100

Table 8. Content analysis items regarding adoption of scientific breeding practices

SI. No.	Practice	Frequency (adopters)	Percentage (adopters)
1.	Artificial insemination for breeding	119	99.17
2.	Breeding within three months after calving	52	43.33
3.	Veterinary aids in sterility cases	92	76.67
4.	Feeding extra ration and supplements on pregnancy	28	23.33

Table 9 : Distribution of respondents based on adoption of milking practices

n = 120

SI. No.	Category	Frequency	Percentage
1	Low (<30)	26	21.67
2	Medium (30-60)	77	64.17
3	High (≥60)	17	14.16
	Total	120	100

Nija George and Senthilkumar

Table 10. Content analysis items regarding adoption of scientific milking practices

Sl. No.	Practice	Frequency (adopters)	Percentage (adopters)
1.	Pre milking udder cleaning with antiseptic	28	23.33
2.	Milking more than twice daily	7	5.83
3.	Drying of the cow prior to parturition	115	95.83
4.	Dry cow therapy	14	11.67
5.	Adopting full hand method of milking	71	59.17
6.	Practicing teat dipping	41	34.17

Table 11: Distribution of respondents based on adoption of health care practices

n = 120

Sl. No.	Category	Frequency	Percentage
1	Low (<60)	41	34.17
2	Medium(60- 79.99)	47	39.17
3	High(≥-79.99)	32	26.66
	Total	120	100

Table 12. Content analysis items regarding adoption of scientific health care practices

Sl. No.	Practice	Frequency (adopters)	Percentage (adopters)
1.	Veterinary aid for ailments	111	92.5
2.	Vaccination to prevent diseases	100	83.33
3.	Insurance for productive animals	68	56.67
4.	Regular deworming	95	79.17
5.	control of external parasites	29	24.17

Table 13: Distribution of respondents based on overall adoption index

n = 120

Sl. No.	Category	Frequency	Percentage
1	Low (<60)	53	44.16
2	Medium (60-69.9)	46	38.34
3	High (≥- 70)	21	17.5
	Total	120	100

RESEARCH ARTICLE

Genetic Characterization of Aminoglicoside Resistance Genes in *P. aeruginosa* Strains Collected from Different Parts of Tonekabon Shahid Rajai Hospital in North of Iran, using PCR

Mozghan Porjafari[1]*, Masood Ghane[2], Mohammadreza Kouchaki[1] and Nader Mashayekh[3]

[1]Department of Microbiology,Tonekabon Branch, Islamic Azad University, Tonekabon, Iran
[2]Department of electrical and computer engineering, pooyandegan danesh institution of higher education, chalous, Iran
[3]Department of Microbiology, Lahijan Branch, Islamic Azad University, Gilan, Iran.

*Address for correspondence
Mozghan Porjafari,
Department of Microbiology,
Tonekabon Branch, Islamic Azad University,
Tonekabon, Iran.
Email ID: Mozhganporjafari@yahoo.com.

ABSTRACT

The objective of this study is genetic characterization of Aminoglycoside resistance genes in p.aeruginosa starins collected from different parts of Tonekabon Shahid Rajai hospital, using PCR. 430 clinical samples were collected from different parts of Shahid Rajai hospital in Tonekabon in north of Iran. The samples were collected by wet swab and they were cultured in Brain Heart Infusion Broth(BHI) medium for 24 hours in 37◦C. After 24 hours, the samples were made vertex and were cultured in special medium of p.aeruginosa. After 24-48 hours, p.aeruginosa colonies appeared in special medium and biochemical tests were used for phenotypic recognition of p.aeruginosa colonies. Antibiotic sensitiveness was performed by disk-diffusion method (Kirby - Bauer) and based on CLSI standards. DNA was extracted through phenol-chloroform method. In this study, out of 430 clinical samples from different parts, 35 p.aeruginosa bacteria were collected. The rate of resistance toward Tobramycin were 42.7%, and no resistance was observed toward Amikacin and Gentamicin in *p.aeruginosa* strains under study.The results gained from reproducing resistance genes to Aminoglycoside by PCR shows no existence of the gene aadA, aac (6')-aph (2) and it shows the existence of the gene aadE in 33 (94.2%) strains collected from different parts of Shahid Rajai hospital of Tonekabon located in the north of Iran. Regarding the increasing rate of medicine

Mozghan Porjafari *et al.*

resistance against the bacterium p.aeruginosa, resistance against Aminoglycoside antibiotics can make a basic problem in hospitals which need more attention to the use of these medicines and their prescription by the doctor.

Key words: p.aeruginosa**,** Resistance, Aminoglycosides, Tonekabon.

INTRODUCTION

P. aeruginosa is one of the important pathogenes of the hospital and treating the infections from this bacterium is very difficult due to its high resistance against most antibiotics [1]. The increasing use of different antibiotics such as Aminoglycoside and clinical introduction of numorous ingredients related to it have been recognized as a factor for appearing and spreading different strains of resistant bacteria. Resistance against Aminoglycoside in all types of bacteria such as p.aeruginosa has become more complicated by increasing the time for using Aminoglycoside. In addition, there is a combination of mechanisms which increases this spectrum of resistant Aminoglycoside [2,3].

The resistance of p.aeruginosa against Aminoglicoside has been reported in many hospitals. Studies show a relationship between the existence of these resistant microorganisms and the rate of using Aminoglycoside in different parts [4]. Resistance against various medicines is often the result of a combination of different mechanisms in a strain or the action of a special mechanism. Resistance against Aminoglycoside happens due to enzymatic changes, penetrability and the action of external pumps [5].

Among these mechanisms, inactivating medicines with the help of changed and coded enzymes by chromosome or plasmid is common. These changed enzymes are Aminoglycoside phosphoril transferas (aph), Aminoglycoside acetyl transferas (aac), and Aminoglycoside nocleotidil transferas (ant) [6]. Increasing antibiotic resistance specially resistance against Aminoglycoside which works with plasmid makes rapid transfer of the resistance gene against sensitive p.aeruginosa and other negative bacteria, and makes the organism resistant against treatment [7].

In this study, the genetic characterization of Aminoglycoside resistance genes in p.aeruginosa strains collected from different parts of Shahid Rajai hospital by PCR has been analyzed.

MATERIALS AND METHODS

The clinical research was done between December 2011 until June 2012. 430 clinical samples were collected from different parts of Shahid Rajai hospital located in the north of Iran. These parts include women, dialysis, ICU, CCU, children, operation and internal units.

For sampling, first 100 microliter distilled water was poured in every test tube to make the swab wet, and then the test tubes were made autoclave. In addition, 5cc Brain Heart Infusion Broth (spain- pronadisa) enriching medium was poured in some test tubes and was used as the transferred medium in order to transfer the samples to the laboratory. For sampling, all parts of sterile swab was pulled on the surface completely and after sampling, it was immediately put in a tube containing Brain Heart Infusion Broth(BHI) which was numbered for every place. At the end of the sampling, the tubes were transferred to the laboratory. The test tubes were made vertex and in order to do the initial enriching, the tubes were incubated for 24 hours in 37° C. After 24 hours, the samples were made vertex and from microbial suspension were cultured on specific medium of p.aeruginosa. After 24-48 hours, p.aeruginosa colonies appeared on specific medium. For phenotypic recognition of p.aeruginosa, biochemical tests were used such as: gram staining, oxidase, catalase, glucose, fructose, lactose, maltose, manitol, OF test, Pigment production and gelatin test.

Recognizing Antibiotic Resistance:

Antibiotic sensitiveness has been done using disc diffusion (Kirby - Bauer) and based on CLSI standards. First the medium of Moller Hinton agar (Merck- Germany) and then standard microbial suspension with half percent of Mc Farland standard density was prepared. After complete scattering of microbial suspension on the medium of antibiotic discs (Iran, Padtan Teb), Tobramycin(10μg) and Gentamicin(10μg) and Amikacin(30μg) were put with a distance of 2cm from each other, and after 24 hours of incubation in 37◦ C, the diameter of the area with clear zone every disc was measured and the results were recorded [8].

PCR

The extraction of the DNA of the bacteria was done by phenol-chloroform method which was explained by Sambrook[9].

Reproduction of the resistance genes with PCR method:

Oligonucleotide primers for reproducing resistance genes (aadA, aac (6)- aph (2) aadE) were selected from the recorded scenes [10,11,12]. Table 1 shows forward and reverse primers for reproducing resistance genes against Aminoglycoside antibiotics.

The processes of genes reproduction:

Mixed primary PCR reaction with final volume of 25µl include 2.5 μ l PCR buffer, 2 µl $MgCl_2$ 25 µM, 200 µM dNTP, 0/75 unit of Taq polymerase enzyme, 1 µl of forward primer, 1 µl of reverse Primer, 4 µl DNA template and distilled water was added to the final capacity [13]. values are represented in Table 2, 3 and 4.

Agarose gel Electrophoresis:

PCR product was electrophoresed in gel agarose 1.5% with DNA ladder1 kb (Fermentas Company - Russia). The same amount of PCR products was electrophoresed in75 V for 60 minutes and then colored with ethidium bromide, and then was filmed by ultra violet ray and by Uvidoc machine (England).

RESULTS

In this study, 47 pseudomonas bacteria were collected out of 430 clinical samples in different parts among which 35 bacteria were p.aeruginosa. Out of 35 strains under analysis, the rates of resistance to Tobramycin were 42.7%. In this study, p.aeruginosa strains did not show resistance against Amikacin and Gentamicin (Table 5).PCR was used for recognizing the gene of DNA in pseudomonas bacterium collected from samples. The existence of 1490 bp shows the existence of DNA of the bacterium (Figure1).The gained results from reproducing resistance genes against Aminoglycoside shows the lack of gene aadA, aac (6)- aph (2) using PCR out of 35 strains collected from different parts of Shahid Rajai hospital in the north of Iran. aad E gene was observed in 33 strains (94.2%) out of 35 strains under study (Figure 2).

DISCUSSION

P.aeruginosa is one of the most important pathogens and infectious factors in hospitals. Most of the hospital infections are produced by mean bacteria. Among the bacteria producing hospital infections, pseudomonas is more

Mozghan Porjafari *et al.*

important than others because of its compatibility with the environment and its existence in every part of the hospital [15]. One of the important problems related to pseudomonas is the problem of antibiotic resistance. Antibiotic resistance is one of the most important problems that hospitals face. The wide use of medicines controlling immune system and the use of antibiotics has made the hospital patients more vulnerable in front of these infections [16]. In the studies conducted in different countries, the rate of resistance against Gentamicin31%, 55.8%, 54.9%[17,18,19] Amikacin 5.3%, 14.8%, 15.5%[20,21,22] and Tobramycin38% ,38.2%33.9%[23, 24, 25]. The percentage of resistance was lower in some studies and noticeably higher in some other studies. Based on the results gained from this study and other mentioned results, we can say that the resistance of the strains against p.aeruginosa in other studies is because they make diseases and maybe the strains collected in this study were in lack of resistance against these antibiotics.

In this study, out of 35 strains of pseudomonas aeruginosa , 33 (3.94%) strains had aadE gene and two strains (5.7%) lacked such genes. aadA and aac (6)- aph (2) genes were not recognized in the strains under the study, so in this study, among the mechanisms resistant against Aminoglycoside, aadE gene is the superior gene.The whole process in these studies shows an increase in the rate of resistance against antibiotics, but this increase has ups and downs. Regarding the fact that in all the studies, disk diffusion method has been used, the reason for these ups and downs can be due to the difference in resistance in different places, the type of infection or the type of the disk.

Resistance against Aminoglycoside antibiotics in our isolations was low for Gentamicin and Amikacin and it was high for Tobramycin. This can be due to the selection of the bacteria, geographical difference or prescription of the medicine by the doctor.aadE gene is widely spread among gram positive bacteria . aadE gene has been found in plasmid pRE25, E. faecalis bacterium and in C.jejuni bacterium [26,27].

Genes that code anT enzymes such as aadE are found in plasmids and transposons and chromosomes. Ant (6′) (aadE) gene is often found in ant (6)- sat 4- aph (3′)- III which specially codes resistance against Aminoglycosides and streptothricin [28].This branch is part of Tn 5405 and is related to other transposons. These are widespread among Staphylococci and Enterococci and are located on plasmids and chromosomes [29]. aadA gene exists as a cassette and is a big part of some of the plasmids and transposons and integrons . aadA gene can be part of unusual gene box and can exist as a conjunction gene. In addition, this gene has been found in connection with other enzymes of resistance against p.aeruginosa bacterium [30].

The present study shows a high colony of aadE gene in collected strains. This high colony of aadE gene can be due to the existence of other bacteria in hospitals and receiving this gene through plasmid and transposons. It can also be due to the fact that different parts of the hospital are related to each other and these bacteria can easily be transferred to these parts by the staff. It also may be due to the amount of using Aminoglycoside antibiotics. aadE gene was not observed in these bacteria and that can be due to the lack of this gene in the collected bacteria.

aac(6′)- aph (2″) genes are usually found in transposons such as Tn 4001. This gene was not observed in p.aeruginosa collected in this study and it can be because of the lack of this gene in the collected bacteria, the type of antibiotics used in this hospital or not transferring this gene by transposons among the bacteria [31].In general, the level of resistance against Aminoglycoside antibiotics in p.aeruginosa bacterium depends on factors such as the amount of enzyme production, their catalytic capacity and the type of Aminoglycoside antibiotic. This can be a reason for existence or lack of existence of some genes in this study [32].

In this study, for the first time was reported the existence of aadE gene in p.aeruginosa collected from the surfaces in different parts of Shahid Rajai hospital in Tonekabon. This shows the need for more attention to taking antibiotics and also doing antibiogram tests before prescribing antibiotics by the doctor and regarding hygienic points by the staff in the hospital, so we can prevent spreading resistance against Aminoglycoside antibiotics in this bacterium pathogen and spreading it in different parts of the hospital.

REFRENCES

1.Mirsalehian A, Feizabadi M, Nakhjavani FA, Jabalameli F, Goli H, Kalantari N. Detection of VEB-1, OXA-10 and PER-1 genotypes in extended-spectrum beta-lactamase-producing Pseudomonas aeruginosa strains isolated from burn patients. Burns 2010;36(1):70-4.

2. Rice LB, Bonomo RA. Genetic and biochemical mechanisms of bacterial resistance to antimicrobial agents. In: Lorian V.editor. Antibiotics in laboratory medicine, 4th ed. Baltimore,MD: Williams & Wilkins 1996 :p. 453-501.

3. Barnhart C, Campbell R, LaRosa LA, Marr AM, Morgan A,Van Berkom D. Aminoglycosides: Mechanism of Resistance accessed on 22 March 2003.

4. Meyer, R. D., Lewis, R. P, Carmalt, E. D, and Finegold, S. M. Amikacin therapy for serious gram-negative bacillary infections. Ann. Intern. Med. 1975;83:790-800.

5. Islam S, Oh H, Jalal S, Karpati F, Ciofu O, Hoiby N, et al. Chromosomal mechanisms of aminoglycoside resistance in Pseudomonas aeruginosa isolates from cystic fibrosis patients. Clin Microbiol Infect. 2009;15:60–6.

6. Yamane K, Wachino J, Doi Y, Kurokawa H, Arakawa Y. Global spread of multiple aminoglycoside resistance genes. Emerg Infect Dis. 2005;11: 951-3.

7.Rossolini GM, Mantengoli E. Treatment and control of severe infections caused by multiresistant Pseudomonas aeruginosa. Clin Microbiol Infect. 2005;11 Suppl 4:17-32.

8. Clinical and Laboratory Standards Institute. Performance standards for Antimicrobial susceptibility Testing: Document M10-S15. CLSI, Wayne, PA, USA, 2005.

9. Sambrook .J, Russell. D.W. Molecular Cloning, Cold Spring Harb Lab Press, NY,2001, 3.

10. Ferretti, J. J., and Curtiss. R. III (ed.). Streptococcal genetics. Amer ican Society for Microbiology, Washington, D.C. 1987.

11. Hollingshead, S., and Vapnek. D.Nucleotide sequence analysis of a gene encoding a streptomycin/spectinomycin adenyltransferase. Plasmid 1985;13: 17–30.

12. Ferretti, J. J., Gilmore, K. S., and Courvalin, P. Nucleotide sequence analysis of the gene specifying the bifunctional 6-aminoglycoside acetyltransferase 2-aminoglycoside phosphotransferase enzyme in Streptococcus faecalis and identification and cloning of gene regions specifying the two activities. J. Bacteriol. 1986;167:631–638.

13. Swenson, J. M., Ferraro, D. F. Sahm, N. C. Clark, D. H. Culver, F. C. Tenover, and The National Committee for Clinical Laboratory Standards Study Group on Enterococci. 1995. Multilaboratory evaluation of screening methods for detection of high-level aminoglycoside resistance in enterococci. J. Clin. Microbiol. 33:3008–3018.

14. Nancye C. Clark, Orjan Olsvik, Jana M. Swenson, Carol A. Spiejel, Fred C. Tenover, Detection of a Streptomycin/Spectinomycin Adenylyltransferase Gene (aadA) in Enterococcus faecalis, Antimicrobial Agents And Chemotherapy, Jan. 1999, p. 157–160.

15. Brooks, G.F., Butel, J.S., Morse, S.A. Jawets Melnick and Adelberg's.Medical Microbiology, Lange Basic Science. 2004; PP: 262-267.

16. Zolldann, D., Haefner, H., Poetter, C., Buzello, S., Sohr, D., Luetticken, R. Assessment of a selective surveillance method for detecting nosocomial infections in patients in the intensive care department. Am. J. Infect Control. 2003; 31(5): 261-5.

17. Sevillano, E., Valderrey, C., Canduela, M. J., Umaran, A., Calvo, F., Gallego, L.Resistance to antibiotics in Clinical isolates of Pseudomonas aeruginosa. Pathologie Biologie, . 2006; 54: 493-497.

18. Dubois, V., Arpin, C., Dupart,V and Quentin, C.β lactam and aminoglycoside resistance rates and mechanisms among Pseudomonas aeruginosa in French general.

19. Mohajeri P. Determination suspceptibility and antibiotic resistance from clinical different spciemen at Kermanshah therapeutic. Kermanshah University Medical Journal. 2003; 4: 11-20.

20. Sevillano, E., Valderrey, C., Canduela, M. J., Umaran, A., Calvo, F., Gallego, L. Resistance to antibiotics in Clinical isolates of Pseudomonas aeruginosa. Pathologie Biologie, 2006;54: 493-497.

Mozghan Porjafari *et al.*

21. Dubois, V., Arpin, C., Dupart,V, Scavelli, A., Coulange, L., et al. β lactam and aminoglycoside resistance rates and mechanisms among Pseudomonas aeruginosa in French general practice(community and private health care centres).J Antimicrob Chemother, 2008; 62(2):316-23.

22. Jamali .N, Bahari .M, Hoshmand .M. Prevalence of bla VIM and bla IMP MBL genes in imipenem-resistant Pseudomonas aeruginosa strains isolated from patients with burn wounds and burn injuries shahid Motahari hospital, Tehran, J Microbiol .1387; First Year: Issue 1.

23. Mohajeri P. Determination suspceptibility and antibiotic resistance from clinical different spciemen at Kermanshah therapeutic. Kermanshah University Medical Journal. 2003; 4: 11-20.

24. Carlos Juan,Laura Zamorano,Jose ´L.Peo´rez,Yigong Ge,and Antonio Oliver.Activity of a New Antipseudomonal Cephalosporin, CXA-101 (FR264205),against Carbapenem-Resistant and Multidrug-ResistantPseudomonas aeruginosa Clinical Strains. Antimicrobial Agents And Chemotherapy, 2010; p. 846–851.

25. Ve´ronique Dubois, Corinne Arpin, Virginie Dupart, Aline Scavelli, Laure Coulange,Catherine Andre ´et al. β - Lactam and aminoglycoside resistance rates and mechanisms among Pseudomonas aeruginosa in French general practice(community and private healthcare centres), Journal of Antimicrobial Chemotherapy. 2008; 62, 316–323.

26. Vaziri F, Peerayeh SN, Nejad QB, Farhadian A. The prevalence of aminoglycoside-modifying enzyme genes (aac (6)-I, aac (6)-II, ant (2)-I, aph (3)-VI) in Pseudomonas aeruginosa. Clinics. 2011;66(9):1519-1522.

27. Tolmasky, ME. Aminoglycoside-modifying enzymes: characteristics, localization, and dissemination.In: Bonomo, RA.; Tolmasky, ME., editors. Enzyme-mediated resistance to antibiotics:mechanisms, dissemination, and prospects for inhibition. ASM Press; Washington, DC: 2007a. p.35-52.

28. Schwarz .F.V, Perreten. V, Teuber .M. Sequence of the 50-kb conjugative multiresistance plasmidpRE25 from Enterococcus faecalis RE25. Plasmid 2001;46:170–187. [PubMed: 11735367].

29. Cerda. P, Goni. P, Millan. L, Rubio. C, Gomez-Lus .R. Detection of the aminoglycoside streptothricin resistance gene cluster ant(6)-sat4-aph(3 ')-III in commensal viridans group streptococci. Int Microbiol 2007;10:57–60. [PubMed: 17407061].

30. Werner G, Hildebrandt B, Witte W. Linkage of erm(B) and aadE-sat4-aphA-3 in multiple-resistantEnterococcus faecium isolates of different ecological origins. Microb Drug Resist 2003;9(Suppl1):S9–16. [PubMed: 14633362].

31. Yan. JJ, Hsueh .PR, Lu. JJ, Chang. FY, Ko. WC, Wu JJ. Characterization of acquired β-lactamases and their genetic support in multidrug-resistant Pseudomonas aeruginosa isolates in Taiwan: the prevalence of unusual integrons. J Antimicrob Chemother 2006;58:530–536. [PubMed:16816399].

32. Culebras E, Martinez JL. Aminoglycoside resistance mediated by the bifunctional enzyme 6'-Naminoglycoside acetyltransferase-2″-O-aminoglycoside phosphotransferase. Front Biosci.1999;4:D1–8. [PubMed: 9872730].

Table 1. Forward and reverse primers for reproducing resistance genes against Aminoglycoside antibiotics

Target gene	Sequence (5′→3′)	Amplicon size
aadE	ACT GGC TTA ATC AAT TTG GG/ GCC TTT CCG CCA CCT CAC CG	597
aadA	TGA TTT GCT GGT TAC GGT GAC/ CGC TAT GTT CTC TTG CTT TTG	284
aac(6')-aph(2'')	TGA TGA TTT TCC TTT GAT GT/ CAA TCT TTA TAA GTC CTT TT	1395

Mozghan Porjafari *et al.*

Table 2. Setup of PCR reactions to detect *aadE* gene in *Pseudomonas aeruginosa*

		Temperature(°C)	(S)Time
First Denaturation		93	300
30:Loop	Denaturation	93	45
	Anneling	55	30
	Extention	72	60
Extention Final		72	300

Table 3. Setup of PCR reactions to detect *aadA* gene in *Pseudomonas aeruginosa*

		Temperature(°C)	(S)Time
First Denaturation		95	300
30:Loop	Denaturation	95	45
	Anneling	53	60
	Extention	72	30
Extention Final		72	600

Table 4. Setup of PCR reactions to detect *(aac (6')- aph (2)* gene in *Pseudomonas aeruginosa*

		Temperature(°C)	(S)Time
		95	300
30:Loop	Denaturation	95	60
	Anneling	44	60
	Extention	72	40
Extention Final		72	600

Table 5. Antibiogram Test Results

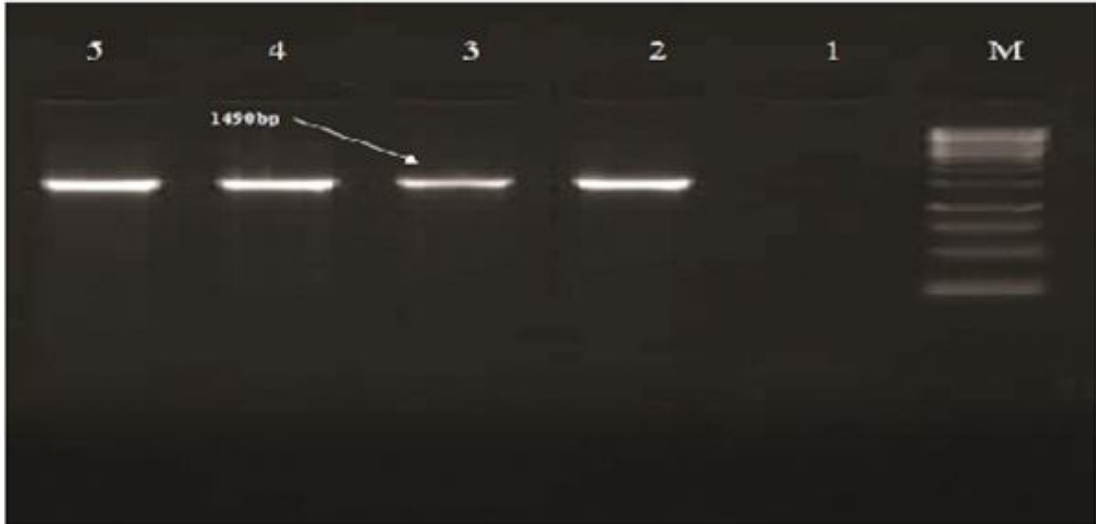| Antibiotic	Moderately	Sensitive	Resistance
Amikacin	5.7%	94.3%	-
Gentamicin	2.8%	97.2%	-
Tobramycin	8.6%	48.7%	42.7%

Figure1. The result of reproducing bacterium gene using PCR on gel agarose 1.5%. M: molecular marker 1kb, Lanes 2 until 5 show reproduced DNA. Lane1: negative control.

Figure 2. The result of reproducing *aadE* gene using PCR on gel agarose 1.5%. M: molecular marker 1kb, Lanes 1 until 10 shows reproduced DNA. Lane 11: negative control.

RESEARCH ARTICLE

Positive Young Adults Development in Life Skills Training Program: a Reliability and Validity Scale

Parastoo Golshiri[1], Ahmadreza Zamani[1], Arash Najimi[2], Ali-asghar Asadollahi Shahir[3], Elham Mozafarianpour[4] and Shervin-sadat Hashemian Esfahani[1]*,

[1]Department of Community Medicine, School of Medicine, Isfahan University of Medical Sciences, Isfahan, Iran.
[2]Department of Health Education and Health Promotion, School of Health, Isfahan University of Medical Sciences, Isfahan, Iran.
[3]Health Insurance Organization, Gorgan, Golestan, Iran.
[4]Department of Public Health, School of Health, Qom University of Medical Sciences, Qom, Iran.

*Address for correspondence

Shervin-sadat Hashemian Esfahani,
Department of Community Medicine, School of Medicine
Isfahan University of Medical Sciences,Isfahan, Iran.
E-mail: shervin.hashemiyan@yahoo.com
Mobile : (+98) 9111708271

ABSTRACT

Researches demonstrate that many life skills educational plans were previously performed, due to lack an evaluation tools, finally left unevaluated. This study aimed to investigate the reliability and validity of the Positive Young Adults Development scale, within the framework of life skills education program in schools of Isfahan (Iran) was performed. In this study, young adults' positive Development scale provided by Colorado National Investigating Center is applied. This scale consists of 63 items. The Face validity and content validity of the scale was examined using a panel of experts. Eventually, the scale was applied among a 588 of participants in life skills education program. Confirmatory factor analysis was used to examine the factor's validity and Cronbach's alpha or Alpha coefficient was used to measure internal consistency. All the 63 items examined, based on the opinions of experts, content validity received a more than 0.79 score. Average index for the content validity of the scale was 0.91. The results confirmed the proposed structure with model- fit indices. Reliability confident was calculated 0.89 for the whole scale and 0.85-0.94 for factors. The results showed that the Positive Young Adults Development scale can be a valid and reliable tool for evaluating life-skills educational program.

key words: life-skills, schools, validity, reliability, students, Young Adults.

INTRODUCTION

The term life-skills stands for a large group of psycho-social inter-personal skills that help people make decisions wisely (1), communicate effectively, develop their confrontational skills and personal management (2, 3). These skills enhance the adaptation power and positive and also effective behavior, hence enables individuals take their own social responsibilities without hurting other people and encounter with daily problems and challenges effectively (4).

Today, a noticeable part of the Education System formal programs are dedicated to life-skills educational program. Various researches state that life-skills educational programs affect problem solving knowledge, self-awareness skill, self-supervision, confrontational skills, reality examining skill, psycho-social suitability, alcohol consumption reduce, decision-making skill, responsibility, inter-personal skills, ethical behavior, and social skills among students (5-10). Furthermore, studies demonstrate that life-skills educational program has remarkably reduced alcohol consumption among youth (11). Other researches also show that life-skills educational program has been an effective activity to prevent drug abuse in schools (12). Further, life-skills educational program can effectively decrease mental disorders symptoms, depression, and stress especially among those suspicious to mental disorders (2). A research by Wahl et al. in 2011 on the Global Plan of Preventing Disorders and Enhancing Life-skills showed that life-skills educational program commonly had positive effects on social networks members, and also on depression symptoms, and aggressive behaviors (13).

Evaluation is one of the most important parts of planning and can give useful information about educational programs' designing and performance methods, and also provides a helpful basis for assessing the program's functions if done correctly (14). Evaluation can help analyze the projects' structure and organize and also determine their strengths and weaknesses, and therefore facilitate goals achievement (15). In spite of evaluation's extraordinary importance, evidence show that this touchy part is not considered modernly and adherently in most of life-skills educational programs. Furthermore, the program's effect on different aspects of the target group's empowerments is rarely considered when its effectiveness on them is studied, which can be due to failure to allocate sufficient time, lack an evaluation tools, or the evaluation process difficulty (16-18). This study aimed to develop a tool for evaluating the life skills training program.

MATERIALS AND METHODS

Subjects

The research population included all the students participated in life-skills educational program in Isfahan city. This program was performed in 10 regions of Isfahan and 20,000 male and female students participated in it. It was conducted in 2012 with the purpose of students' educational problems pathology, improve mental health among students, their parents, and the school's staff, decrease social damages prevalence among students, make positive changes in students' knowledge, attitude, and behavior towards school and education, and improve students' educational status.

Multi-stage sampling method was used to choose the subjects. First 5 regions were chosen accidentally from the 10 regions, then two high schools (1 male and 1 female high school to control the gender factor) were chosen from each region and students were examined according to each region's ratio of the whole sample.

Instruments

In this study, Positive Young Development scale provided by Colorado National Investigating Center (2004) was used (19). Translation and re-translation process were standardly done to match the questionnaire culturally (20). The

questionnaires were translated from English to Farsi by two bilingual translators, independently. The translations differed slightly that were matched by the researcher. The re-translation was done by another translator. This process was continued until all the differences between the items were matched. The aforementioned scale was designed to evaluate all the performed programs among young adults group. In this study, researchers started to specify and also categorize the scale according to life-skills educational program goals in three domains consisting: program's quality, studying the program's direct and indirect effects. The questionnaire's first part is designed to evaluate the educational program's quality, and consists of 20 items. The second part consists of 11 questions on young adults' function towards life-skills and 5 questions on positive options. The third part was designed to evaluate life-skills educational program side effects and consists of 27 items on educational success (9 items), exercise (3 items), social involvement (5 items), cultural suitability (5 items), and Sense of Self (5 items). The scale was scored as three- point Likert and Yes, Somewhat, and No options received 3, 2, and 1 scores, respectively.

Face validity

Face validity was conducted in two steps: qualitative and quantitative. In the qualitative step, face validity, relevant items, ambiguity and insufficient understanding, and the difficulty of understanding were considered by a panel of experts (4 education specialists, 5 health promotion specialists and 2 social medicine experts). At this step, the researcher used opinions of experts to correct items in each of the mentioned cases.

In the quantitative step, Impact Score was calculated. At this stage experts were asked to classify each of the items of the questionnaire according to a range of 5 Likert scale in terms of Importance, from quite important (score 5) to never important (score 1). If the impact coefficient was more than 1.5 points for each question, the items were found suitable for further analysis and were saved. In addition, 5 students selected from the target group presented their views about Simplicity and intelligibility of the scale.

Content Validity

Both qualitative and quantitative methods were used to examine the content validity (21). In the qualitative section some experts were interviewed and asked to present their own reforming viewpoints about the grammar, using appropriate and intelligible words, good scoring, the time considered to complete the designed scale, the chosen dimensions' symmetry, putting each item in its best place, after studying the scale accurately. After collecting the experts' ideas, the researcher started to provide the scale's final version according to the gathered data. In quantitative methods, content validity ratio (CVR), and content validity indicator (CVI) were calculated for 65 items to determine the content validity. To examine the CVR, the scale was given to 4 education specialist and 4 health education specialist; the answers were designed based on a three-point Likert scale consisting of: Necessary, helpful but not necessary, and not necessary. To examine the CVI, the views of 15 experts in the specialties related to the field of the study were used. The indexes of "relevance", "clarity", and "simplicity" examined the questions of the scale based on 4-point Likert scale.

Construct validity

The Confirmatory factor analysis method was performed to evaluate the questionnaire's Construct validity and also to examine and assess the original questionnaire's dimensional conforming degree compared to its Farsi version. Construct validity examination aims at answering to the question that how much the questionnaire's structure conforms to the primary goals of designing it. This model is assessed by four indices including: Chi-squared test, the comparative fit index (CFI), the normed fit index (NFI), and the root mean square error of approximation (RMSEA).

Reliability

To determine of the reliability the internal consistency method was used. To measure the internal consistency, Cronbach's alpha coefficient was used. Cronbach's alpha represents the proportion of a group of items that measure the structure. Acceptable internal consistency in this study, were considered as the rate of more than 0.7 (21). Therefore, Correlation Item-total method was used to determine the scale's internal consistency which compares each question's correlation with the whole scale, and thus decides whether to eliminate some questions.

The questionnaires were filled out in groups within 1 month. The questioners are informed about data collection principles (including training sessions' management and discipline, presenting the tools, reading guidelines, completing the tools, and data collection methods) through a common session.

Research data were analyzed using SPSS version 21 and AMOS 21 and descriptive statistics, Cronbach's alpha coefficients and Pearson Correlation Coefficient, Chi-squared test, CFI, NFI, and RMSEA indices.

RESULTS

Final subjects included 588 people, 279 females (47.4%), and 309 males (52.6%). Face validity by calculating the Impact Score for each item indicate that all items of the scale appropriated the Impact Score of more than 1.5. From the whole 60 items examined in content validity section, based on opinions of experts, all of them received more than 0.79 scores. The questionnaire's average content validity score was 0.91.

Factors of Positive Young Adults Development scale were examined through Confirmatory factor analysis with regard to suitability four measures that verified the recommended model fit (figure 1). Chi-square measure was equal to 4.425 and P=0.251 meaning that there is a reasonable relation between the suggested model and the observed data. CFI and NFI are relative fit measures which compare the model with the given model identic with zero model with 0.95 reasonable measure. CFI and NFI were 0.968 and 0.972, respectively, which show the model's ideal fit. RMSEA measures the difference between the sample and population coefficients which demonstrate that the nearer the quantities are to zero, the better the model fit is. RMSEA was 0.084 which means an average fit.

The Reliability for the questionnaire and also each factor was calculated after doing factor analysis through Cronbach's alpha. Reliability coefficients for the whole scale and marking variables were 0.87 and 0.85-0.94, respectively (Table 1). Each factor's internal consistency coefficient and also each question's correlation with all the questions are presented in table 3. Each item's correlation with each factor's total score was calculated and showed that every question had a desirable correlevance coefficient with the whole questions. Questions 35 and 57 had the least (0.31) and the most (0.64) correlation, respectively (Table 2).

DISCUSSION

This study aimed at investigating empowerments of young adults participated in life-skills educational program examining scale through Confirmatory factor analysis and internal consistency. This research results in line with Colorado National Investigating Center showed that the scale had a reasonable validity (19). In other words, Confirmatory factor analysis model results showed a reasonable fit of the questionnaire's factor structure. Furthermore, Cronbach's alpha coefficient also showed that Positive Young Adults Development scale had a reasonable reliability.

Life-skills educational programs are considered very important as a method to transfer information and prepare the way for growth and skills achievement and making knowledge (22-25). Thus, the quality of these programs is today

Shervin-sadat Hashemian Esfahani *et al.*

life-skills educational program's main controversy at schools. The developed scale's first part concentrated on different aspects of the content, attractiveness, education and educators quality in life-skills educational program to observe and evaluate these programs' quality and also compare its performance methods in different schools and levels. Domains to be evaluated in life-skills educational program are studied in the direct effects part so that their value and desirability are determined. Direct effects are studied among young adults to continue educational activities, stop them, modify or change some aspects. In the response part of some questions like the degree of change in Peer communication, feelings and thoughts statement, decision-making, goals setting, and environmental hazards avoidance are asked by students.

Although the importance and necessity of studying and evaluating life-skills educational programs consequences in various studies is becoming normal and researchers agree on it, assessing these kinds of educations' effectiveness is considered the most important part. In a program's effectiveness its positive and negative impacts on the target population are investigated and hence its side-effects are revealed and judged (26-28). In the indirect impacts part, life-skills educational program effectiveness is examined in parts including educational success, exercise, social involvement, cultural suitability, and Sense of Self. The study results can be used by life-skills educational program planners, executives, and educators at schools. It can be a practical scale to evaluate life-skills educational program. This scale has given a new insight towards evaluating life-skills educational program in Iran through examining the program's quality, direct and indirect impacts, simultaneously. Moreover it can create a new perspective on assessment and evaluation of life skills training program.

ACKNOWLEDGMENTS

REFERENCES

1.Rezayat F, Dehghan Nayeri N. Self-efficacy after life skills training: a case-control study. Nursing and midwifery studies. 2013;2(4):83-8.

2.Jegannathan B, Dahlblom K, Kullgren G. Outcome of a school-based intervention to promote life-skills among young people in Cambodia. Asian journal of psychiatry. 2015;9:78-84.

3.Keenan S, King G, Curran CJ, McPherson A. Effectiveness of experiential life skills coaching for youth with a disability. Physical & occupational therapy in pediatrics. 2015;34(2):119-31.

4.van der Heide I, Wang J, Droomers M, Spreeuwenberg P, Rademakers J, Uiters E. The relationship between health, education, and health literacy: results from the Dutch Adult Literacy and Life Skills Survey. Journal of health communication. 2013;18 Suppl 1:172-84.

5.Currie LK, Pisarik CT, Ginter EJ, Glauser AS, Hayes C, Smit JC. Life-skills as a predictor of academic success: an exploratory study. Psychological reports. 2012;111(1):157-64.

6.Hanley GP, Fahmie TA, Heal NA. Evaluation of the preschool life skills program in Head Start classrooms: a systematic replication. Journal of applied behavior analysis. 2015;47(2):443-8.

7.Lai MH, Graham JW, Smith EA, Caldwell LL, Bradley SA, Vergnani T, et al. Linking Life Skills and Norms With Adolescent Substance Use and Delinquency in South Africa. Journal of research on adolescence : the official journal of the Society for Research on Adolescence. 2013;23(1):128-37.

8.Luna-Adame M, Carrasco-Gimenez TJ, Rueda-Garcia Mdel M. Evaluation of the effectiveness of a smoking prevention program based on the 'Life Skills Training' approach. Health education research. 2013;28(4):673-82.

9.Minnis AM, vandommelen-Gonzalez E, Luecke E, Dow W, Bautista-Arredondo S, Padian NS. Yo Puedo--a conditional cash transfer and life skills intervention to promote adolescent sexual health: results of a randomized feasibility study in san francisco. The Journal of adolescent health : official publication of the Society for Adolescent Medicine. 2015;55(1):85-92.

10.Moshki M, Hassanzade T, Taymoori P. Effect of Life Skills Training on Drug Abuse Preventive Behaviors among University Students. International journal of preventive medicine. 2015;5(5):577-83.

11.Spoth R, Trudeau L, Shin C, Redmond C. Long-term effects of universal preventive interventions on prescription drug misuse. Addiction. 2008;103(7):1160-8.

12.Buhler A, Schroder E, Silbereisen RK. The role of life skills promotion in substance abuse prevention: a mediation analysis. Health education research. 2008;23(4):621-32.

13.Wahl MS, Patak MA, Pössel P, Hautzinger M. A school-based universal programme to prevent depression and to build up life skills. Journal of Public Health. 2011;19(4):349-56.

14.Heimlich JE. Environmental education evaluation: reinterpreting education as a strategy for meeting mission. Evaluation and program planning. 2010;33(2):180-5.

15.Ruhe V, Boudreau JD. The 2011 Program Evaluation Standards: a framework for quality in medical education programme evaluations. Journal of evaluation in clinical practice. 2013;19(5):925-32.

16.Choque-Larrauri R, Chirinos-Caceres JL. [Determining the efficacy of a high-school life-skills' programme in Huancavelica, Peru]. Revista de salud publica (Bogota, Colombia). 2009;11(2):169-81.

17.Forneris T, Danish SJ, Scott DL. Setting goals, solving problems, and seeking social support: developing adolescents' abilities through a life skills program. Adolescence. 2007;42(165):103-14.

18.Sorensen G, Gupta PC, Nagler E, Viswanath K. Promoting life skills and preventing tobacco use among low-income Mumbai youth: effects of Salaam Bombay Foundation intervention. PloS one. 2012;7(4):e34982.

19.The Colorado Trust and National Research Center. The After-School Initiative'sToolkit for Evaluating Positive Youth Development. Denver: The Colorado Trust; 2004.

20.Harkness J, Pennell BE, Schoua-Glusberg A. Survey questionnaire translation and assessment. Methods for testing and evaluating survey questionnaires. 2004:453-73.

21.Polit DF, Beck CT. The content validity index: are you sure you know what's being reported? Critique and recommendations. Research in nursing & health. 2006;29(5):489-97.

22.Eggenberger E, Heimerl K, Bennett MI. Communication skills training in dementia care: a systematic review of effectiveness, training content, and didactic methods in different care settings. International psychogeriatrics / IPA. 2013;25(3):345-58.

23.Guhne U, Weinmann S, Arnold K, Becker T, Riedel-Heller S. [Social skills training in severe mental illness--is it effective?]. Psychiatrische Praxis. 2012;39(8):371-80.

24.Pulsford D, Jackson G, O'Brien T, Yates S, Duxbury J. Classroom-based and distance learning education and training courses in end-of-life care for health and social care staff: a systematic review. Palliative medicine. 2013;27(3):221-35.

25.Reichow B, Kogan C, Barbui C, Smith I, Yasamy MT, Servili C. Parent skills training for parents of children or adults with developmental disorders: systematic review and meta-analysis protocol. BMJ open. 2015;4(8):e005799.

26.Li Q, Zhou RH, Liu J, Lin J, Ma EL, Liang P, et al. Pre-training evaluation and feedback improved skills retention of basic life support in medical students. Resuscitation. 2013;84(9):1274-8.

27.Smith M, Stolder ME, Liu MF. Evaluation of an innovative late-life depression training program. Perspectives in psychiatric care. 2015;50(1):19-26.

28.Whittemore R, Jaser SS, Jeon S, Liberti L, Delamater A, Murphy K, et al. An internet coping skills training program for youth with type 1 diabetes: six-month outcomes. Nursing research. 2012;61(6):395-404.

Shervin-sadat Hashemian Esfahani *et al.*

Table 1. Mean score and internal consistency of the domains of the scale

Domains	items	Mean score (SD)	Cronbach's a
Program's quality	20	37.36 (8.08)	0.85
Life-skills	11	23.49 (5.92)	0.91
Positive options	5	12.88 (2.70)	0.94
Educational success	9	17.89 (4.47)	0.87
Exercise	3	6.28 (2.09)	0.85
Social involvement	5	10.30 (2.80)	0.90
Cultural suitability	5	10.71 (2.92)	0.89
Sense of Self	5	11.35 (2.99)	0.91

Table 2. Values of mean, standard deviation and corrected item-total correlations of the scale

IN	X (SD)	r	IN	X (SD)	r	IN	X (SD)	r
1	1.73 (0.69)	0.42	22	2.15 (0.76)	0.58	43	2.08 (0.75)	0.55
2	1.95 (0.74)	0.43	23	2.10 (0.80)	0.57	44	2.09 (0.73)	0.54
3	2.10 (0.76)	0.41	24	2.23 (0.75)	0.63	45	1.77 (0.76)	0.38
4	1.72 (0.65)	0.39	25	2.10 (0.79)	0.61	46	1.96 (0.83)	0.43
5	1.84 (0.75)	0.48	26	2.25 (0.76)	0.67	47	2.22 (0.79)	0.52
6	1.67 (0.72)	0.43	27	2.05 (0.75)	0.63	48	2.10 (0.81)	0.46
7	1.82 (0.76)	0.43	28	2.20 (0.76)	0.63	49	1.97 (0.73)	0.56
8	1.75 (0.67)	0.46	29	2.07 (0.74)	0.61	50	1.93 (0.74)	0.51
9	1.72 (0.75)	0.46	30	1.99 (0.76)	0.53	51	2.03 (0.78)	0.54
10	1.66 (0.68)	0.52	31	2.02 (0.81)	0.55	52	1.98 (0.80)	0.57
11	2.14 (0.73)	0.46	32	2.42 (0.71)	0.47	53	2.35 (0.74)	0.63
12	1.57 (0.70)	0.36	33	2.64 (0.68)	0.36	54	2.02 (.077)	0.55
13	1.95 (0.74)	0.47	34	2.61 (0.72)	0.34	55	2.08 (0.77)	0.57
14	2.16 (0.78)	0.42	35	2.73 (0.62)	0.31	56	2.14 (0.79)	0.56
15	2.13 (0.82)	0.46	36	2.45 (0.76)	0.37	57	2.24 (0.74)	0.64
16	1.89 (0.72)	0.50	37	1.87 (0.73)	0.54	58	2.22 (0.74)	0.49
17	1.97 (0.74)	0.52	38	2.01 (0.73)	0.57	59	2.33 (0.75)	0.62
18	1.69 (0.71)	0.50	39	2.04 (0.77)	0.56	60	2.19 (0.76)	0.63
19	1.91 (0.79)	0.48	40	2.03 (0.78)	0.52	61	2.22 (0.75)	0.62
20	1.91 (0.78)	0.38	41	2.05 (0.75)	0.58	62	2.32 (0.76)	0.57
21	2.29 (0.76)	0.60	42	1.98 (0.79)	0.58	63	2.27 (0.74)	0.61

IN: Item Numbers

X: Mean

SD: Standard Deviation

r: Corrected item-total correlation

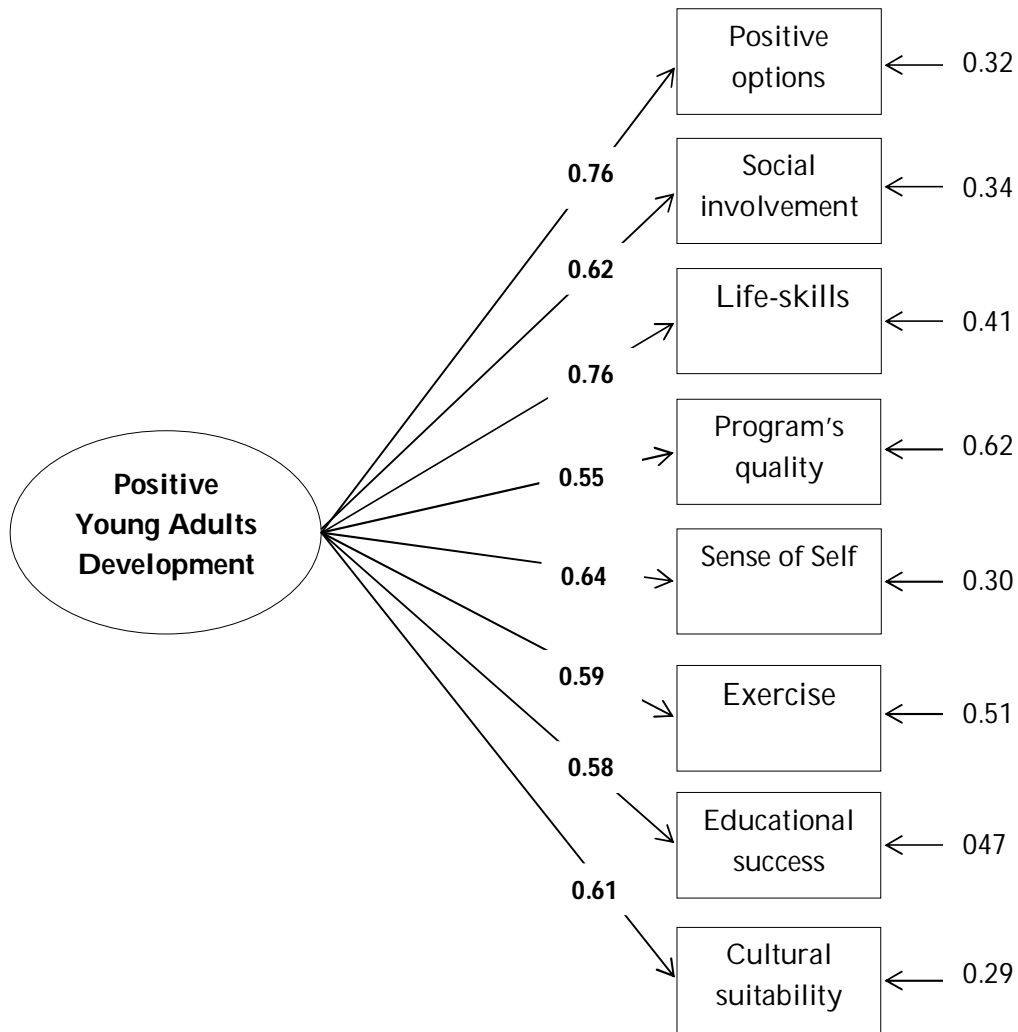**Shervin-sadat Hashemian Esfahani** *et al.*

Figure 1: Factor Confirmatory Measurement Model

Free Convection Flow and Heat Transfer of Non-Newtonian Power-Law Fluids over a Vertical Porous Plate with Magnetohydrodynamic Effects

Abdol Mehdi Adli-Soukedli[1] and Mahmood Reza Khadangi-Mahrood[2]

[1]Department of Chemical Engineering, Shahrood Branch, Islamic Azad University, Shahrood 36199-43189, Iran.
[2]Department of Chemical Engineering, Qouchan Branch, Islamic Azad University, Qouchan36199-43189, Iran.

*Address for correspondence
Abdol Mehdi Adli-Soukedli
Department of Chemical Engineering,
Shahrood Branch, Islamic Azad University,
Shahrood 36199-43189, Iran.
E-mail: rezaramazani87@gmail.com

ABSTRACT

In this study, we present a numerical analysis of free convection flow and heat transfer is presented for non-Newtonian power-law fluids with MHD effects over a vertical porous plate, the surface of which is exposed to a constant wall temperature. For analysis, the Continuty, Momentum and Energy equations are solved by the implicit finite difference scheme of Crank–Nicolson's type. Velocity and temperature of the flow have been presented for various parameters such as Prandtl number, flow behavior index (n), porous plate parameter and magnetic parameter. The local Nusselt number and skin friction coefficient is also presented graphically.

Keywords: Magnetohydrodynamic flow, free convection flow, Non-Newtonian power-law fluids, Vertical porous plate

INTRODUCTION

In recent years MHD flow and non-Newtonian fluid behavior problems have become in view of its significant applications in industrial manufacturing processes such as plasma studies, petroleum industries Magneto-hydrodynamics power generator cooling of clear reactors, boundary layer control in aerodynamics. Many authors have studied the effects of magnetic field on mixed, natural and force convection heat and mass transfer of non-

Abdol Mehdi Adli-Soukedli and Mahmood Reza Khadangi-Mahrood

Newtonian fluid problems. Magnetohydrodynamic has attracted the attention of a large number of scholars due to its diverse applications. In astrophysics and geophysics, it is applied to study the stellar and solar structures, interstellar matter, radio propagation through the ionosphere etc. In engineering it finds its application in MHD pumps, MHD bearings etc. Convectionon non-Newtonian fluid in porous media has applications in geothermal energy recovery, oil extraction, thermal energy storage and flow through filtering devices .The phenomena of mass transfer is also very common in theory of stellar structure and observable effects are detectable, at least on the solar surface. The study of effects of magnetic field on free convection flow of non-Newtonian fluid is important in liquid-metals, electrolytes and ionized gases. The thermal physics of hydromagnetic problems with mass transfer is of interest in power engineering and metallurgy.

Pop and Na [1] presented a case of free convection heat transfer of non-Newtonian fluids along a vertical wavy surface in a porous medium. Yue-Tzu and Wang [2] studied the problem of natural convection of a non-Newtonian power-law fluid with and without yield stress about a two- dimensional axi-symmetric body of arbitrary shape in a fluid- saturated porous medium on the basis of boundary layer approximation. Chen and Chen [3] presented similarity solutions for natural convection of a non-Newtonian fluid over vertical surfaces in porous media. Jumah and Mujumder [4] investigated the problem of natural convection coupled heat and mass transfer from a vertical flat plate in a porous medium saturated with a Herschel – Bulkley fluids. Abel and Veena [5] studied the viscoelasticity on the flow and heat transfer in a porous medium over a stretching sheet. Bestman [6] examined the natural convection boundary layer with suction and mass transfer in a porous medium. Comparatively little work exists on non- Newtonian fluid-saturated porous media as is evident from the review by Shenoy [7] .Makinde [8] examined the transient free convection interaction with thermal radiation of an absorbing-emitting fluid along moving vertical Permeable plate. Chamkha [9] assumed that the plate is embedded in a uniform porous medium and moves with a constant velocity in the flow direction in the presence of a transverse magneticeld. Kim [10] studied unsteady MHD convective heat transfer past a semi-infinite vertical porous moving plate. EL-Hakiem et al .[11] presented group theoretical analysis of unsteady free convection flow over a continuous moving vertical plate embedded in a fluid-saturated porous medium in the presence of amagnetic field .M.A.Abd El-Naby et al. [12] presented Finite difference solution of radiation Effects on MHD unsteady free-convection flow over vertical porous plate.

The object of the present paper is to study the transient free convection and heat transfer flow of non-Newtonian power-law fluids past a vertical porous plate, under the influence of a uniform transverse magnetic field in the presence of constant wall temperature. The dimensionless governing equations are solved by using implicit finite difference scheme of Crank–Nicolson's type. Velocity and temperature of the flow have been presented for various parameters such as Prandtl number, flow behavior index (n), porous plate parameter and magnetic parameter. The local Nusselt number and skin friction coefficient is also presented graphically.

Nomenclature		**Greek symbols**	
B_0	Magnetic field flux density, (tesla)	τ	Shear stress
g	Acceleration due to gravity, (m.s^{-2})	$\overline{\mu}$	Dimensionless of dynamic viscosity
t'	Dimensionless time	β	Coefficient of expansion with concentration, (k^{-1})
K	Thermal conductivity, (w. m^{-1}. k^{-1})	μ	Coefficient of dynamic viscosity
t	Time, (s)	μ_o	Reference dynamic viscosity

Abdol Mehdi Adli-Soukedli and Mahmood Reza Khadangi-Mahrood

n	The flow behavior index	σ	Electrical conductivity of the fluid, (Ω.m^{-1})
T	Temperature of the fluid, (k)	α	Thermal diffusivity, (m^2.s^{-1})
u ,v	Velocity components along(x,y)-axis, (m.s^{-1})	ρ	Fluid density, (kg.m^{-3})
U,V	Dimensionless velocity components in	υ	Kinematic viscosity
	X,Y directions respectively	υ_o	Reference Kinematic viscosity
L	The length of the plate	θ	Dimensionless temperature
x	Special coordinate along the plate, (m)	θ_W	Surface temperature ratio to the ambient fluid
X	Dimensionless spatial coordinate along the plate		
y	Spatial coordinate normal to the plate, (m)	**Subscripts**	
Y	Dimensionless spatial coordinate normal to the plate	W	Evaluated at wall conditions
Gr	Grashof number	∞	Evaluated at free stream condition
Pr	Prandtl number		
Nu	Nusselt number		
W	Evaluated at wall conditions		
M	Magnetic parameter		

MATHEMATICAL FORMULATION

The Physical model, coordinate system and boundary conditions are shown in Fig .1. Consider a MHD free convection flow of an electrically conducting, for non-Newtonian power-law fluids over an isothermal vertical porous plate. The x-axis is assumed to be taken along the plate and the y-axis normal to the plate. The wall is maintained at conestant temperature T_w and than the ambient temperature T_∞ respectively .a uniform magnetic field is applied normal of magnitude B_0 to the plate.

The governing equations include mass conservation in a continuous medium (Equ. 1), the Navier-Stokes equation (Equ. 2) and also the energy equation (Equ. 3).

Abdol Mehdi Adli-Soukedli and Mahmood Reza Khadangi-Mahrood

$$\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} = 0 \tag{1}$$

$$\frac{\partial u}{\partial t} + u\frac{\partial u}{\partial x} + v\frac{\partial u}{\partial y} = \frac{1}{\rho}\frac{\partial}{\partial y}\left[\mu\frac{\partial u}{\partial y}\right] + g\beta(T - T_\infty) - \frac{\sigma B_0^2}{\rho}u \tag{2}$$

$$\frac{\partial T}{\partial t} + u\frac{\partial T}{\partial x} + v\frac{\partial T}{\partial y} = \alpha\frac{\partial^2 T}{\partial y^2} \tag{3}$$

The non-Newtonian fluid model used in this study is the power-law model (Equ. 4).

$$\tau = m\left|\frac{\partial u}{\partial y}\right|^n \tag{4}$$

The Coefficient of dynamic viscosity, µ for power-law fluids is given by (Equ. 5).

$$\mu = m\left|\frac{\partial u}{\partial y}\right|^{n-1} \tag{5}$$

The physical problem assumes the following initial and boundary conditions (Equ. 6).

$$t \leq 0 \ : u = 0 \ , \ v = 0 \ , T = T_\infty$$

$$t > 0 \ : v = -v_0 \ , \ u = 0, T = T_w \quad \text{at} \quad y = 0$$

$$t > 0 \ : \ u = 0 \ , \ T = T_\infty \qquad \text{at} \quad x = 0$$

$$t > 0 \ : u \to 0 \ , T \to T_\infty \qquad \text{at } y \to \infty \tag{6}$$

Introducing the following dimensionless quantities (Equ. 7)

$$x = \frac{X}{L}, \quad y = \frac{Y}{L}Gr^{1/4}, \quad u = \frac{UL}{\upsilon_o}Gr^{-1/2}, \quad v = \frac{VL}{\upsilon_o}Gr^{-1/4} \ , \ \overline{\mu} = \frac{\mu}{\mu_o},$$

$$\overline{\mu} = \left|\frac{\partial U}{\partial Y}\right|^{n-1}, \mu_o = m\left(\frac{\upsilon_o Gr^{\frac{3}{4}}}{L^2}\right)^{n-1}, t = \frac{\upsilon_o t'}{L^2}Gr^{1/2}, \quad \theta = \frac{T - T_\infty}{T_w - T_\infty}, \tag{7}$$

$$Gr = \frac{g\,\beta L^3 (T_w - T_\infty)}{\upsilon_o^2}, \quad M = \frac{\sigma B_0^2 L^2}{\mu_o Gr^{1/2}}, \text{Pr} = \frac{\upsilon_o}{\alpha}, \mu = m \left| \frac{\partial u}{\partial y} \right|^{n-1}$$

The governing equations can be rewritten in dimensionless form as follows:

$$\frac{\partial U}{\partial X} + \frac{\partial V}{\partial Y} = 0 \tag{8}$$

$$\frac{\partial U}{\partial t'} + U\frac{\partial U}{\partial X} + V\frac{\partial U}{\partial Y} = n\frac{\partial^2 U}{\partial Y^2}\left|\frac{\partial U}{\partial Y}\right|^{n-1} + \theta - M.U \tag{9}$$

$$\frac{\partial \theta}{\partial t'} + U\frac{\partial \theta}{\partial X} + V\frac{\partial \theta}{\partial Y} = \frac{1}{\text{Pr}}\frac{\partial^2 \theta}{\partial Y^2} \tag{10}$$

The corresponding initial and boundary conditions in non-dimensional form are given by (Equ. 11).

$$t' \leq 0 \, , \, \theta = 0 \, , V = 0 \, , U = 0$$

$$t' > 0 \, , U = 0 \, , V = -V_0 \, , \, \theta = 1 \qquad \text{at} \quad Y = 0$$

$$t' > 0 \, , U = 0 \, , \theta = 0 \qquad\qquad \text{at} \quad \text{X=0} \tag{11}$$

$$t' > 0 \, , U \rightarrow 0 \, , \theta = 0 \qquad\qquad \text{at} \quad Y \rightarrow \infty$$

The local as well as Nnsselt number and skin friction coefficient in terms of dimensionless quantities are given by:

$$Nu = -X\frac{\partial \theta}{\partial Y}\Big|_{Y=0} \tag{12}$$

$$C_f = \left|\frac{\partial U}{\partial Y}\right|^{n-1}\left(\frac{\partial U}{\partial Y}\right)_{Y=0} \tag{13}$$

Numerical Solution of the problem

The governing equations (8-10) are unsteady, coupled and non-linear with boundary conditions. An implicit finite-difference technique of Crank–Nicolson has been employed to solve the nonlinear coupled equations, as described (Thomas algorithm) in Carnahan et al [13]. The finite difference equations corresponding to equations (8–10) are as follows:

Abdol Mehdi Adli-Soukedli and Mahmood Reza Khadangi-Mahrood

$$\frac{U_{i,j}^{n+1} - U_{i-1,j}^{n+1} + U_{i,j}^{n} - U_{i-1,j}^{n}}{2\Delta X} + \frac{V_{i,j+1}^{n+1} - V_{i,j-1}^{n+1} + V_{i,j+1}^{n} - V_{i,j-1}^{n}}{4\Delta Y} = 0 \tag{14}$$

$$\frac{U_{i,j}^{n+1} - U_{i,j}^{n}}{\Delta t'} + U_{i,j}^{n} \frac{U_{i,j}^{n+1} - U_{i-1,j}^{n+1} + U_{i,j}^{n} - U_{i-1,j}^{n}}{2\Delta X} + v_{i,j}^{n} \frac{U_{i,j+1}^{n+1} - U_{i,j-1}^{n+1} + U_{i,j+1}^{n} - U_{i,j-1}^{n}}{4\Delta Y} \tag{15}$$

$$= n\left(\frac{U_{i,j+1}^{n+1} - 2U_{i,j}^{n+1} + U_{i,j-1}^{n+1} + U_{i,j+1}^{n} - 2U_{i,j}^{n} + U_{i,j-1}^{n}}{2\Delta Y^2}\right)\left|\frac{U_{i,j+1}^{n+1} - U_{i,j-1}^{n+1} + U_{i,j+1}^{n} - U_{i,j-1}^{n}}{4\Delta Y}\right|^{n-1}$$

$$+ \frac{\theta_{i,j}^{n+1} + \theta_{i,j}^{n}}{2} - M\frac{U_{i,j}^{n+1} + U_{i,j}^{n}}{2}$$

$$\frac{\theta_{i,j}^{n+1} - \theta_{i,j}^{n}}{\Delta t'} + U_{i,j}^{n}\frac{\theta_{i,j}^{n+1} - \theta_{i-1,j}^{n+1} + \theta_{i,j}^{n} - \theta_{i-1,j}^{n}}{2\Delta X} + v_{i,j}^{n}\frac{\theta_{i,j+1}^{n+1} - \theta_{i,j-1}^{n+1} + \theta_{i,j+1}^{n} - \theta_{i,j-1}^{n}}{4\Delta Y} \tag{16}$$

$$= \frac{1}{\Pr}\frac{\theta_{i,j+1}^{n+1} - 2\theta_{i,j}^{n+1} + \theta_{i,j-1}^{n+1} + \theta_{i,j+1}^{n} - 2\theta_{i,j}^{n} + \theta_{i,j-1}^{n}}{2\Delta Y^2}$$

The region of integration is considered as a rectangle with sides $X_{max}(=1)$ and $Y_{max}(=10)$, where corresponding to $Y \to \infty$ which lies far from the momentum, energy and concentration boundary layers. An appropriate mesh sizes considered for the calculation are $\Delta X = 0.01$, $\Delta Y = 0.05$ and $\Delta t' = 0.005$.

RESULTS AND DISCUSSION

The transformed governing Eqs.(8), (9), (10) and the associated initial and boundary conditions (11) can be solved by the implicit finite difference scheme of Crank–Nicolson's type. In the paper we focused on the effects of the magnetic field parameter, porous plate parameter, Prandtl number and flow behavior index on the transient velocity and temperature profiles.

Figures .2 and 3, show the effect of the magnetic field parameter M on the velocity and temperature profile. It is observed that the velocity decreases with increases in M parameters. However, the Temperature increases with an increase in M parameters.Figures .4 and 5, describe the behavior of transient velocity and temperature for fluids with different value of power-law index n. It can be observed that the temperature decreases monotonously with increasing the n but the velocity has a different behavior for small and large n.

Figures.6 and 7, show the effect of Prandtl number on transient velocity and temperature distribution. Both velocity and temperature decrease as Prandtl number increases. This is in a greement with the physical fact that the thermal boundary layer thickness decreases with increasing Prandtl number.

Figures .8 and 9, show the effect of the porous plate parameter on the velocity and temperature profile. It is observed that the velocity and Temperature increases with increases in porous plate parameter.

Figures.10, show the effect of magnetic field parameter (M) on local Nusselt number respectively. It is observed that, local Nusselt number decrease as M increases.Figure.11, show the effect of flow behavior index (n) on local Nusselt number respectively. It is observed that the local Nusselt number decrease with increases in flow behavior index.

Figures.12, show the effect of magnetic field parameter (M) on skin friction coefficient respectively. It is observed that, skin friction coefficient decrease as M increases.Figure.13, show the effect of flow behavior index (n) on local skin friction coefficient respectively. It is observed that the skin friction coefficient increase with increases in flow behavior index.

REFERENCES

1. T Pop and T Y Na." free convection heat transfer of non-Newtonian fluids along a vertical wavy surface in a porous medium" Proceedings of the.4th International Symposium on Heat Transfer, Beijing, China, 1996, P452.
2. Y Yue-Tzu and S Wang "Free convection heat transfer of non-Newtonian over axi-symmetric and two-dimensional bodies of arbitrary shape embedded in a fluid- saturated porous medium."International Journal of Heat and Mass Transfer , vol 39, no 1, 1996, p 203.
3. H.T.Chen,C.K.Chen,Free convection of non-Newtonian fluids along a vertical plate embedded in a porous medium ,ASME Journal of Heat Transfer 110 (1988) 257–260.
4. R.Y.Jumah , A.S. Mujumdar , free convection heat and mass transfer of non-Newtonian power-law fluids with yield stress from a vertical flat plate in a saturated porous media , Int.Commun . heat mass transfer 27 (2000) 485494.
5. AbelS,Veena PH.Visco-elastic fluid flow and heat transfer in porous medium over astretching sheet . Int JNon-Linear Mech1 998;33:53140 [1] D.A. Nield and A. Bejan, Convection in Pourous Media, 2 nd edition p. 537, Springer, New York (1999).
6. Bestman AR . Natural convection boundary layer with suction and mass transfer in a porous medium.Int J Energy Res 1990;14:389-96.
7. A.V. Shenoy, Non-Newtonian Fluid Heat Transfer in Porous Media, In: J.P. Hartnett and T.F. IrvineJr (eds.), Advances in Heat Transfer, vol. 24, Academic Press, San Diego(1994).
8. Makinde OD . Free convection flow with thermal radiation and mass transfer past a moving vertical porous plate. Int Comm Heat Mass Transfer 2005;32:1411-9.

9. Chamkha AJ .Unsteady MHD convective heat and mass transfer past a semi-innite vertical permeable moving plate with heat absorption.Int J Eng Sci 2004;42:217-30.
10. Y.J. Kim, Unsteady MHD convective heat transfer rpast a semi-infinite vertical porous moving plate with variable suction ,Internat .J. Engrg Sci.38(2000)833–845.
11. M.A.EL-Hakiem ,S. M.M.EL-Kabeir , A.M.Rashad, Group method analysis of unsteady MHD natural convection flow over a moving vertical sheet in afluid saturated porous medium, J.Comput . Appl .Math. (2007);384-397.
12. M.A.Abd El-Naby,Elsayed M.E.Elbarbary , NaderY.AbdElazem . Finite difference solution of radiation Effects on MHD unsteady free-convection flow over vertical porous plate. Int Comm Mathematics and computation;151 (2004)327-346.
13. B. Carnahan, H.A. Luther, and J.O. Wilkes (1969). Applied Numerical Methods, Wiley ,New York.

Abdol Mehdi Adli-Soukedli and Mahmood Reza Khadangi-Mahrood
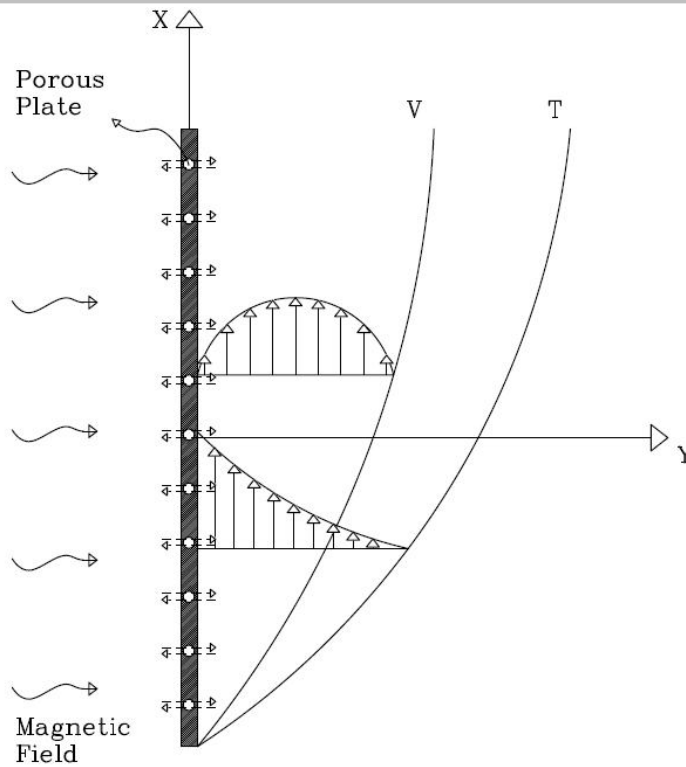
Figure1. Physical model and coordinate system
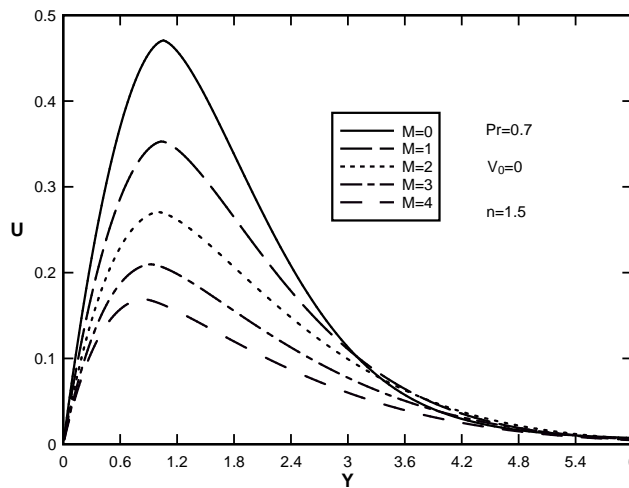
Figure.2. Transient velocity profiles for the different values of magnetic field parameter (M)

Abdol Mehdi Adli-Soukedli and Mahmood Reza Khadangi-Mahrood
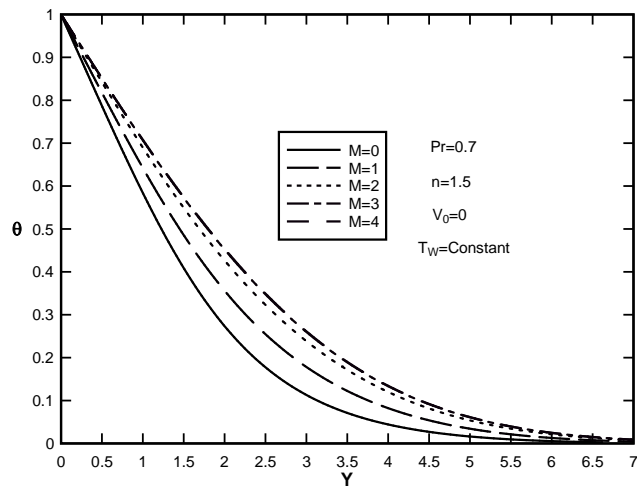
Figure.3. Transient temperature profiles for the different values of magnetic field parameter (M)
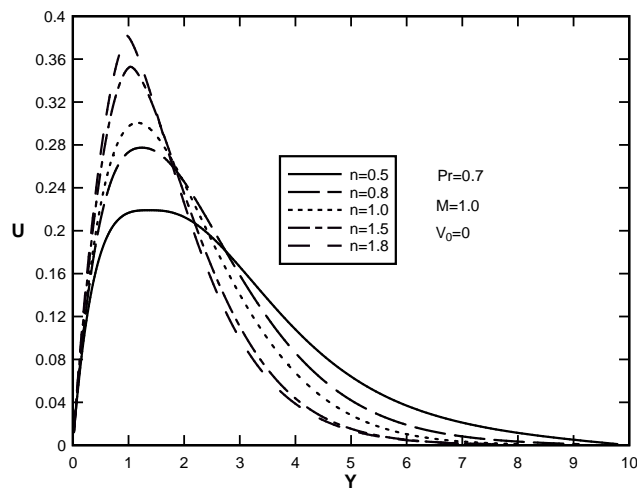
Figure.4. Transient velocity profiles for the different values of flow behavior index (n)

Abdol Mehdi Adli-Soukedli and Mahmood Reza Khadangi-Mahrood
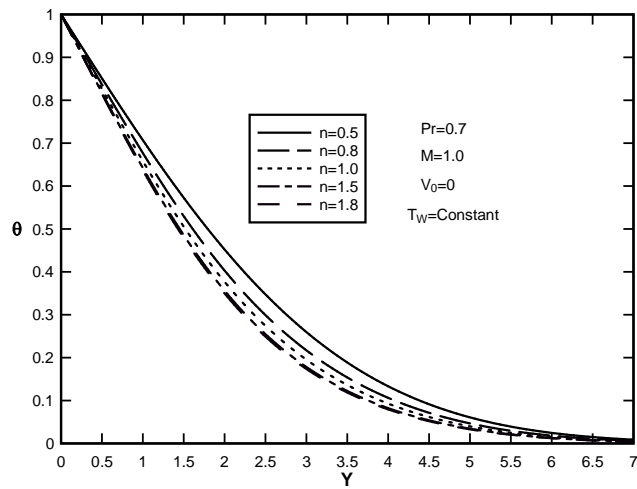
Figure.5. Transient temperature profiles for the different values of flow behavior index (n)
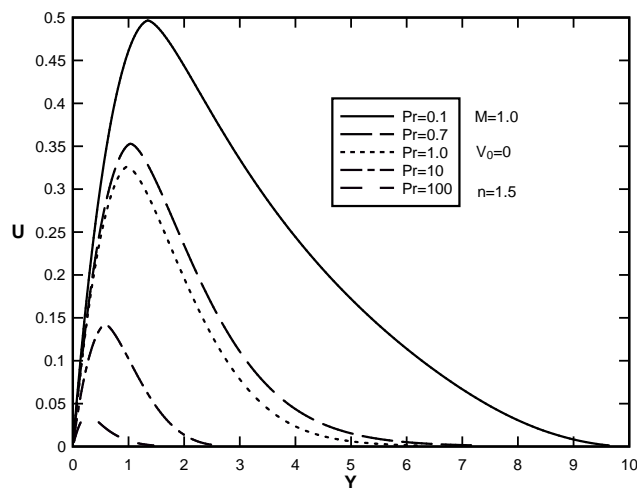
Figure.6. Transient velocity profiles for the different values of Prandtl number

Abdol Mehdi Adli-Soukedli and Mahmood Reza Khadangi-Mahrood
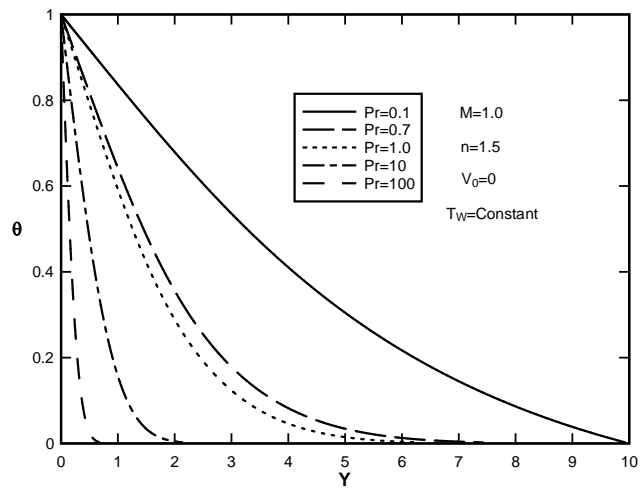
Figure.7. Transient temperature profiles for the different values of Prandtl number
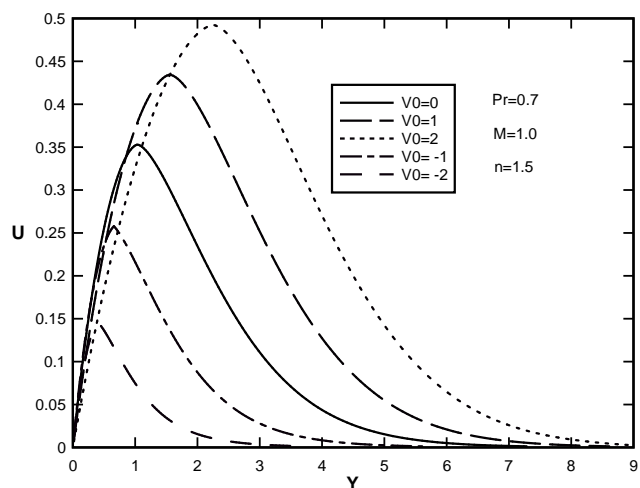
Figure.8. Transient velocity profiles for the different values of porous plate parameter

Abdol Mehdi Adli-Soukedli and Mahmood Reza Khadangi-Mahrood
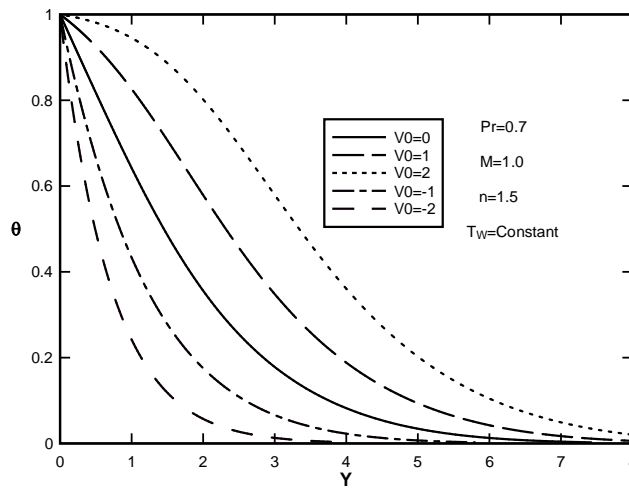
Figure.9. Transient temperature profiles for the different values of porous plate parameter
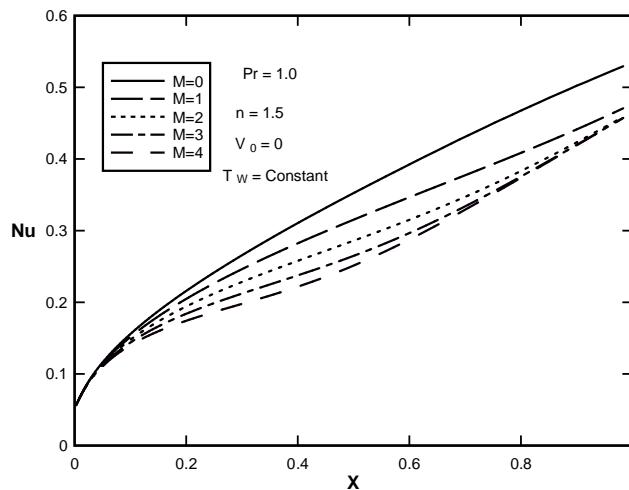
Figure.10. The effect of M parameter on the local Nusselt number

Abdol Mehdi Adli-Soukedli and Mahmood Reza Khadangi-Mahrood
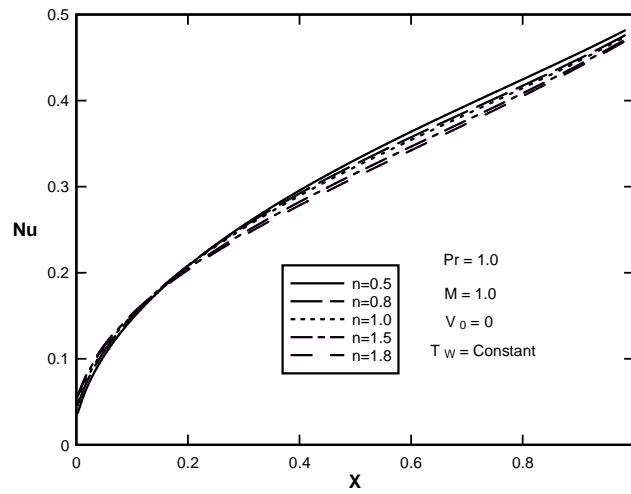
Figure.11. The effect of flow behavior index on the local Nusselt number
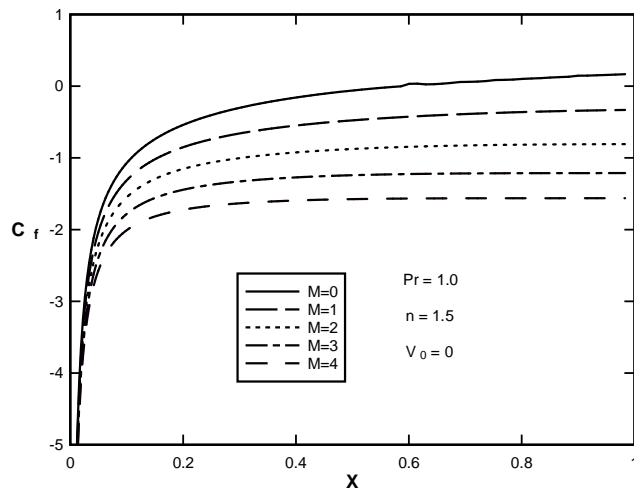
Figure.12. The effect of M parameter on the skin friction coefficient

Abdol Mehdi Adli-Soukedli and Mahmood Reza Khadangi-Mahrood
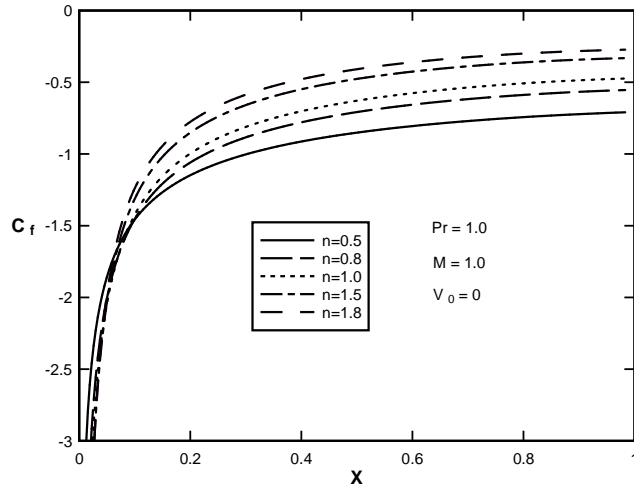
Figure.13. The effect of flow behavior index on the skin friction coefficient

RESEARCH ARTICLE

Optimal Identification and Control of Novel Chaotic System using Genetic Algorithm

Seyed Ebrahim Siahbalaei and Mahmood Ghanbari*

Department of Electrical Engineering, AliAbad Katoul Branch, Islamic Azad University, AliAbad Katoul, Iran.

*Address for correspondence
Mahmood Ghanbari
Department of Electrical Engineering,
AliAbad Katoul Branch,
Islamic Azad University,
AliAbad Katoul,Iran.
E-mail: mmm_gh_53@yahoo.com,
Fax: +98 1732158891

ABSTRACT

In this paper, an optimal adaptive controller is used to control and estimation of the novel three-dimensional autonomous chaotic system with a single cubic nonlinearity. In the recent work, adaptive control laws are designed to stabilize the new chaotic system with unknown parameters to its unstable equilibrium point at the origin. Six constant parameters are utilized in control strategy. In this paper, single objective and multi objectives genetic algorithm is used to find the optimal values of control parameters. The results show that by optimizing the control parameters using single objective method, the error settling time decreases significantly and efficiency of control increases butit increases the control effort. To find the optimal strategy without increasing the control input, multi objectives genetic algorithm method is implied and it is shown that utilizing this method leads to shorter control and estimation time without increasing the control input.

Keywords: Multi Objective; Genetic Algorithm, Adaptive Control.

INTRODUCTION

First scientist who showed the chaotic motion was Lorenz. Lorenz system shows very complex and complicate dynamical behavior, as two-scroll butterfly-shaped chaotic attractor [1]. After Lorenz, Chen introduced another

Mahmood Ghanbari and Seyed Ebrahim Siahbalaei

chaotic system which was not equivalent to the Lorenz system [2,3]. Later, Lü and Chen found another chaotic system [4], which represents the transition between the Lorenz and Chen attractors.Later, by utilizing computer searching, Sprott found 19 simple chaotic systems with lower than three equilibrium points [5–7]. It is worthy to note that some autonomous chaotic systems have three equilibrium points: one stable saddle point and two unstable points (for example, the Lorenz system [1], the Chen system [2], and the L system [4]). The other 3D chaotic systems such as the original Rossler system [8], DLS [9,10] and Burke–Shaw system [11], have two unstable saddle-foci.Yang and Chen found a novel chaotic system with three fixed points: one saddle and two stable fixed points [12].Recently, Yang et al. [13] and Pehlivan et al. [14] introduced and analyzed the new three dimension chaotic systems with six terms including only two quadratic terms in a form very similar to the Lorenz, Chen, L, and Yang–Chen systems, but they have two very different fixed points: two stable node-foci.The chaos has many advantage and disadvantage effects on engineering field. Thus,there has been increasing interest in identifying chaotic dynamics in engineering applications, where some attention has been found on creating chaos via simple physical systems, such as electronic circuits [15–20]. Chaos potential real-world applications [21] in various chaos-based technologies and information systems such as secure data transformation [22–29] have attracted electronic engineersto produce chaotic attractors.Recently new chaotic system with unknown parameters is introduced and adaptive control is used to control and synchronization of this novel system [30]. Six control parameters are introduced in this paper which are set as constant as 3. In This paper we will use to obtain optimal values of these parameters in a way that the last square control and synchronization error be minimum.

MATHEMATICAL MODEL

The new chaotic system is described by the following autonomous nonlinear system of differential equations [30]:

$$\dot{x}_1 = ax_1 - x_1$$
$$\dot{x}_2 = -bx_1 - x_3$$
$$\dot{x}_3 = cx_3 + x_1 x_2^2 - x_1$$

(1)

where x_1, x_2, x_3 are the states and a, b, c are constant, positive, parameters of the system. The new system (1) has totally seven terms on the right-hand side with a cubic nonlinearity. Typical values of the parameters are: a=1, b=0.46, c=0.46.Bifurcation diagram is plotted in Fig. 1. As shown in this figure, system has chaotic vibration for a>1.Phase plane of the system for mentioned values of parameters is plotted in Fig. 2. As shown in this figure, the system response doesn't lies on periodic stable orbit and has a chaotic motion in phase plane.Figure 3 shows the system time response. Lyapunov exponents of the system as a function of time and parameter a are plotted in Fig. 4 and Fig. 5 respectively. As seen in these figures, the largest Lyapunov exponent is positive which verifies the chaotic response of the system.To control and synchronization of this novel system, adaptive control was used in which control inputs are as [30]:

$$u_1(t) = -\hat{a}x_2 + x_1 - k_1 x_1$$
$$u_2(t) = -\hat{b}x_1 + x_3 - k_2 x_2$$
$$u_3(t) = -\hat{c}x_3 + x_1 x_2 + x_1 - k_3 x_3$$

(2)

where $\hat{a}$, $\hat{b}$ and $\hat{c}$ are estimation of unknown parameters with following update law:

Mahmood Ghanbari and Seyed Ebrahim Siahbalaei

$$\dot{\hat{a}} = x_1 x_2 + k_4 e_a$$
$$\dot{\hat{b}} = -x_1 x_2 + k_5 e_b \tag{3}$$
$$\dot{\hat{c}} = x_3{}^2 + k_6 e_c$$

Lyapunov approach was used to derive control and update law, where $k_1, k_2 \ldots k_6$ are control parameters which were set to $k_i = 3$ in [30]. To optimal design of this controller Genetic Algorithm will be used here.

Optimization

Single Objective Optimization

To find the optimal values of parameters k_1, to k_6 we use Single objective Genetic Algorithm. Brief overview of how a genetic algorithm works is described below: Generate Initial Population: a number of individuals (the population) are randomly initialized. Evaluate Objective Function:The objective function is then evaluated for these individuals, producing the first generation of genomes. Checking the Optimization Criteria: The criteria of optimization are checked in this state.Generate new Population:If the optimization criteria are not met, the creation of a new generation starts.Selection: Individuals are selected according to their fitness for the production of offspring.

Recombination:Parents are recombined (crossover) to produce offspring. All offspring will be mutated with a certain probability. The fitness of the offspring is then computed. The offspring are inserted into the population replacing the parents, producing a new generation.This cycle is performed until the optimization criteria are reached, or until a pre-set maximum number of generations have been generated. The initially and randomly selected population is left to evolve for 30 generations, after which no significant change is found in the objective function value. So this is used as termination criteria for the algorithm [31]. Twelve-bit string element is used for the encoding of each of the controller parameters. The crossover and mutation probabilities are chosen to be 0.8 and 0.02, respectively.

The genetic algorithm MATLAB tool box developed by Chipperfield et al. [32] was used in the present study. Mean squared normalized error is considered as an objective function in this section. The lower and upper bounds of optimization parameters are set as $0 < k_1, \ldots k_6 < 10$. Figure (6) shows the best fitness value as a function of generation. Black point is the best fitness value of populations in any generation and blue point is the mean of all individuals' fitness value in generations. As seen in this figure, mean value converge to the best value after 30 generations and the best fitness value is $f = 60.7$. The control parameters are found as:

$$k_1 = 9.49; \quad k_2 = 6.76; \quad k_3 = 5.2;$$
$$k_4 = 2.17; \quad k_5 = 5.8; \quad k_6 = 3.36$$

The error of the system for optimal parameters and non-optimal parameters are shown in following figures. As seen in this figure, by optimizing of control parameters, the tracking error set to zero in shorter time than non-optimized parameter system. These figures imply that, optimal values of parameters lead to better estimation of system parameters and also result in fast control of the system.To see the control effort for optimal and non-optimal control system, the control effort is plotted for both cases in Fig. 10. As seen in this figure, the control effort for optimal parameters is more than non-optimal control effort. This is the motivation to use multi objective Genetic Algorithm by minimizing the control and estimation times as well as control effort.

Mahmood Ghanbari and Seyed Ebrahim Siahbalaei

Multi objective Optimization

To find the optimal values of parameters k_1, t, k_3 we now use multi objective Genetic Algorithm.

As mentioned before, a single objective optimization algorithm will normally be terminated upon obtaining an optimal solution. However, for most realistic the multi-objective problems, there could be a number of optimal solutions. Suitability of one solution depends on a number of factors including user's choice and problem environment, and hence finding the entire set of optimal solutions may be desired.Mathematically, a general multiobjective optimization problem contains a number of objectives to be minimized and constraints to be satisfied. In this case, a multiobjective optimization problem consists of optimizing a vector of functions:

$$Opt(F(x)) = (f_1, f_2, \ldots, f_n)$$

These functions $f_1, f_2, \ldots, f_n$ usually in conflict with each other, are a mathematical description of performance criteria.

The meaning of optimum is not well defined in this context, so it is difficult to have a vector of decision variables that optimizes all the objectives simultaneously. Therefore, the concept of Pareto optimality is used. The concept of optimality in single objective is not directly applicable in multiobjective optimization problems. For this reason a classification of the solutions is introduced in terms of Pareto optimality. For the problem presented in this study, Pareto front is plotted in Fig. 11.This points are non-dominated points. As seen in this figure, two objective functions are error norms ($\|x\|$) and maximum value of control effort ($\mathrm{Max}(u_1)$). Based on the design conditions and physical constraints, one of the non-dominated points in Fig. 11 can be chosen which can lead to fastest control strategy of the control strategy with minimum effort. The selected point here is shown in Fig. 11.Fig. 12 shows the variation of system errors for the optimal values of gain obtained by multi objective strategy and the results are compared with Ref. [30]. This figure indicates that the optimal selecting of control gains lead to fast control.Fig. 13 shows the control effort for optimal and non-optimal cases. As shown in this figure, for both cases, the control efforts are in same range.

CONCLUSION

In this paper we proposed the optimal adaptive controller to control the chaotic vibration of new proposed chaotic system. Single and multi-objectives genetic algorithms are used in this paper to find the optimal values for the parameters in this controller. For the single objective case, the norm of variables of state space is considered as objective function and the obtained results demonstrated that the control of variable and the estimation of variable are done in shorter time of the previous reference. Comparison of optimal strategy control input with the non-optimal case revealed that this optimal strategy needs more control input.For multi objective case, two objective functions were defined as the norm of variables of state space and the maximum value of control input. It is shown that proposed optimal control leads to small settling time and it doesn't need more control effort.

REFERENCES

1. E.N. Lorenz, Deterministic nonperiodic flow, Journal of the Atmospheric Sciences 20 (1963) 130–141.
2. G. Chen, T. Ueta, Yet another chaotic attractor, International Journal of Bifurcation and Chaos 9 (1999) 1465–1466.
3. T. Ueta, G. Chen, Bifurcation analysis of Chen's attractor, International Journal of Bifurcation and Chaos 10 (2000) 1917–1931.
4. J. Lü, G. Chen, A new chaotic attractor coined, International Journal of Bifurcation and Chaos 12 (2002) 659–661.
5. J.C. Sprott, Simple chaotic flows, Physical Review E 50 (1994) 647–650.

6.   J.C. Sprott, Simplest dissipative chaotic flows, Physics Letters A 228 (1997) 271 274.

7.   J.C. Sprott, A new class of chaotic circuit, Physics Letters A 266 (2000) 19–23.

8.   O.E. Rssler, An equation for continuous chaos, Physics Letters A 57 (1976) 397–398.

9.   G. van der Schrier, L.R.M. Maas, The diffusionless Lorenz-equations: Shil'nikov bifurcations and reduction to an explicit map, Physica D 141 (2000) 19–36.

10. Z.C. Wei, Q.G. Yang, Controlling the diffusionless Lorenz equations with periodic parametric perturbation, Computers and Mathematics with Applications 58 (2009) 1976–1987.

11. R. Shaw, Strange attractor, chaotic behavior and information flow, Zeitschrift fur Naturforschung A 36 (1981) 80–112.

12. G. Yang, G.R. Chen, A chaotic system with one saddle and two saddle node-foci, International Journal of Bifurcation and Chaos 18 (2008) 1393–1414.

13. G. Yang, Z.C. Wei, G.R. Chen, An unusual 3D autonomous quadratic chaotic system with two stable node-foci, International Journal of Bifurcation and Chaos 20 (2010) 1061–1083.

14. Pehlivan, Y. Uyaroglu, A new chaotic attractor from general Lorenz system family and its electronic experimental implementation, Turkish Journal of Electrical Engineering and Computer Science 18 (2010) 171–184.

15. K.M. Cuomo, A.V. Oppenheim, Circuit implementation of synchronized chaos with applications to communications, Physical Review Letters 71 (1993) 65–68.

16. S. Nakagawa, T. Saito, An RC OTA hysteresis chaos generator, IEEE Transactions on Circuits and Systems I: Fundamental Theory and Applications 43 (1996) 1019–1021.

17. J.C. Sprott, Simple chaotic systems and circuits, American Journal of Physics 68 (2000) 758–763.

18. S. Ozoguz, A. Elwakil, M.P. Kennedy, Experimental verification of the butterfly attractor in a modified Lorenz system, International Journal of Bifurcation and Chaos 12 (2002) 1627–1632.

19. Elwakil, M. Kennedy, Construction of classes of circuit-independent chaotic oscillators using passive-only nonlinear devices, IEEE Transactions of Circuits and Systems I: Fundamental Theory and Applications 48 (2001) 289–307.

20. Pehlivan, Y. Uyaroglu, M. Yogun, Chaotic oscillator design and realizations of the Rucklidge attractor and its synchronization and masking simulations, Scientific Research and Essays 5 (2010) 2210–2219.

21. S. Yu, J. Lü, W. Tang, G. Chen, A general multi-scroll Lorenz system family and its realization via digital signal processors, Chaos 16 (2006) 033126.

22. M.E. Yalcin, J.A.K. Suykens, J. Vandewalle, S. Ozoguz, Families of scroll grid attractors, International Journal of Bifurcation and Chaos 12 (2002) 23–41.

23. M.E. Yalcin, J.A.K. Suykens, J.P.L. Vandewalle, Cellular Neural Networks, Multi Scroll Chaos and Synchronization, World Scientific, Singapore, 2005.

24. K.S. Tang, G.Q. Zhong, G. Chen, K.F. Man, Generation of n-scroll attractors via sine function, IEEE Transactions on Circuits and Systems I: Fundamental Theory and Applications 48 (2001) 1369–1372.

25. J. Lü, G. Chen, Generating multi-scroll chaotic attractors: theories, methods and applications, International Journal of Bifurcation and Chaos 16 (2006) 775–858.

26. Pehlivan, Y. Uyaroglu, Rikitake attractor and its synchronization application for secure communication systems, Journal of Applied Sciences 7 (2007) 232–236.

27. Pehlivan, Y. Uyaroglu, Simplified chaotic diffusionless Lorenz attractor and its application to secure communication systems, IET Communications 1 (2007) 1015–1022.

28. Y. Uyaroglu, I. Pehlivan, Nonlinear Sprott94 Case A chaotic equation: synchronization and masking communication applications, Computers and Electrical Engineering 36 (2010) 1093–1100

29. M. Messias, D.C. Braga, L.F. Mello, Degenerate Hopf bifurcation in Chua's system, International Journal of Bifurcation and Chaos 19 (2009) 497–515.

30. V. Sundarapandian, I. Pehlivan, Analysis, control, synchronization, and circuit design of a novel chaotic, Mathematical and Computer Modelling 55 (2012) 1904–1915

Mahmood Ghanbari and Seyed Ebrahim Siahbalaei

31. K.Kristinsson, System identification and control using genetic algorithms, IEEE Trans. Systems, Man Cybernetics, 22, 1033–1046 (1992)
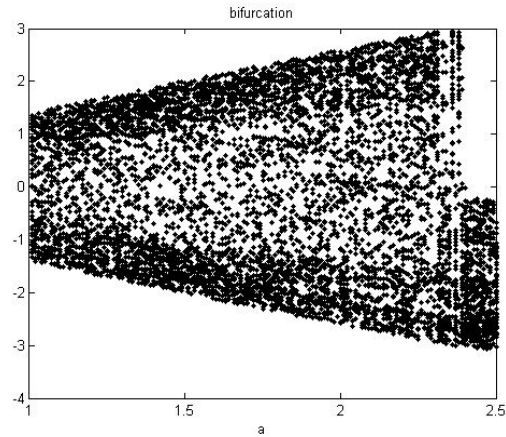
Figure 1. Bifurcation diagram

(a)

(b)

(c)

3542
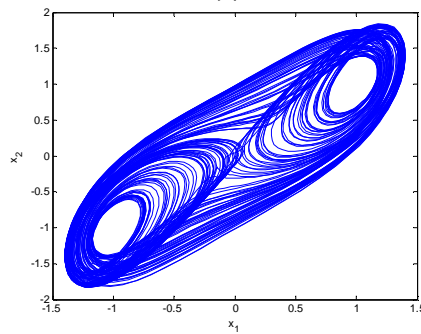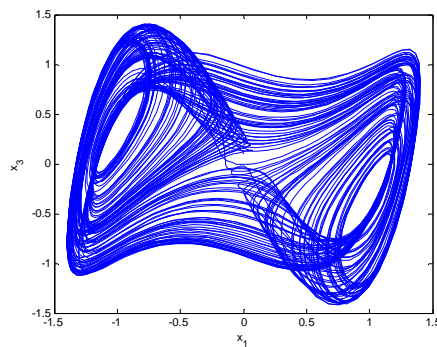
Mahmood Ghanbari and Seyed Ebrahim Siahbalaei
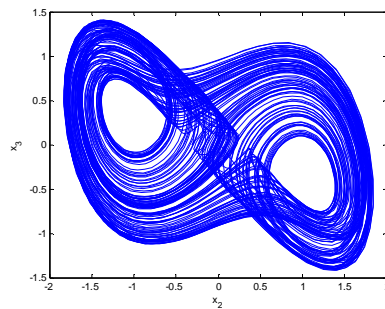
Figure 2. System phase plane [30]

(a)
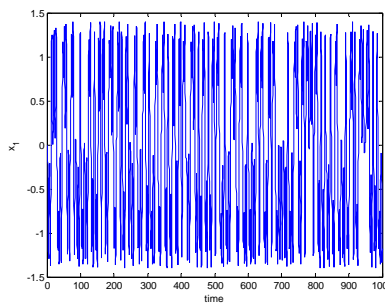
(b)
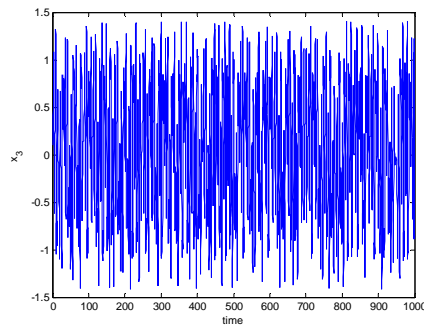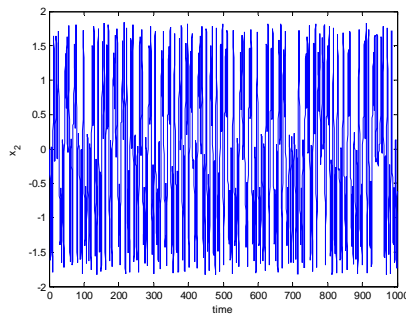
Figure 3. Time response of the system states [30]

Mahmood Ghanbari and Seyed Ebrahim Siahbalaei
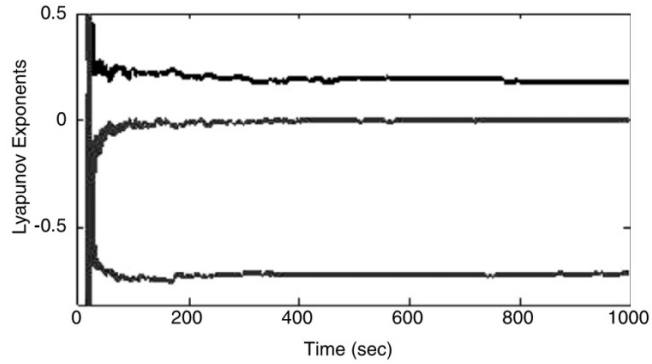
Figure 4. Lyapunov exponents as a function of time [30]
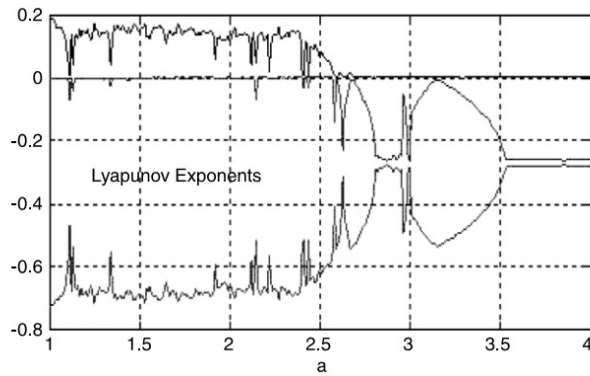
Figure 5. Lyapunov exponents as a function of a [30]
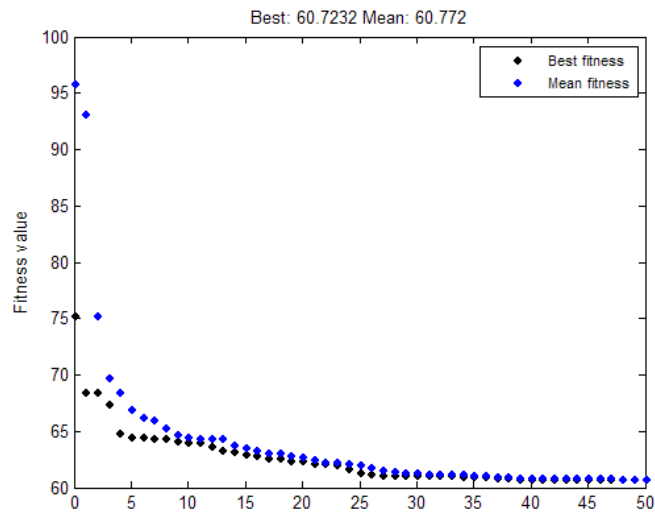
Figure. 6. Optimization procedure

Mahmood Ghanbari and Seyed Ebrahim Siahbalaei
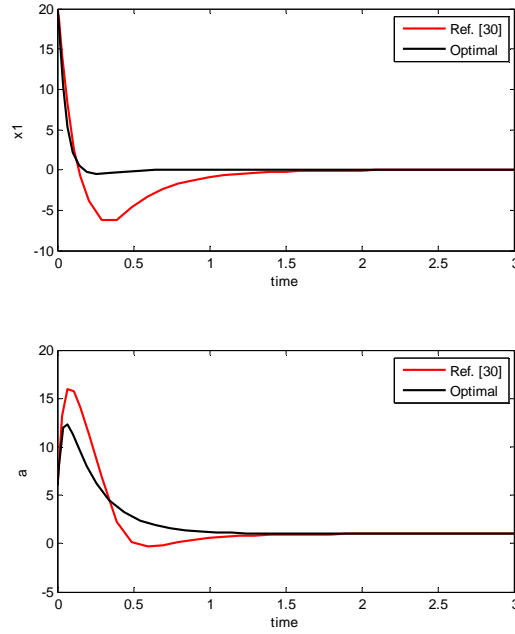
Figure. 7. Time history of x_1 **and** a **, Non optimal (Ref. 30) and optimal (This paper)**
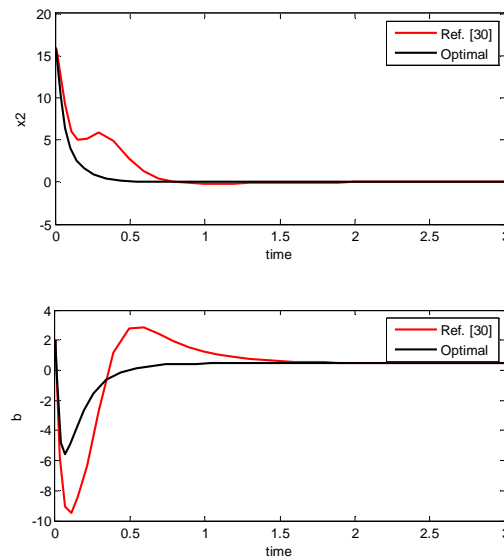
Figure. 8. Time history of x_2 **and** b **, Non optimal (Ref. 30) and optimal (This paper)**

Mahmood Ghanbari and Seyed Ebrahim Siahbalaei
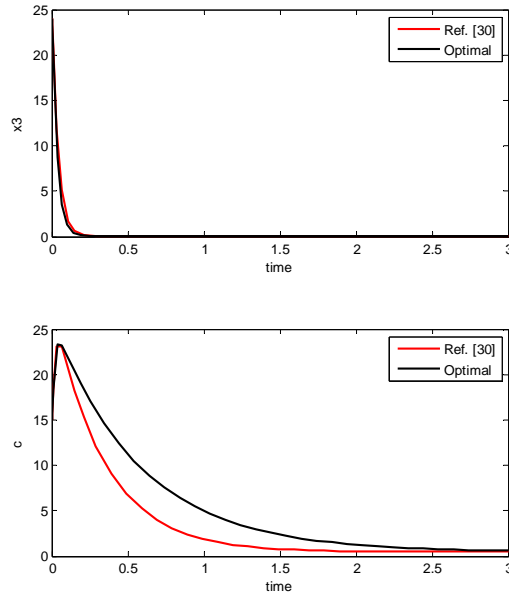
Figure. 9. Time history of x_3 and c, Non optimal (Ref. 30) and optimal (This paper)
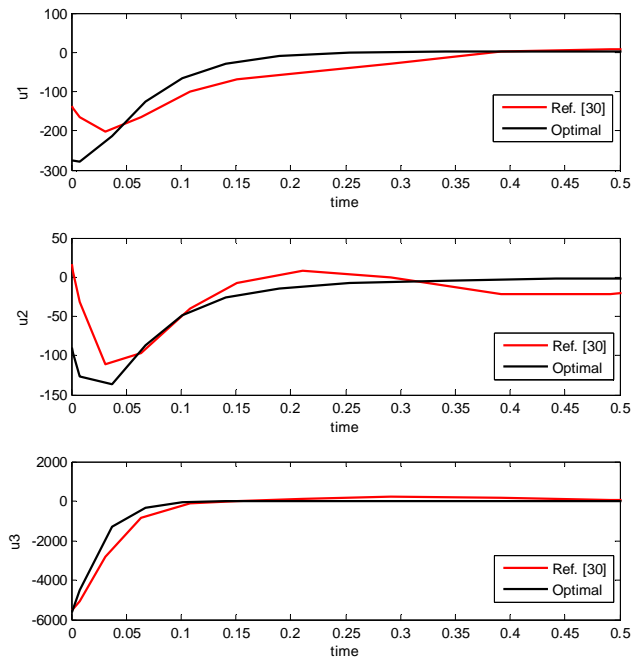
Figure. 10. Time history of u, Non optimal (Ref. 30) and optimal (This paper)

Mahmood Ghanbari and Seyed Ebrahim Siahbalaei
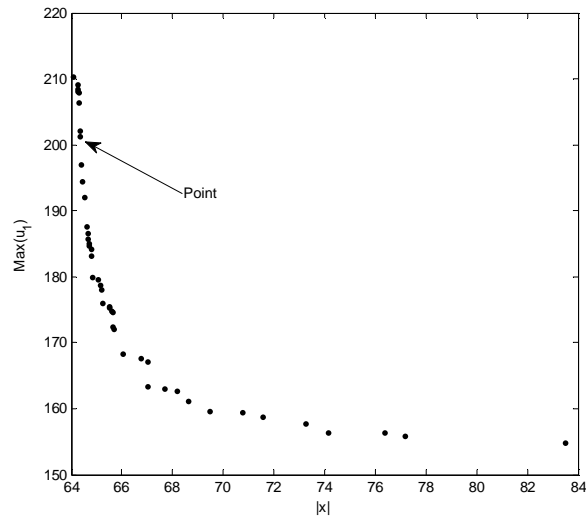
Figure. 11. The Pareto front of a set of solutions
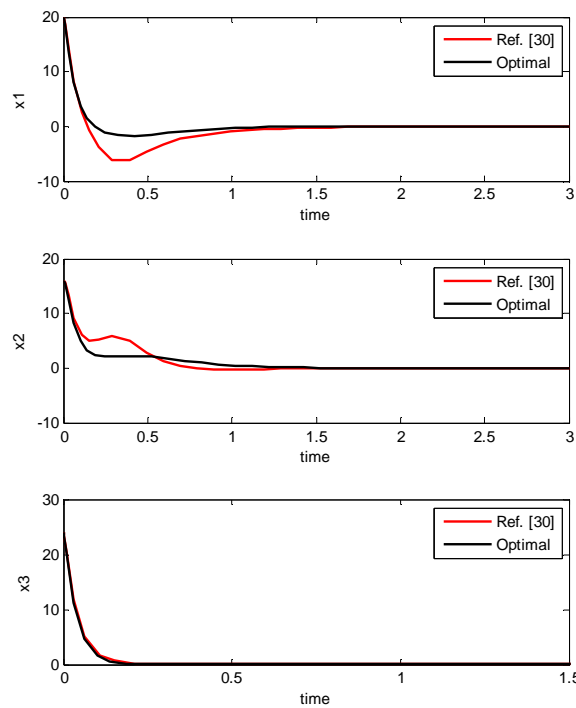
Figure. 12. Time history of state space variables

Mahmood Ghanbari and Seyed Ebrahim Siahbalaei

Figure. 13. Time history of control input

RESEARCH ARTICLE
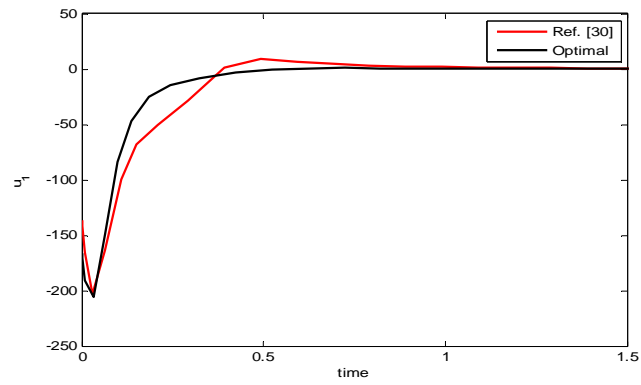
Woman, Epic, Shahnameh

S.Mojtaba Hosseini[1]* and S. Zahra Askarinejad[2]

[1]Department of Persian Language and Literature, Faculty of Literature and Humanities, Bushehr branch, Islamic Azad University, Bushehr, Iran.
[2]Department of Persian Language and Literature, Bushehr Branch, Islamic Azad University, Bushehr, Iran.

*Address for correspondence
Dr.S.Mojtaba Hosseini
Assistance Professor at Department of Persian Language and Literature,
Faculty of Literature and Humanities,
Bushehr branch, Islamic Azad University,
Bushehr, Iran.
E-mail: dr.smho@iaubushehr.ac.ir

ABSTRACT

Love, in fact, makes us perfect and considered as a means through which one can be promoted to the heavenly world. Love is a miracle, indescribable, that can go one from the lower world to the celestial world and a preliminary step for ones soul perfection as well. This article indicates that love equipped with arms decorates its beauty and the peak of its beauty is highly crystalized in the epic poems. This is the reason why mellifluous Ferdowsi emphasizes this belief through his poems. Of course, it is the power of the epic loves manifested at the battlefield by epical heroes and this power is a beginning in order to become victorious. As a result, the victory and the epic love become one. Through this research, I found that love could not be unidirectional, because sacrifice and devotion give much more beauty to the world of this epic love. This research aims to portray the land loves in an epic work.

Key words: woman, Epic, Shahnameh, love**.**

INTRODUCTION

"And one of His signs is that He created mates for you from yourselves that you may find rest in them..." (30:21)According to above sura, interpreters consider man and woman as complementary to each other and manyhadithshave admiredthe dignity of womenin a beautiful ways.Shahnameh, which is a national epic, praises women and talks about women and their role with beautiful anddelicate words. The Persianpoet, Ferdowsi,ties

together violentpower of struggle andwar with the tender force of love and kindness.Therefore, itisreasonabletoarguethat romances in shahnameh are away from lustful love affairs and weaknessof body andmind. It is worth notingthat love to women is an introductiontothe birthof political events and has alwaysbeenthedriving factorto show great deeds.What is important in this regardis the role of women as one side of love to initiate and foster these great efforts. They are themainguidanceandfinal organizer of the love and define the narration of love by their interactions, which respectively indicate thecentralityof women intheconflict.

Woman in Qur'an

More thantenversesof the Qur'andiscusswomen, and even God titled two surahs in their honor:Nisa al-Kobra with 176 verses known as al-Nisa, means women, andNisa al-Soghra with 12 verses known as al-Talagh, means divorce. Qur'an has always describes men and women side by side with an equal path to the last cause. In this regard, the clearest exampleofdivinerevelations is verse 35 of sura 33, Al-Ahzab, which mentions ten traitsof common attributes between women and men. Quran knows men and women oneinallthe traitsof human excellencebecause bothare createdfromasinglesoul; for instance:"O people! be careful of [your duty to] your Lord, Who created you from a single being …." (4:1)"And Allah has made wives for you from among yourselves…" (16:72)

Woman in Persian literature

In addition to theQuran and Hadith, writers and poets have paid a particular attention to women being the subject of praises or blames. However, the important point is the fact that they have been represented in different colors and manifestations as the core of thecreation. Talking about women, ans also their good and badtraits, are frequentlyseen in poetry and prose in various forms and images created by poets and writers. The Persian poets have used both woman and material love ras acenterpieceand the maincircuit of their works that leads to either admired or reproached position for women. Sincethethirteenth centuryAD, we have witnessedthe emergence ofnewand differentattitudesaboutfemalecharacters and positions insocial historyandour countryin the works ofPersianelites. Women engaged in the determination and completation of their human personality to achive a divineauthority. "Persianprose, withnegative attitudesto women as a half of society, has experienced much more changes. Women had been considered as equal as instruments for pleasure and entertainment. Attributes of man have been portrayed superior, his mind premiere and his management more worthy than woman. The women are always described insisting on their enchantingbeauty, physical delicacy andfragility, enticement and seduction." (Servat, 1991: 220)

Love in word and its types

Love has been defined as the following items: "1) the extremelikes.2) Excessivefriendship, complete affection, crossing thelimitsof friendship. 3)A noun from the infinitive "عِشْقَ" and itsmeaningis radical. 4) Adisease thataffects people. A diseasesuch asmelancholy, it affection behaves in such a manner that draws II attention of the patient to itself and its acceptability; in this case, the patient firmly hopes to contact the lover, a sense intensified by lust. 5) Meansvery lovingandprecious, long-chance,swift, powerful, chivalrous, kind, generous, big-hearted, disentangling, rebellious, reckless,restless,oppressive, exalting, beingfired, bitter, world-burning, blood-eating, vampire, … and is used with terms such as lose, weighing, compliments, rise, grow, andshow." (Hosseini Kazerooni, 2004:8)Typesofloveare:

"1) **Superior Love**:The enthusiasm for meeting the real beloved and idol and the self-knowledge is called superior love; some philosophers believe thatloveis thebasis forthe creationof a world, thecurrent balanceinall creatures and thesource ofalltheirmobilities and actions.

2) **Chosen Love**: Love of the world people in thinking about creation and God's power.

3**) Physical Love**: A love that bases on instinct and lustful desires.

3550

4) **Spiritual Love**:A spiritual and devine love.

5) **Real Love**: The love of the unique Creator of the universe.

6) **Divine Love**: Love is spiritual.

7) **Moral Love**: A love that is the object mental and spiritual enjoyment.

8) **SuperficialLove**: The physical and the material love.

9) **VirtualLove**: love is ephemeral and temporary bound to to time and place." (Hosseini Kazerooni, 11:2004)

Overview of the the Romances in Shahnameh and its Species

Although theepicbeginswithrancorandendsin hatred, it includes enchanting suspension and combination of love among all stories. Totally, it talks about love affairs betweenlovers twelve times. Romantic relationships are themes of some Shahnameh stories. In most cases,womenareinitiatingrelationships: Tahmineh to Rustam, SoudabehtoSyavvsh, Golnar to Ardeshir, Malekeh the daughter of Ghassani Tayer, Iranian bondwoman of Kaiser to ShapurZolaktaf, Arezoo toBahram Gur, Bandoian woman to BahramChubin and Shirin to Khosrow Parviz. In some cases, menbegin lovegames: ZaltoRoodabeh, Sohrab to Gordafarid, BijantoManijeh, Bahman tohisdaughterHomay and Sheroya tohisstepmother Shirin.Studying their familiarity and overviewing their affections, one can conclude to categorize the types and quality of their love and dependency in Shahnameh in the following:

A)   **Auditory Love**: Zal felt in love with Ruddabeh after hearing about her attributes in a feast in Mehrab house:

"O Zal, thou knowest not beauty since thou hast not beheld the daughter of this man. For she is like unto the slender cypress, her face is brighter than the sun, her mouth is a pomegranate flower." (Shahnameh, 2003: 157)Tahmineh, according to her own confession, felt in love with Rostam by her listenings:"I have heard about thylegendarydeeds from everyone,Thou do not afraidoflion, leopard, DevilandWhale,andThou have sharp claws,Thou walk alone in Turan at nights, trverse the boundaries and do not fall asleep,Thou may eat a fried zebra; make sky to cry by thy sword." (Ibid: 147)Bijan fell in love with Manijeh after listening to Gurgin who talked about her beauty:"Where Manijeh is, the saughter of Afrasiab, who brithens gardens like sunAll of her face is hidden behind a cover; she is as tall as a cedar with black hairs,Her face is a garden full of flower with eyes saturated with sleepness; she has lips filled with wine smelling like rosewater." (Ibid: 16-17).

B)   **Visual Love:**

Sohrab fells in love with Gordafarid by seeing her beauty after putting her helmet away and devotes his affability according to the order of his heart. Nodoubt, this trivial love to the sister of Gaždaham leads him to escape from the son of worldPaladin.

> "While crashed toward her, put away her hamlet quickly,
> Her hairs seprated from the armor, her face shines like sun,
> Sohrab recognizes her gender when his hairs effluenced the hamlet." (Ibid: 184)

Malekeh, the daughter of Ghassani Tayer, became mad of ShapurZolaktaf after watching him in the dawn."Malekeh looked at the banner and head of cavaliers above the wall of citadel, His face paled like flower, his hair like Musk, the beautiful flower changed into red the same as a bloody axe,She was encharmed by the handsome man and run toward her foster with a heart full of love." (Ibid: 222) Arezoo, the daughter of Jeweler Mahyar, felt in love with Bahram Gur. Composing a sung to describe his traits, Arezoo argues her love in her sung:

Mojtaba Hosseini and Zahra Askarinejad

"One just look at thy face, thou can not similarize to a troop one except thou,
He has the heart of a lion and the figure of an elephant,
Thy face are pomegranateflowers, it seems that he cleans the the flowers by his wines,
Two arm like that of giants, it can smashes the mountain Bistoon,
You are a man whom no one have seen or will seen like you in battle field,
The body of Arezoo is frivolous for you; she is alive only for you." (Ibid: 353)

Fate and Destiny

Fateplaysthethe most importantroleintheboundlessuniverseandflows in all things. In this masterpiece, Shahnameh, fate is the major cause that determines situations because each of the stories is the manifestation of destinydomination over human lifeand world, none of them describes the human freedom. "In fact, the stories are thev same as chess. Forgivenessand effort begin a challenge but at lastthe king of forgiveness wins and the king of effort is checkmated. These stories are like triangles whose first angles are plans of forgiveness and the efforts to violate the plans; finally, forgivenesswillimplementhisarrangements and joins the point that he has begun, which draw the first angle, to the point that the heroes have met in their rebelious efforts. In this way, he traps two people in a triangle fence" (Sarrami, 1994: 619-618).Indeed, heroes, who wuld like to free themselves from the bounds of treats, will fight their destiny. They are trapped in a cycle considering vain valuesbecause the consiquence of the fight is the overall dominance of destiny. It is obviousthat commonthemesand content of Shahnameh is determinism, which is stated at thebeginning of Keikhosrostory and is currentin all parts ofShahnameh."We may try, but there is no benefit in our efforts, because the conclusion has existed before we begin our deeds." (Shahnameh: 31)The trace ofdestinycould be pointed insomeofthestories. Fore example, in thestory ofArdeshir and the daughter ofArdavan, destiny juggles clearly. Destiny does throwdown the poisonous cup from Ardeshir's hand and reveals the betrayal of Ardavan's daughter; destiny has forced Shapour to traverse rudely limitations in front of Ardeshir.

"Walked to the Ardavan's daughter, the moon-face run to the king,
Brought a cup of yellow ruby, full of sugar immersed in cold water,
Combined poisn with sugar, might Bahman drink the beverage,
As the King Ardeshir took the cup, it threwdown and cup broke." (Ibid: 163-64)

In the story of Shapour and Nooshzad girl, again, destiny is superhero. The superhero hassheltered andtrained Mehrak's little girl. It leads Shapour to fell in love with girl and marry her without the permision of her father. In fact, his fate has managed the love and has motivated Ardeshir to calls for the assistance of Indian astrologists to relieve himself and save his country. The consequence of the plans of destiny is the relationship between Mehrak and Ardeshir. Listening to her words, Ardeshir decided to kill all of Mehrak's family and relations. Destiny conqueres the fate of them by arranging a situation in which Ardeshir kills everyone, except the little girl. After years, the destiny makes theacquaintanceofShapourandMehrak's daughter that results in the links to Ormazd. After seeing his grandchild, Ardeshir claims:

He said among the famous people, to all of those who were wise,
The astute star counter says, it is imminent and inevitable,
The tricky Indian said the words; your fate will never be pleasurable,
No kingdom, nojemadar, no treasure and army, no flag and not even a crown,
Unless the blood of Mehrak Nooshzad, be mingled that heritage with the other race,
Now, eight years have been passed, destiny has fulfiled all of our wishes." (Ibid: 171-72)
In the strory of Bahram and Sepinood, finally, destiny leads the Inian Raja to accept Bhram as the bridegroom of his daughter. This marriage causes the Iranian king to run away from Iran.

"Said to Bahram: O the brave man, you are powerful, do not seek to further,
I will give you my daughter, similar to me in deeds and speech,

If I do this behavior, you have no way except to run away." (Ibid: 428)

Specific CharacteristicsofLove Stories

Weshouldpoint outthatthe description ofinternal and externalbeautiesof women inShahnamehis congruent with epicmood. Fer dowsi characterizes each of his love stories with a particular trait, which we can reach to a specific person by thesameattribute with little attention. In the story of Zal and Ruddabeh, when Zal asks Ruddabeh to offer a solution, Shethrowdownhis longhairfor Zal to climb up; it shows that her hair is solong andthick that Zal, with hear huge body, can climbs.In the story of Rostam and Tahmineh, we are sure that Tahmineh fells in love with Rostam by hearing about his traits and seeks for an opportunity to find him; and finally, the she met her wishes. Rostam comes to Samangan to find his lost horse, Tahminehseizesthe opportunityand goes after Rostam; Tahmineh talks deliberately about herdesireto marryhim through her dignity without anoying him. In fact,here, the subject is the intellect and wisedom of Tahmine who deliberately leads her love to its appropriate position. The knowledge and wisedom of Tahmineh, indeed, has justified Rostam to fell in love with Tahmine.

In the case of Manije, it should be noted that one could attribute the trait of faithfulnessto her; sherespectsher loveand dignifiesits sanctit truly. She devotes all of her energy to bring Bijan freedom; she attempts to find any sign of Bijan to feed his hunger; Manijeh spendsnights ofdespair, hopes forBijan's freedomand endures love difficulties with all of her heart. Truly, she is perfect sample of strongwoman and steadfast lover who considers all of the tragedies as his fate and asks God tools of redemption and salvation. Tolerating all of these pains and difficulties, she is sad for Bijan and her heartburnsfor him. The example of loyalty is Manijeh, not enyone else. Shahnameh has recalled another woman named Katayoun who had been loyal the same as Manijeh and bears many difficulties.

Anther trait, stated in Shahnameh, is thaumaturgy and charming throughfemaleenchantinglanguage andvoice. In the story of Khosrow Parviz and Shirin, Shirin affects Khosrow with her eloquentand expressivelanguage and imprisons him in the trap ofhis love. Bahram Gur's love to miller girls follows the same pattern; the love has been started by beautiful and pleasant voice and prosody of the girls. All of the four girls sing together with a harmony affecting Bahram. In addition, the Mehrak's daughter draws Shapour's attention to herself through her sweetsmoothie and subtle volubility.

Women from the Perspective of some Writers

Shahnameh is an epic of thegoods, bads, beautifuls, evils, wars and parties that has derived from the Mazdaian religion and pre-Islamic though of Iranians; M.A. Islami Nedoushen agrees, "The worldview of Shahnameh is to defend good deeds against bad deeds. This defense will excessively continue to sacrifice numerousvictims" (Hariri, 1990: 7).Meanwhile, the women have a deserved role. In fact,contrary to whatsome peoplebelieve, Shahnameh has not criticizedwoman; if we ignore Soodabehthat is women's notoriety, the womennamed by Ferdowsi in Shahnameh are the perfectexamples of women, which have internat and external beauty apart from their wisdomandmagnanimity.

Dr. IslamiNadushanbelieves, "the women of Shahnameh have their own particular female goodness. They see their salvation in the salvation of their men and many of them through their devoutness along with their husbands and Childs walkmodestly in a path that must leads to the conquer of the good deeds over bad affairs" (Hariri: 1990: 19).

Dr. Siaghi is also claimed, "Women in Shahnameh as well as other aspects of the human have dignity and perfection; the manifestation of her personality is not affected by the force of desires and characters of the story. Nevertheless, in other narrations, especially in the love poems writen by Irannian masters of petry, her picture is portrayed according to the plot of the story; in other words, the poet or writer did not try to contemplate on the existence, creation, recognition and analysis of the effective factors in her life and nature. Cases of non-compliance of these creatures with the opposite sex result usually in the dissatisfaction shout of men. The judgment is issued in such cases are not

Mojtaba Hosseini and Zahra Askarinejad

directly related to the person mentioned in the story, it is the general judgment for all women; the same as the rule that Nezami exported for women in Leili and Majnun" (Ibid: 20). Furthermore, he argues, "the word woman is used three hundred times in Shahnameh. As you know, in Avesta "جني", in ancient India "جاني" and in Pahlavi "ژن" refers to women or female characters" (ibid: 162).

CONCLUSION

Undoubtedly, women have always maintained their position as the primer actor of life and they have played a significant role in the continuityand sustainabilityof life; this fact motivates many authors and tginkers as a subject for contemplation. In this manner, the have observed women from various perspectives and analyzed their role based on the perspectives. Thus, Shahnameh, as a nationalepic, has considered women a decisive category, especially in the creation and initiation of a kind of love which repectively has determined the destiny and evaluation of each of heroic figure.

In Shahnameh, particularly initsmythical parts, heroes and female characters are portrayed in a different manner. Ferdowsi considers as chaste women those who are in accordance with their current culture and customs; he regards thegroup of women whobreakthe normsamongimpure women. He introduces women in a symbolic way; they are symbols that revealtheir behaviors, manners and intentions.

In general, it is reasonable to say that a woman for ferdowsi has aspecialstanding and position in which she completes a half of the body of community; she is a skillful, adept andsagacious director whom is introdced to the epic by author. In addition, she is adynamicand moving creature that bears no passiveness and lethargy; but she attempts always to plays her constructive role accurately and highlight her role more prominentlyinallfields.

REFERENCES

1. The Holy Qyran (2009). Shakir M. H. (trans.), EZreads Publications: USA.
2. Servat, Mansour (1991). The TreasuresofWisdom in the Works of Nezami. Tehran: Amir Kabir.
3. A group of authors (1990). Persian romances. Tehran: Tirgan
4. Joneidi, Freidoon (1997). PahlavanRostamstories(Zal andRoodabeh). Tehran: Balkh.
5. Hariri, Nasser (1990). Ferdowsi, women,and tragedy.Tehran: Babol bookhouse.
6. Hosseini Kazerooni, Seid Ahmad (2004). Love inMasnavi Manavi. Tehran: Zavar.
7. Dehkhoda, Ali Akbar (1963). Dictionary. Tehran.
8. Sarami, Ghada Ali (1994). From the Flower color to the sufferingofthorn(morphology of Shahnameh stories). Tehran: ScientificandCultural.
9. Gharib, Mahdi (1997). The storyof Bijan and Manijeh in Shahnameh. Tehran: Institute for Humanitiesand Cultural Studies.
10. Moosavi, Mostafa (1996). Bijan and Manijeh. Tehran: Soroush.
11. Homayounfar, Rokn al-Din (2003). Ferdowsi's Shahnameh. Tehran: Asatir.

RESEARCH ARTICLE

Effect of GEM TV Channel on Lifestyle of Female High School Students in Tehran (Case Study: Education Organization, District 1, and Tehran)

Houriehossadat Hosseini* and Reza Hadi

Department of Social Communication Sciences, Damavand Branch, Islamic Azad University, Damavand, Iran.

*Address for correspondence
Houriehossadat Hosseini,
Department of Social Communication Sciences,
Damavand Branch,Islamic Azad University,
Damavand,Iran.
Email: hshb1343@gmail.com.

ABSTRACT

Current work aims at investigating effect of GEM TV channel on life style of female high school students in Tehran (case study: Education Organization, District 1, Tehran) and it is of descriptive and correlation type. Statistical population includes female high school students in district 1 in Tehran during 214. Their figures are 5,741 in the current year. Sample size was specified as 360 using Cochran formula. Cluster random sampling method was used following estimation of sample size. In order to measure effect of GEM TV channel on lifestyle, an author made questionnaire was used. Pearson correlation test and regression analysis was used for data analysis. Research findings showed watching GEM TV channel series has negative significant effect on lifestyle of female high school students. Also, findings indicated watching GEM TV channel series have negative effect on dimensions of lifestyle such as psychological health, spiritual health and environmental health.

Keywords: GEM TV channel, lifestyle, physical health, psychological health, spiritual health, social health, environmental health

INTRODUCTION

Although investigating behaviors of people in the society in the global world, especial their health behaviors and lifestyle is necessary, it is underestimated in our society. Despitrelationshipbetweenphysicalhealthandsocioeconomic factors, different ideas are yet provided in this regards. Curtis et al. (2000) estimated that about 50 percent of sudden deaths in western countries mayresultfromthelifestyle(Curtisetal.,2000).Manystudieshaveshownthose who choose lifestyle experience lower risky behaviors (Basentpav, 2001). Cockerham (2000) defines healthy lifestyle as follows

3555

Houriehossadat Hosseini and Reza Hadi

lifestyle includes patterns of healthy behaviors based on choices of people according to their living situation. Simple activities such as using alcohol, smoking, ting belt, and like that may strengthen or weaken living situation of the individuals. In other words, healthy lifestyle is a collection of one's choices according to living situations and such choicesinfluence one's health (Cockerham, 2000). According to Weber, health-based lifestyles rely on living choices and opportunities available to the people. These opportunities include class, age, gender, ethnicity and other relevant structural variables that shape the lifestyle choices. For example, these choices typically include decisions about smoking (Cockerhamet al., 2006).On the other hand, instead of stepping in a postmodern world, the world steps toward an era in which outcomes of modernization are deeper and more global (Giddens, 2003). There is no doubt that today modern world extends beyondenvironment of individual activities and no one is able to be securedagainst changes resulting from modernization develo0pment or act against it; even modernization influences people who live in the most traditional habitations of the advanced parts of the world (Chavoshian, 2002). Globalization has had considerable effect on all living dimensions. Rapid dissemination of ideas through modern media technologies (satellite) has added variety of cultural elements and lifestyle and variety and multiplication enables emergence of sub-cultures and provides grounds for manifestation of cultural products in international arena. In today world, satellite plays significant role in progress of human culture and civilization through transfer of information and new knowledge as well as public though exchange (Sorvin, 2005).Extensive volume of satellite waves has caused that medial planning is iran is always directed toward satellite channels. However, this attention to satellite channels increased by birth of FARSI 1 channel. Previously most Persian satellite channels mainly focused on news and disseminating political information. But more emphasis of programs in this channel on family series is warns for the planners. These series are mostly inconsistent with most socialization processes in Iranian society. Different and contradictive relations with Iranian society's culture and formal ideology of political system which are broadcast in these series have increased sensitivity to broadcast and reception of these programs in the society. According to some information estimates, there are about 3 million receivers for satellite channels in Iran (Kavand, 2008). According to available figures, about 30 percent of people watch GEM TV programs (IRNA News Agency, 2011).

Hence, watching GEM TV is an emergent phenomenon in Iran. Firstly, depth and extent of interest of this channel's viewers is considerably different from other satellite channels. Secondly, evaluation of satellite channels threats by cultural authorities and policy makers in Iran has been differently. The risk of loss of "national media" hegemony, degradation of internalization processes of the Islamic values, risk of being drawn into banality for Iranian families, and showingtaboos are among main issues of concern and risks. Iranian youths have had various choices under influence of macro sociocultural national and international changes as well as their different social statuses, and understanding these different dimensions is necessary for understanding changes of lifestyle. Thus, current work aims at finding answer for this question: does GEM TV channel influence life style of female high school students in Tehran?

THEORETICAL FOUNDATIONS

Lifestyle is part of the life which is actually realized and includes perfect spectrum of activities which are done during daily life. Thus, spectrum of different activities of individuals in every area of the life may construct their lifestyle in the same area (Razavizadeh, 2007). Thus, broadcasting TV programs throughsatelliteschannels over two past decades has been considered by many countries as a global issue. To this end, each country has considereddifferent aspects of the issue according to their cultural or political sensitivities and considerations (especially in terms of traditional, national or religious values). One of these sensitivities is conflict between satellite programs and sociocultural considerationsespecially in our country and thus emergence of social harms. Various studies have been conducted on lifestyle and effects of satellite channels. For example, Christensen and Carpiano (2014) in their work entitled "Social class differences in BMI among Danish women" tested research hypotheses using regression test and Pearson correlation. Findings of the research showed social class are positively related to lifesty in Danish women. Women in medium social class who were educated pursued healthier lifestyle. Also, Södergren et al. (2014) in their work entitled "Predicting healthy lifestyle patterns among retirement age older adults in the WELL

Houriehossadat Hosseini and Reza Hadi

study" found two groups of lifestyle patterns: healthy (53% of men and 72% of women) and less healthy lifestyle. Physical activity, the amount of television viewing time, and consumption of fruits recognize "healthy" lifestyle, while the consumption of vegetables, alcohol in men and fast foods in women can be considered as a healthy lifestyle.Kelly et al. (2011) conducted a study entitled "Correlates among Healthy Lifestyle, Cognitive Beliefs, Healthy Lifestyle Choices, Social Support, and Healthy Behaviors in Adolescent". Their findings showed there is significant relationship between cognitive variables, social support, behavioral skills and healthy lifestyle behaviors. Taira et al. (2002) investigated relationship between sleep health and lifestyle. Their findings indicated people with regular sleep, exercise and suitable nutritive diet had higher emotional compatibility and suffered from less mental and physical disorders. Suwazono et al. (2003) studied relationship between working conditions and lifestyle and mental diseases in Japan Communication Co. and found significant relationship between mental diseases and lifestyle (sleep hours, sport exercises, nutrition). The lower lifestyle scores and working hours, mental diseases are more probable. Investigating effect of GEM TV series on youth lifestyle is necessary because all nations seek for consolidating their religious and national values and beliefs so that they can develop lifestyles considering these values and beliefs in their youths accordingly. However, international satellite channels attempt to emphasize on changing lifestyle and exiting framework of national and religious values and directing toward western lifestyles. This research can provide practical recommendations and solutions for strengthening Iranian youth lifestyle and reducing negative effects of these series on lifestyle of Iranian girls. Thus, this research aims at investigating effect of GEM TV channel on Tehran female high school students.

RESEARCH HYPOTHESES

H1: It seems GEM TV channel has significant effect on lifestyle of Tehran female high school students.
H2: It seems GEM TV channel has significant effect on physical health of Tehran female high school students.
H3: It seems GEM TV channel has significant effect on psychological health of Tehran female high school students.
H4: It seems GEM TV channel has significant effect on spiritual health of Tehran female high school students.
H5: It seems GEM TV channel has significant effect on social health of Tehran female high school students.
H6: It seems GEM TV channel has significant effect on environmental health of Tehran female high school students.

METHODOLOGY

Current research is an applied research in terms of purpose and it is a descriptive study of correlation type in terms of data collection and analysis. Research statistical population includes all female public high school students in second grade in district 1 in Tehran during academic year 2014 – 2015 (n = 5,741). 360 students were determined assample size using Cochran formula. Cluster random sampling was used. Following implementation of questionnaires in the statistical population, 348 completed questionnaires were returned to the author which was basis of the research.

RESEARCH TOOLS

Life Style Questionnaire (LSQ)

This questionnaire includes 70 items aiming at evaluating different dimensions of life styles (physical health, sport and wellbeing, weight and nutrition control, prevention of disease, psychological health, spiritual health, social health, prevention from drugs and substances, prevention from events and environmental health). Likert scale is used. In the study by Lali et al. (2012), construct validity of the life4 style questionnaire as a tool for lifestyle evaluation and measurement was confirmed using factor analysis test. Also, reliability of the questionnaire was supported using Cronbach alpha. Cronbach alpha coefficient was calculated as 0.87 (Lali et al., 2012). Of course, 25 items were derived from this questionnaire in the current research according to the research hypothesis.

Houriehossadat Hosseini and Reza Hadi

GEM TV Series Questionnaire

It is an author made questionnaire including 18 items. Items of the questionnaire emphasize on key concepts which can influence youth lifestyle in satellite series especially GEM TV. Items are scored based on Likert scale as never, low, average, high, and no idea.Reliability of the research questionnaires are calculated using SPSS 20 software and Cronbach alpha, which is given in the table below.

RESEARCH FINDINGS

In order to investigate normal distribution of data, Table was used.According to Table 2, it is observed in significance level, Kolmogorov–Smirnov test is estimated above Type I error 0.05 for all test variables. Thus, null hypothesis is not rejected, i.e. normality of probable distribution of scores. Thus, in order to test, Pearson and regression parametric test is used.H1: It seems GEM TV channel has significant effect on lifestyle of Tehran female high school students.Pearson correlation method was used in order to test relationship between GEM TV channel and lifestyle of Tehran female high school students, results of which are given in Table 3.

Table 3 indicates there is negative inverse relationship between GEM TV satellite channel and physical health component (r = -0.066) which is not significant at level 0.05. ** denotes that relationship is significant at sig level $\alpha <$ 0.05. Also, there is negative inverse relationship between GEM TV channel and psychological health component (r = -0.210) which is significant at level 0.05. In other words, watching GEM TV channel series leads to reduced psychological health. It was found there is negative inverse relationship between GEM TV satellite channel and spiritual health component (r = 0.209) which is significant at level 0.05. In other words, watching GEM TV channel series leads to reduced spiritual health. There is negative inverse relationship between GEM TV satellite channel watching and social health component (r = -0.004) which is not significant at level 0.05. There is negative inverse relationship between GEM TV channel and environmental health component (r = -0.222) which is significant at level 0.05. In other words, watching GEM TV channel series leads to reduced environmental health.

Table 4 indicates there is negative inverse relationship between GEM TV satellite channel and physical health component (r = -0.066) which is not significant at level 0.05. in addition, in order to determine contribution of GEM TV satellite channel in prediction physical health, according to regression coefficients (Beta) it can be stated GEM TV satellite channel has no significant contribution in predicting physical health of students (Table 5).H3: It seems GEM TV channel has significant effect on psychological health of Tehran female high school students.Pearson correlation method was used in order to investigate effect of GEM TV channel on psychological health, results of which are given in Table 6.As observed in Table 6, there is negative inverse relationship between GEM TV channel and psychological health component (r = -0.210) which is significant at level 0.05. In other words, watching GEM TV channel series leads to reduced psychological health of students. Also, calculated coefficient of determination indicates GEM TV channel describes 0.044 percent of variance of psychological health variable. In addition, in order to determine contribution of GEM TV channel series in predicting lifestyle of students, according to regression coefficients (Beta) it can be stated contribution of psychological component is -0.210 (Table 7). H4: It seems GEM TV channel has significant effect on spiritual health of Tehran female high school students.Pearson correlation method was used in order to investigate effect of GEM TV channel on spiritual health, results of which are given in Table 8.

As observed in Table 8, there is negative inverse relationship between GEM TV channel and spiritual health component (r = -0.209) which is significant at level 0.05. In other words, watching GEM TV channel series leads to reduced spiritual health of students. Also, calculated coefficient of determination indicates GEM TV channel describes 0.044 percent of variance of psychological health variable. In addition, in order to determine contribution of GEM TV channel series in predicting lifestyle of students, according to regression coefficients (Beta) it can be stated contribution of spiritual component is -0.209 (Table 9). H5: It seems GEM TV channel has significant effect on social health of Tehran female high school students.As observed in Table 10, there is negative inverse relationship between

Houriehossadat Hosseini and Reza Hadi

GEM TV channel and social health component (r = -0.004) which is not significant at level 0.05. In addition, in order to determine contribution of GEM TV channel series in predicting social health of students, according to regression coefficients (Beta) it can be stated GEM TV channel has no contribution in predicting social health of students (Table 11).H6: It seems GEM TV channel has significant effect on environmental health of Tehran female high school students.Pearson correlation method was used in order to investigate effect of GEM TV channel on environmental health, results of which are given in Table 12.As observed in Table 12, there is negative inverse relationship between GEM TV channel and environmental health component (r = -0.222) which is significant at level 0.05. In other words, watching GEM TV channel series leads to reduced environmental health of students. Also, calculated coefficient of determination indicates GEM TV channel describes 0.049 percent of variance of environmental health variable. In addition, in order to determine contribution of GEM TV channel series in predicting lifestyle of students, according to regression coefficients (Beta) it can be stated contribution of environmental health component is -0.222 (Table 13).

DISCUSSION AND CONCLUSION

According to first research hypothesis, GEM T^V channel has significant effect on lifestyle of female high school students in Tehran. According to research findings, it can be stated that viewing GEM TV channel series has significant negative effect on lifestyle of Tehran female high school students. It is somehow consistent with findings by Ahmadi et al. (2009). Ahmadi et al. (2009) in their work entitled "Effects of new communication technologies (Internet, computer games and satellite) on public education, with an emphasis on the adaptation of the second year of high school students in Tehran" found no significant relationship between satellite programs viewing and compatibility of students. However, they showed increasing time of using internet and computer games improve compatibility. Also, considering negative direction of relationship between viewing satellite programs and compatibility it can be concluded increasing time of viewing satellite programs reduces compatibility in students. It is inconsistent with findings by SaeeArasi and Ghobadi (2011). Second research hypothesis stated GEM TV satellite programs have insignificant effect on physical health of Tehran female high school students. According to research findings, it can be stated lifestyle in physical health dimension is not significantly related to viewing GEM TV satellite programs. Thus, first minor hypothesis is rejected.

According to third research hypothesis, GEM TV satellite channel has significant effect on psychological health of Tehran female high school students. According to research findings, it can be stated GEM TV satellite channel has significant effect on psychological health of Tehran female high school students. Fourth research hypothesis stated that GEM TV satellite channel has significant effect on spiritual health of Tehran female high school students. According to research findings, it can be stated GEM TV satellite channel has significant effect on spiritual health of Tehran female high school students. It is consistent with findings by Baseri and Hajiani (2010) and Bakhtiari and Farokhi (2012). Fifth research hypothesis stated that GEM TV satellite channel has significant effect on social health of Tehran female high school students. According to research findings, it can be stated GEM TV satellite channel has no significant effect on social health of Tehran female high school students. Thus, fourth minor hypothesis is rejected. According to sixth research hypothesis, GEM TV satellite channel has significant effect on environmental health of Tehran female high school students. According to research findings, it can be stated GEM TV satellite channel has significant effect on environmental health of Tehran female high school students.

REFERENCES

1. Ahmadi, P., Khademi, E. &FatahiBayat, S. (2009). Effects of new communication technologies (Internet, computer games and satellite) on public education, with an emphasis on the adaptation of the second year of high school students in Tehran", Modern Educational Thought, No. 5 (3), pp. 9-36.
2. Bakhtiari, H. &Farrokhi, H. (2012). Relationship between satellite TV programming and religious identity of youth, Research on Islamic Education, No. 20 (new courses) (15), pp. 55-72.

3. Baseri, A. &Hajiani, E. (2010). Function of satellite media in mental imagination, Military Psychology, No. 1 (4), pp. 79-89.

4. Christensen, V. T., &Carpiano, R. M. (2014). Social class differences in BMI among Danish women: Applying Cockerham's health lifestyles approach and Bourdieu's theory of lifestyle. Social Science & Medicine, 112, 12–21.

5. Cockerham WC.(2000) Health lifestyles in Russia. Social science &medicine.; 5: 1313-24.

6. Curtis AJ.(2000) Health psychology: Routledge: 120-28.

7. Giddens, A. (2003). Modernity and identity (society and personal identity in the modern age),Tr. by N. Movafaqian, Tehran: Ney Publication, Second Edition.

8. IRNA (2011). Exploring hidden and obvious targets of Persian Channels, Report of Strategic Research Center of the Expediency Council meeting on Monday 3 May

9. Kelly, S. A., Melnyk, B. M., Jacobson, D. L., &O'Haver, J. A. (2011). Correlates Among Healthy Lifestyle Cognitive Beliefs, Healthy Lifestyle Choices, Social Support, and Healthy Behaviors in Adolescents: Implications for Behavioral Change Strategies and Future Research. Journal of Pediatric Health Care, 25(4), 216–223.

10. Lali, M., Abedi, A. &Kajbaf, M.B. (2012). Building and validating Lifestyle Questionnaire (LSQ), Psychological Research, Vol. 15, No. 1

11. Razavizadeh, N. L. (2007). Effects of media on the lifestyle of the inhabitants of Tehran, Tehran: Ministry of Culture and Islamic Guidance.

12. SaeeArasi, I.&Ghobadi, I. (2011). Effects of Persian satellite channel programs on youth social behavior (Case Study: Karaj)," Behavioral Sciences, No. 3 (7), pp. 75-93.

13. Södergren, M., Wang, W. C., Salmon, J., Ball, K., Crawford, D., & McNaughton, S. A. (2014). Predicting healthy lifestyle patterns among retirement age older adults in the WELL study: A latent class analysis of sex differences. Maturitas, 77(1), 41–46.

14. Sorvin, V. & Tankard (2005). Theory of Communication, Tr. by A. Dehghan, Tehran: Tehran University Publication.

15. Suwazono, Y., Okubo, Y., Kobayashi, E., Kido, T., &Nogawa, K. (2003).A follow-up study on theassociation of working conditions and lifestyles with the development of (perceived) mentalsymptoms in workers of a telecommunication enterprise. Occupational Medicine (Oxford, England), 53(7), 436-442.

16. Taira, K., Tanaka, H., Arakawa, M., Nagahama, N., Uza, M., &Shirakawa, S. (2002). Sleep health andlifestyle of elderly people in Ogimi, a village of longevity. Psychiatry and ClinicalNeurosciences, 56(3), 243-244.

Table 1: Cronbach alpha table for research questionnaires

Questionnaire	Cronbach Alpha
Lifestyle questionnaire	0.856
GEM TV questionnaire	0.816

Table 2: Results of normality test for research variables in regression model

		GEM TV Satellite Channel	Lifestyle
Normal parameters	Mean	3.411	3.206
	SD	0.648	0.608
Highest difference	Absolute value	0.084	0.063
	Positive	0.84	0.074
	Negative	0.517	-0.063

Houriehossadat Hosseini and Reza Hadi

Kolmogorov statistics Z	0.607	0.648
Significance level	0.325	0.107

Table 3: Correlation between lifestyle components and GEM TV channel

		1	2	3	4	5	6
1	GEM TV channel	1					
2	Physical health	-0.066	1				
3	Psychological health	-0.210**	0.481**	1			
4	spiritual health	-0.2009**	0.426	0.606**	1		
5	social health	-0.004	0.344**	0.360**	0.397**	1	
6	environmental health	-0.222**	-0.428**	0.445**	0.417**	0.239**	1

Table 4: Correlation between GEM TV satellite channel and physical health

Variable	Correlation type	Correlation level	Adjusted R (R^2)	Square of Adjusted R(R^2)	Correlation direction	Sig. level
GEM TV satellite channel & physical health	Pearson	-0.066	0.004	0.000	Positive	0.305

Table 5: Regression coefficient for GEM TV satellite channel and physical health

Statistical index / Model	B	Beta	T	P
Constant	4.253	0.066	28.601	0.000
Physical health	0.052		1.027	0.305

Houriehossadat Hosseini and Reza Hadi

Table 6: Correlation between GEM TV channel and psychological health

Variable	Correlation type	Correlation level	Adjusted R (R²)	Square of Adjusted R (R²)	Correlation direction	Sig. level
GEM TV satellite channel &psychological health	Pearson	-0.210	0.044	0.040	Positive	0.001

Table 7: Regression coefficient for GEM TV satellite channel and psychological health

Statistical index Model	B	Beta	T	P
Constant	3.76	-0.210	14.608	0.000
psychological health	0.281		3.312	0.001

Table 8: Correlation between GEM TV channel and spiritual health

Variable	Correlation type	Correlation level	Adjusted R (R²)	Square of Adjusted R (R²)	Correlation direction	Sig. level
GEM TV satellite channel & spiritual health	Pearson	0.209	0.040	0.044	Positive	0.001

Table 9: Regression coefficient for GEM TV satellite channel and spiritual health

Statistical index Model	B	Beta	T	P
Constant	3.76	0.209	14.955	0.000
spiritual health	0.281		3.295	0.001

Houriehossadat Hosseini and Reza Hadi

Table 10: Correlation between GEM TV channel and social health

Variable	Correlation type	Correlation level	Adjusted R (R²)	Square of Adjusted R (R²)	Correlation direction	Sig. level
GEM TV satellite channel & social health	Pearson	0.004	0.000	0.004	Positive	0.964

Table 11: Regression coefficient for GEM TV satellite channel and social health

Statistical index Model	B	Beta	T	P
Constant	4.803	0.004	24.508	0.000
social health	0.004		0.068	0.946

Table 12: Correlation between GEM TV channel and environmental health

Variable	Correlation type	Correlation level	Adjusted R (R²)	Square of Adjusted R (R²)	Correlation direction	Sig. level
GEM TV satellite channel & environmental health	Pearson	0.222	0.049	0.045	Positive	0.001

Table 13: Regression coefficient for GEM TV satellite channel and environmental health

Statistical index Model	B	Beta	T	P
Constant	3.033	-0.222	12.253	0.000
environmental health	0.294		3.510	0.001

RESEARCH ARTICLE

The Design of Cultural-Recreational Paradise (Pardis) in Shafagh Complex of Zob Ahan of Isfahan

Pegah Geramifard* and Deihim Taki

Department of Architecture, Faculty of Architecture, Khorasgan (Isfahan) Branch, Islamic Azad University, Isfahan, Iran.

*Address for correspondence
Pegah Geramifard
Department of Architecture, Faculty of Architecture,
Khorasgan (Isfahan) Branch,
 Islamic Azad University,
Isfahan, Iran.

ABSTRACT

For the modern human being involved in the mental and psychological tensions of variety and complexity of social relations, three factors of population density, information accumulation and environmental crises namely the lack of relation between human being and nature created a type of mental crises and this neural crisis has adverse effects on physical, mental and social diseases in the form of abnormalities. To satisfy physiological and social needs and playing social roles, human being needs the spaces with suitable conditions and if he cannot create the required conditions, the behavior is change and he can adapt himself with the existing conditions. Thus, an Iranian person has never considered his interaction with environment separated from his culture, these two factors can get meaning beside each other in Paradiseand Iranian garden. This study attempts to find a way by which the environment, activities, individual action interaction models with environment can be organization with culture. Indeed, this study attempts to create the spaces to improve cultural-recreational sites design as it improves the quality of cultural-recreational spaces of open environments. This study is conducted by qualitative method and descriptive-analytic data collection method and based on Iranian garden construction in cultural-recreation spaces, it can be considered with a person interaction with environment beside culture. The required site is located in Shafagh complex of ZobAhan in Isfahan (district 13 of Municipality of Isfahan). The main idea of design is based on northern-southern area of Iranian garden and other spaces are organized based on required areas around this area. In the design, it is attempted to create coordination and integration between the designed elements. Water element is an effective organic factor in site. It is also attempted to keep it as a comforting factor. It is hoped that thi

Pegah Geramifard and Deihim Taki

study is a positive step to design open spaces of cultural-recreational sites to meet the physiological and social interaction needs.

INTRODUCTION

Today, a new ontology is discussed in the views of many theorists in which the coordinated relation between human and nature is searched. Among architecture approaches, the relation with nature is turned into a challenging issue but the impact of this issue on architecture is reflected in various mental and physical levels. This issue is based on an important need of human life. It seems that one of the reasons of variety of levels among nature-based architecture approaches is based on disagreement regarding nature concept. In some nature-based approaches, real and net quality is searched in architecture space. What emphasizing the literal, artistic, cultural and belief aspects of Paradisemodel in thought life of human being is searching good perfection of the desire of returning to the eternal origin (heaven), the origin from which human being is taken out (descension) and the returning to this place is in the form of a collective model in the collective unconscious. This enables human being to make active fantasy and critical creativity, extra-materialistic idealistic as tangible. This ideal perfection by its positive and negative aspects in mental world think about world research and its materialistic existence is impossible. Sometimes, it draws the model of achieving the world as it is claimed by imitating it, we can achieve a good system in reality (Parham and Ghaemi, 2010). The description of earthly heavens via cultural relations between Greece and Rome with Iran went to west and it is called paradisus in Latin term and its meaning is consistent with the same image Iranians had as better and " best paradise" earthly or heavenly (Mallory, 1997, p. 628, Corbin, 1990, 138). On the other hand, the term " Peiri Deze" was turned into "Pardis" in Sasanid era. These paradises were royal gardens of Sasanid era and they entered Arabic countries via western borders in this description and like "Ferdoos" shows a representation of heaven gardens in the mind of people (Farevashi, 1976, 135). In arid climate of Iran, green gardens are considered as cool and comfortable place for recreation and comfort. The reasons are main factors and some of them are specific as economic, political, cultural and recreational reasons (Motedayen, 2010). If the relation between human, nature and artificial environment is favorite, the health and mental health in society is increased with hopeful quality and the need of human nature to close relation with nature and enjoying its graces can make human, nature and providing mental health in the current world as interacting. The current human being attempts to recreate his physical and mental health in nature (Shahcheraghi, 2012). Any element in environment beside its performance has some possible capabilities ([Gibson], 1979). Any element in nature fulfills performance and can have extra capacities. In this theory, it is assumed that the perception of audience of hidden capabilities of elements of perspective can refer to the social, cultural backgrounds. Environmental capabilities are not only dependent upon its elements and they include human grounds as culture and society (Costall, 1995; 467). Indeed, creating suitable facilities for recreational-cultural activities isa necessity for excellent life of an informed person. Indeed, in development trend, some spaces are created regarding these activities and these spaces should be designed as valuable and like other needs, cultural-recreational issues should be the necessities of life to make great cultural, scientific and economic changes. To meet physiological and social needs, and to play social roles, human being needs the spaces with suitable conditions and behavior is changed only when the required conditions are not created and the existing conditions can be adapted. This study attempts to find a way by made environment, activities, interaction models and individual action with environment can be beside the culture. Indeed, this study attempts to create the spaces to improve the open spaces design of cultural-recreational sites as it improves the quality of cultural-recreational spaces of open spaces. Site is designed and managed as it is the main goal of creating cultural-recreational spaces.

Pegah Geramifard and Deihim Taki

THEORETICAL BASICS

Culture is a complex set of identifications, arts, beliefs and traditions, law, tradition, attitudes and etc. a person can achieve in his society (Murish, 1994). The culture of each person is the result of awareness, recognitions and experiences, when the data are not used directly, but we can say each person is the owner of culture and no society can lose its culture (Felamaki, 2006). By recognition of culture, we can say cultural complex is the spaces gathering to start an attempt to increase individual and social culture. The spaces that are different in terms of size, form and performance but due to having a visual order are associated to each other (Sharifianpour, 2003). The quality of life environment of people in society is effective on their routine activities namely, their mental features. Human life is affected by various environmental issues in all periods. The health is based on dynamics of a society, healthy and active people in society giving good moods to the environment and promote the society to excellent goals. Individual and environment has close relation and create a unified environment as none of them are defined alone and they are interact with each other. Human being relation with surrounding environment is based on a set of senses, today, one's unconscious image of self, a person life, parts feedback and senses in a made environment can be formed (Tihal, 1997, 94). Presenting a full analysis of mutual effect of human being and environment is complex based on all effective factors. Human being requires specific qualities of environment based on needs and goals to be active in environment. The environment determines recipients, the activities are organized and can be also re-created (Shahsavari, 2004, 12). The activities leading to mental comfort are called recreationalactivities; these activities have great influence on reduction of mental tensions, morale, mental comfort and increasing problems tolerance. If recreational activity is done voluntarily and with satisfaction, the result is good. The recreational games as demonstration, boating, fishing and etc. are these activities (Shokuhi, 1994, 13). The environment and views show thousands of ecological, technological and cultural factors. Conditions are specific designed or non-designed sites being made by these factors and they are experienced by people. A person with physical survival and security and mental enrichment attempts to use the processes to encode and decode the concepts in conditions. A person attributes concepts to perception features (perception concepts) and by association of these conditions, direct and indirect experiences of their past (associated concepts) can be extracted (Seyed Sadr, 2009, 134). Now, we can deal with the definition of green space and this region is covered by plants in inside or surrounding cities with two important functions for cities: 1- Adjusting temperature and air temperature, 2- aesthetics in cities, natural or artificial arena are under the influence of establishing threes and flowers, lawn and other plants as based on the supervision and management of human being and considering the regulations, rules and specializations to improve biological , habitat and welfare conditions of citizens and non-rural population centers. Urban green space includes urban parks, green belt, gardens and recreation places and forest parks and etc. (Majnunian, 1995). In a simple description of geometry structure system of Iranian garden, we can say the garden is square or rectangle based on water volume as it can be provided and based on earth feature (at the same level with general slope, slope, close to river) and is based on regular geometry basis of plot or tracing can be performed. Geometry structure in Iranian garden is formed by two major forms, one creating three-axial along with each other in garden and another one is considering two main crossing axial and then garden division is divided into squares with regular divisions. Baghshahr in Isfahan is one of the best experiences regarding urban design about 400 years ago in our country. By this design, the regular main structure of new city is outside of previous city via using garden into garden principles and major city division based on biaxial can create great Charbagh and is linked with the main new square and Gheisarie market with sensitive and less intervention and also old city is linked. In Safavid era, development in new city follows order and structural relation between garden and city (Mirfandarski, 1995, 127). Indeed, nature in current life environments namely in cities and metropolises is effective on stress, fear, perception, comfort, security, privacy, domain and other mental indices and can be importer in individual and collective health of society. Today, sustainable development model is considered as mental health issue of human being in the form of the relation between human and environment. According to designers, the quality of structural environment is the result of relationship between nature and anthropogenic environment. The researchers and designers considering mental health in review of gardens can present their experiences in the form of executed plans and they can be considered in four main groups. Domestic gardens, healing gardens, garden-participative parks and urban enclosed gardens (Shahcheraghi, 2012, 255). Iranian

Pegah Geramifard and Deihim Taki

garden is an independent phenomenon of virgin nature in the mind and contemporary culture of Iran and contemporary culture of Iranian people accepts "garden phenomenon" in physical environment of environment.

STUDY PURPOSE

The searching of direct and indirect effects of open space on quality of cultural-recreational spaces and applied recognition of environment capabilities and improving it.Improving the knowledge of designing open spaces of cultural-recreational sites can be designed, made and managed as it can improve the quality of space in open environments. Ignoring the type of comprehensive plan in designing the architecture of a cultural-recreational center, some issues as communication networks, external development spaces, centrality and edges of Paradise, locating of main buildings and environmental factors can be considered. The creation of green space and design of intimate spaces between the buildings with the aim of integration and linking of buildings and external space to each other has a general image of paradise and it can achieve the recognition of activities and interaction models of individual action with environment beside the culture on designing the architecture of a cultural-recreational center. The paradise design principles are based on design of human being, linking with nature and vision, creating pedestrian area and protection of plant nature. Conscious arrangement of perspective elements in natural environments and cultural-recreational paradises as it leads to the recreation of concentration of soul and body.

Based on the above goals, the following questions are raised:
Is paradise effective on architectural space of cultural-recreational center?
What are the effective features on improving architectural quality of cultural-recreational paradise?
What is the effect of architecture quality of cultural-recreational paradise on audience physical aspects?

Study Method and Type

Study method depends upon the type of study and its nature and based on study subject as the design of cultural-recreational paradise, after the infrastructural architecture studies, the researcher conducts qualitative study along the scientific studies and its scientific results in the study. Qualitative study is conducted by data collection, library and field study to create the spaces to improve design knowledge of open spaces of cultural-recreational sites and meeting the physiological and social needs. Based on the study purpose, different types of studies are divided into three types of basic, applied and development. The present study evaluates a high quality environment to eliminate physical and mental problems and environmental crises namely the lack of relation between human and contemporary human nature and this study is qualitative-applied. The studies of Paradise and Iranian garden model evaluated the spatial needs of required site for designing complex as conducted after infrastructural studies and based on study title and the results by applied (qualitative) can be performed.

Study population and sampling method

The study population is a set of people or units with minimum common attribute. In this study, the study population includes garden and required buildings and their users and sampling method is purposeful.

Data collection instrument

The study method depends upon the study type and its nature and based on subject, after the infrastructural architecture studies, two stages are considered and at first we considered the descriptive-analytic method of features and concepts as nature-based approaches, Paradise model, site quality and etc. After the recognition of needs and investigation of sample centers in Iran, the required spaces are designed. In this study, library documents and

Pegah Geramifard and Deihim Taki

observation including Persian and Latin books, Internet, journals, scientific journals, global standards, images and urban maps and state documents.

Natural situation and geography if Isfahan city

Isfahan city with longitude 51°, 39′, 40′′ eastern and latitude 32°, 38′ ,30′′ northern is located in center of Iran with average sea level height 1570m in Zayanderood coast. From country divisions, Isfahan city is center of Isfahan province in the distance 425km in south of Tehran. The plain on which Isfahan city is located is with average slope less than 3% and its slope is northwest to southeast (Shafaghi, 2002). This province with area of about 107018 km2 is restricted from east to arid and semi-arid area and from West to Zagros mountainous region, green area (Azaniet all, 2013). Based on climatic divisions of country, Isfahan is located in arid climate but some factors are effective on the climate of this province as place height, the rising and falling and their directions, rainfall, effect of wind, close and far distance from western mountainous region and Kavir plain in east and southeast, Isfahan population is 1796967, of which 121032 people live in district 13.

District 3 in Isfahan city

This region is bounded from north along with Zayanderood of Nirogah street intersection to Sohrevardi square, from south to ZobAhan highway, from east to Simin and Janbazan street and from west to Yazdabad bridge along Qods township to power plant road in Zayanderood margin (Figure 1)(municipality site of district 13 in Isfahan).

Physical condition of district 13 of Isfahan city

The townships of district 13 of Isfahan city from physical index (sport, cultural, educational and religious spaces in township level) have considerable differences in terms of comparison with ranking of Topsis table and the results are shown in Table 1 (Topsis model includes 13 stages done by various math techniques)(Azani et al., 2013).

Locating the Required Site

Recognition of spatial features of site to design an urban space is of great importance more than any other issue. The researcher considered many factors as easy access, good location, good weather and suitable area to design cultural-recreational paradise. The required site is located in Shafaghstreet with approximate area 26 thousand square meter in the west of Isfahan city. Except the old dried brick in mountainous area in the north of site, this site has not the limitations of internal (historical texture) and most of its constructions are dedicated to contemporary era. The location of site in proximity to Ghaemie mountain, old dried brick and mountainous park of Abshar in north, KuhNur and Fazilischool in the west of site, ShahidAbaspour power plant and DonbeMountain in southwest can be considered. In this project, the analysis of selected site is investigated in the form of social physical issues as in Figure 2 we can consider site location.

Effective elements on plan

One of the important and effective elements on site design is mountain as the land is located in its food. Also, it is considered one of the most important elements. This site is located in the proximity of mountain and has average slope in northern-southern areas. This slope is effective on site design and landscape of complex and is useful to create beautiful perspective with various perspectives. Other effective elements on site are including: Optimal angle of east and southeast lighting of site, natural elements as green space around site and climatic factors as wind direction, light and land topography.

The required vegetation of design

Besides their effect on air purification and showing the best aspects of nature, plants are also used to cover the unsuitable perspectives. Regarding the introduction of plants to renovate vegetation in region and creating open space, we can consider the followings:1- Ecological conditions on mountain, to provide a consistent condition with natural conditions of mountain and studied area and ecological conditions of region are required., 2- Existing vegetation of required complex, the required land of vegetation of cypress, pine, bushes and decorative plants. To apply the best and prettiest vegetation in landscape design, we should have general introduction with different plant vegetation and decorations.

STUDY FINDINGS

The study findings are the result of qualitative evaluation and we can say the existing architectural elements in each space are effective on its users and this effect is positive directing a person to comfort. The relationship between human and nature has direct impact on increasing his mental health. Thus, if the relation between human, nature and artificial environment is free, mental health is increased in society and the need of human nature to close relation with nature and enjoying its graces, human, nature and mental health providing in current world are interacting. Recognizing the activities and individual interaction models with environment beside culture to provide comfort, mental security, motivation and intellectual and artistic motivations can be achieved. In this section, we respond the raised questions:1- Is Paradise effective on architecture space of cultural-recreational center? According to the studies done by author in this case, there is a good link between buildings and garden and the designers don't consider these two items separated and this is one of the best features to consider Iranian garden. It seems that only paying attention to archetype and geometry of Iranian garden cannot be useful as abstract and conceptual interpretations of garden and helping the designers in process, design and creation of works. In cultural approach to gardens, responding to materialistic, social and mental needs of a person or a group of society can be reviewed. Iranian garden is equipped with fitness order, deprivation and inhibition, free from extreme behaviors, efficiency and profitability, suitable for saving and stability. Also, it has ideal coordination and can justify its regulations in good climate areas even humid areas and we can achieve the best results. 2- Which features are effective on improving the architectural quality of cultural-recreation Paradise? What are the good features of cultural-recreation Paradise architecture. Based on considering the needs, values and goals, human being requires specific qualities. The environment determines the receiving items, organizes the activities and can create need. The composition of elements of garden as land, edges and wall, confinement, opening and path, bottom and ceiling, irrigation system, furniture and decorations, garden components and its qualities are formed. In Iranian garden, other features in garden as emphasis on horizon, separation of inside and outside, importance of wall element, spatial consistency, complexity of composition of historical elements, dependence of garden to surrounding perspective as qualities of linking of components and elements to garden can be raised. Most of these features are general aspects of gardens confined in climatic, cultural and historical grounds. 3- How is the effect of architectural quality of cultural-recreational Paradise on audience? The quality of living environment of people in society affects their routine activities namely their mental features. According to the contemporary human, paradise is a comfortable place. Providing physical comfort and association of meanings and concepts is a mental factor and architecture can provide it as the most important factor of space order. The main key of designing cultural-recreational paradise is a comfortable space for contemporary human being or the citizen involved in routine stressful environments.

The idea of plan

The main idea in designing of this complex is protecting the green nature of the studied site and organic and homogenous design with existing nature and minimum involvement to create an enjoyable environment. The start point or nodal point or plan idea can be very different and the plan idea is one thing and if it is many things, one of them is fully major. The first step is the design of paths. The line defined as area starts in northern-southern direction

Pegah Geramifard and Deihim Taki

and with its direct movement and based on Iranian garden (water is flowing along the path) can continue its movement and at the end of its moving path can achieve the existing index point in site (cultural complex). The next step in the design is a simple processed volume and as it follows the old small houses, it is also a modern one. Cultural building by being inspired by Iranian architecture is formed as a small house in the garden. An area as fountain, entrance and main building can be linked. This project includes a full yard and composed of building and green space and glass façade of building indicates protection against pollution and climatic conditions and extraversion. The low buildings design around Paradise is enclosed by thick wall. Symmetry principle is used in designing green spaces and building design. A checked geometry network with rectangular level as divided into some squares and final stage is the arrangement of spaces designed associated with the use of design and application method. Some spaces as restaurant, green house, arbourand sport fields are organized around this area.

The classification of required spaces in design

In the design of this complex, it is attempted to design various educational, cultural, recreational and service spaces as a coherent complex: Educational spaces, cultural, spaces, cultural-recreational spaces, open educational spaces, leisure-recreational spaces, green house, administrative spaces, service spaces, camping (arbour) and mobile spaces.

CONCLUSION

Regarding the works being explained, there was a good link between the buildings and garden and the designers didn't consider them separated and this is one of the best features in Iranian garden. It seems that only dealing with archetype of Iranian garden geometry cannot help the designers in process, design and creation at the same level as abstract and conceptual interpretations of garden. In other words, we can say, according to the contemporary human, paradise is a comfortable place. Providing physical comfort and association of meanings and concepts is a mental factor and architecture as the most important factor of space order can provide it. The main key of paradise design is a comfortable space for contemporary person and it is based on a combination of local architecture, organic and modern technology architecture. It is attempted that the design is regarding the protection of green space, maximum view and perspective and the best direction and coordination can be created between the designed elements. Also, water element is an effective organic factor in site and it is used as a comforting factor. It is hoped that this study is a positive step to design open spaces of cultural-recreational sites to meet the physiological and social interaction needs.

REFERENCES

1. Azani, M., MokhtarMalekabadi, R., Molayi, Sh. (2013).The study of township sustainable development indices of district 13 in Isfahan. Scientific-research journal of spatial planning (Geography), 9: 119-142.
2. Parham, M., Qaemi, F. (2010). Archetype of Paradise city and its different forms in Iranian culture and old Persian literature. Literal study journal.151-169.
3. Tihall, A. (1997). Latent dimension, Translated, M., Tayebian, First edition. Tehran. Tehran University publications. 265.
4. Seyed Sadr, A.(2009). Green space architecture (landscaping), Tehran.SimayeDanesh publications.604 pages.
5. Shahcheraghi, A.(2012). Paradise paradigms (An introduction to reviewing and recreation of Iranian garden). Tehran. Jihad Daneshgahi University. 302.
6. Sharifianpour, Z. (2013). Designing cultural-recreational park of Khorasegan city.MA thesis.Architecture.Islamic Azad University of Khorasegan.
7. Shokuhi, Gh. (1994). Education and its stages.Mashhad.AstanQodsRazavi publications.Fourteenth edition.
8. Shafaghi, S.(2002).Isfahan Geography. Isfahan: Isfahan University publications.

9. Shahsavari, M.(2004). Architecture based on phenomenology: Human, place, expectation, MA thesis. Architecture school.Islamic Azad University of Khorasegan branch.
10. Farahvashi, B.(1976). JahanFarvari.
11. Felamaki, M.(2006).Architecture formation in Iran and west experiences. Tehran. Faza edition.670 pages.
12. Motedayen, H.(2010). The reasons of formation of historical gardens of Iran.Baghnazar journal. 15: 51-62.
13. Majnunian, H. (1975). Some discussions regarding parks and green space and recreation. Tehran. Ferdoos publications.
14. Murish, A.(1994).An introduction to sociology of education.Translated by Q. Sarmad. Tehran. Tehran University publications.
15. Mirfandreski, M.(1995).Garden as city result.The articles of the first congress of architecture history of Iran urbanization.Fifth Vol. Cultural heritage organization of country.
16. Corbin, H. (1990). Spiritual body and celestial earth: from Mazdean Iran to Shi'ite Iran, Tauris.
17. Costall, A. (1995).Socializing affordances. Journal of Theory and Psychology, 5(4): 467-481.
18. Gibson, J.J. (1979). The ecological approach to visual perception. Boston: Houghton, Mifflin.
19. Mallory, J. P., Douglas, Q. (1997): Encyclopedia of Indo-European culture, Taylor and Francis.
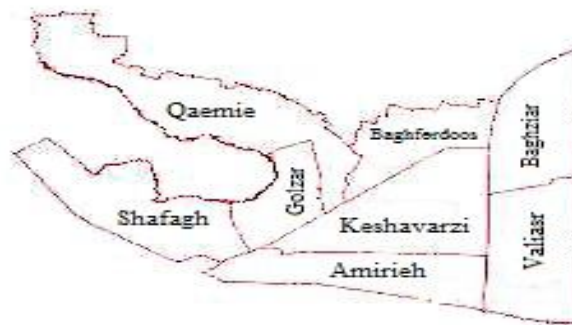
Figure 1- Townships of district 13 with population and area (source: Ezani et al., 2013).

Table 1- The mean of index (physical) in 8 townships of district 13 of Isfahan (source: Azani et al., 2013).

Township	The mean of physical index (sport places, cultural and etc.)	Ranking
Amirieh	5106/2	5
Baghferdoos	2453/4	2
Baghziar	3.3958	8
Qaemie	4458/3	3
Golzar	4348/4	4
Keshavarzi	2105/3	1
Shafagh	2667/3	6
Valiasrtownship	4737/3	7

Pegah Geramifard and Deihim Taki

Figure 2- Cultural-recreational Paradise site in Shafaghstreet

RESEARCH ARTICLE

Endometrial Thickness in Ovariectomized and Non-Ovariectomized Rats Exposed to Clomiphene Citrate with and without Human Chorionic Gonadotropin, a Histological Study

Behpour Yousefi[1], Elnaz Rahbar[1]*, Mahdi Mahdizadeh[2], Sam Zarbakhsh[1], Mohammad Hassan Amjad[1] and Iraj Feyzi[3]

[1]Department of Anatomy, Faculty of Medicine, Semnan University of Medical Sciences, Semnan, Iran.
[2]Department of Anatomy, Faculty of Medicine, Iran University of Medical Sciences, Tehran, Iran.
[3]Department of Surgery, Faculty of Medicine, Ardabil University of Medical sciences, Ardabil, Iran.

*Address for correspondence
Elnaz Rahbar
Department of Anatomy, Faculty of Medicine,
Semnan University of Medical Sciences,
Semnan, Iran.
E-mail: elnazrahbar@gmail.com

ABSTRACT

To evaluate the effects of clomiphene citrate (CC) when used alone or in combination with human chorionic gonadotropin (hCG) on endometrial thickness (ET) of Ovariectomized and Non-Ovariectomizedanimals.Animals (n=72) randomly divided into three groups:Experimental [a)Ovariectomizedandb) Non-Ovariectomized]Sham and Control.Ovariectomizedgroupwent under bilateral ovariectomy. Ovariectomizedand Non-Ovariectomizedgroups divided into five sub-groups (each, n=6):1) CC 10mg/kg, 2) CC 20mg/kg, 3) hCG, 4) CC 10mg/kg with hCG, and 5) CC 20mg/kg withhCG. Experimental groups received daily intraperitoneal injections of CC associated with and withouthCG. The left uterine horns were excised and prepared for study by light microscopy by hematoxylin& Eosin staining.. ET measured and analyzed using SPSS16.0, P < 0.05 was considered statistically significant.Animalsunderwentovariectomy, presented a significantly lower ET (P<0.000-P<0.004), when compared with Non-Ovariectomizedin the same condition that groups and sham and control groups either.ET was significantly thinner in Non-Ovariectomized subgroups taking CC (P<0.000) alone or in combination with hCG than in sham and controls.Administration of hCG following pre-stimulation with CCin both groups of experimental,declining the adverse endometrial effects of CC, but it could not able to return thickness as in control group.The adverse endometrial effects of CC increased

3573

Elnaz Rahbar *et al.*

when used alone or in combination with hCG after ovariectomy.Administration of hCG following pre-stimulation with CC,declining the adverse endometrial effects of CC, but it is not able to return thickness to normal rate.

Key words: Ovarian Stimulation, hCG, Clomiphene Citrate, Endometrial Thickness.

INTRODUCTION

The success of implantation chiefly depends on embryo quality and uterine receptivity (1).Estimation of endometrial receptivity is still an important contest in assisted reproductive technology (ART)(2). Numerous studies have shown a strong correlation between endometrial thickness (ET) and pattern on implantation with successful pregnancy rates (3-7). In addition, there are evidences that a thin endometrial (less than 7mm) and a thick endometrial (more than 14mm) can decrease the chance of conception (8-11). While, the results of other studies are unable to show this relation between the ET and chance of implantation(12, 13) . CC is the most widely prescribed agent as ovarian inductor for the treatment of subfertility linked with oligo-ovulation.Although CC induced ovulation rates are 60-85% conception rates are only about 20%. This conflict may be a result of antiestrogenic effects of CC on both the endometrium and cervical mucus (14)that may lead to thinner endometrium, luteal phase defects and finally poor pregnancy rates(15).Previous studies have shown that use of CC alone impaired endometrial development (16-18)and does have a negative impression on ET (15, 19-21), whereas anotherstudies found no such effects in the fertile women(22-24)In addition, there are controversial reports about the endometrium affected by CC(18).Administration of hCG following pre-stimulation with CChas been shown to improve endometrial development and to result in thicker endometria(15, 16).Ovarian induction with CC commonly continues with hCG administration to induce ovulation,influences endometrial proliferation and subsequently, endometrium increases in thickness (22). It is likely that the accumulation of gonadotropins like follicle stimulating hormone (FSH) or hCG to the treatment protocol was able to correct for the negative endometrial effects of CC alone. However, the most of the previous studies were clinical (ultrasonographic, biopsy) and in-vitro and the results obtained have been controversial,also a similar negative endometrial effect of CC alone and in combination with hCG was not studied in the Ovariectomizedanimals. Therefore, lack of histological and dose depended studies in this area underlines the need for additional research on impacts of dose depended CC alone and combination with hCG on ET in an Ovariectomized and Non-Ovariectomized rats.

MATERIALS AND METHODS

Animals and drug treatment

In this experimental interventional study, Seventy two (12–14 weeksold) of virgin female Wistar rats (Ratus norvegicus)were obtained from the Central Animal Unit at the IranUniversity of Medical Sciences. CCand hCG were purchased from Sigma Chemical Company (St Louis, MO, USA) and LG Life Company (LG Life Sciences, Korea), respectively. Solvents were of analytical grade and were used without further purification. All animal care and experimental procedures were approved by the Ethics Committee of Semnan University of Medical Sciences.Animals randomly divided into three groups: Experimental (a) Ovariectomizedand b) Non-Ovariectomized], sham and control. The ratswere kept under standard laboratory conditions, under a 12 hr: 12 hr light: dark cycle at room temperature of 22±2 °C. Animals had free access to pelleted food and tap water. All groups experience the same conditions, with the exception of the experimental group.

Elnaz Rahbar *et al.*

Experimental group

Divided into two main Ovariectomized (n=30) and Non-Ovariectomized (n=30) groups:Ovariectomized group went under bilateral ovariectomy as described by Hosie.et al (2, 25-27). The animals were allowed3–4 weeks to recover before any treatments after surgery, to make sure that there are no ovarian hormones left in circulating system (28).Then both of Ovariectomized and Non-Ovariectomizedgroups divided into five subgroups (each, n=6):1) CC 10mg/kg, 2) CC 20mg/kg, 3) hCG, 4) CC 10mg/kg with hCG, and 5) CC 20mg/kg with hCG. The CC and hCG treatment was similar in both groups. Animals in 1, 4 subgroups received a single dose of 10 mg/kg of CC, and in 2, 5 subgroups received a single dose of 20mg/kg of CC, daily at 09:00 am for 5 days. (2-4 mg/0.4ml normal saline: 0.9% saline; 9 g NaCl Sigma, dissolvedin 100 ml autoclaved distilled H2O)].After the last injection of CC in both groups, Animals in 3, 4, 5 subgroups received a single dose of hCG (10 I.U. /0-4 ml 0-154 m-NaCl)at 9:00 am.

Shamgroup: (n=6) received normal saline for 5 days.

Controlgroup:(n=6) was vehicle treated.

Sample preparation and staining

All animals were sacrificed on the morning day after mate (a vaginal plaque and smear observed) approximately 24-26 h after the last drug injection using alethal dose of ketamine (150mg/ kg) and Xylasin (15mg/kg). The left uterine horns were excised, placed in 0.1 Mof phosphate buffered saline [(pH 7.4 (Gibco life tech. tablets]), cleaned of fat , cut into 1 cm pieces andthen tissue was fixed in 10% formalin solution, and paraffin embedded were Made. Paraffin-embedded sections of rat uteri were cut at 5μm thickness (transverse serial sections); deparaffinized with xylene, and rehydrated using graded ethanol. The slides were stained with Harris's hematoxylin for 10 min,washed in water for 1 min, incubated in lithium carbonate for 5 min, rinsed in water for2 min, drawn in 90% alcohol 10 times, and then incubated in alcoholic Eosin solution for 5 min.After washing the sections in tap water for 2 min, thesections were rinsed in alcohol, cleared in xylene andmounted by entellen. The histological staining was used adaptedfrom Bancroft and Stevens (29).

Histological study

Transverse sections of left uterine horns uteri were divided in order into four areas;the ET (μm) was measured in four randomly selected fields in each area at 400X magnification under a light microscope.

Statistical analysis

Statistical calculations were performed using SPSS 16.0 software (Statistical Package for Social Science, SPSS Inc, Chicago, IL, USA). Statistical significance between groups was evaluated using one-way analysis of variance. Differences between groups were determined by the Turkey test. Results were presented as mean ± SD with $p < 0.05$ considered to be statistically.

RESULTS

The mortality rates for experimentalanimals were 3%.Measurements of ET in the groups is shown in Tables1, 2 and 3.

Elnaz Rahbar *et al.*

ETin Ovariectomized group

Table.1 shows that animals undergoing ovariectomy,presented a significantly lower ET(p <0.000),when compared with Non-Ovariectomizedgroup in thesame condition according to the treatment received (except of the 10mg/kgCC(p <0.878)and 20mg/kgCC with hCG(p <0.594) subgroups].Comparison of ET in the Ovariectomizedand control groups is also shown in Table .2.At a given dose of 10,20mg/kgCC , 7.5IU/kghCG alone and 10,20mg/kgCC with 7.5IU/kghCG,Ovariectomizedsubgroupsshowed,21%, 30%, 32%, 24%, 14% decrease in ETthannon-Ovariectomizedsubgroups,respectively. Also, the data demonstrated thatwhen animal's without ovary exposed to one of two doses of CC,alone. ETwas lower in subgroups taking 20 mg/kgof CC than in taking 10 mg/kg of CC. The endometrium was found to be thicker when CC was combined with hCGbut these thickening wassignificantly(p <0.000) less than to non-Ovariectomized (except of the 20 mg/kgCCwith hCG subgroup) andcontrol groups (Fig.1a-1e).

B.ET in Non-Ovariectomized group

Comparison of the ET in the Non-Ovariectomized or normal rats exposed to CC with and without hCG, sham and control groups is summarized in Table 3.ET in the Non-Ovariectomized or normal rats taking CC(10, 20mg/kg),hCG alone and CC(10, 20mg/kg) with hCG showed 37%,40%; 44%,47%,; 3%,8%; 21%,25% and 31%,33% decrease in ET when compared to sham and control groups, respectively.Only,ET ofsubgroup (p <0.993) those treated with hCG alone became normal(normalthickening).Also,thedataanalysisrevealed thatwhen these animal's exposed to one of two doses of CC (10, 20 mg/kg) alone, ET resultswere like those seen in the various Ovariectomized subgroups (Fig.1f-1j).

DISCUSSION

Endometrial receptivity is a crucial factor in human reproduction (30) and some studies have suggested that ET is a useful indicator of endometrial receptivity (31). This is the first experimental study that ET was measured in normal animals and undergoing ovariectomy, after exposure to two doses of CC and hCGalone and companied. Wefound out that the adverse endometrial effectsof CC with and without hCG after ovariectomyis increased. Also, the ET was not related to CC dosein both experimental groups. Administration of hCG following pre-stimulation with CCin both groups decliningthe adverse endometrial effectsof CC and increased ET, but these thickening was significantlyless than sham and control groups.Onlyone of the Non-Ovariectomized subgroups which treated withhCG alone, exhibited normal ET.Our results regarding to adecreaseinET ofOvariectomized animalstreated with CC and hCG alone and as a combination,is consistent with the results of a previous study by Carpenter et al who showed that ovariectomy by disturbing the different parts of activin-follistatin system, may negatively affect growth and development of endometrial glands and decreases the ET in Ovariectomized animals(32).Also, thinner endometrial of Ovariectomized animals may be tothat endometrial growth and development depends on ovarian hormones and factors. The ovarian factors that adjust uterine growth and endometrial adenogenesis are not clearly defined, although there are evidences that describe follistatin and inhibin or activin as involved factors.In addition, the maximum ETin Ovariectomized subgroups belonged to hCG subgroup,but these thickening was significantlyless than to Non-Ovariectomizedand normal groups. Thus results of this study indicated that a single dose of hCGis unable to repair the adverse endometrial effects of ovariectomy due to the lack of steroidal hormones of ovary and their role in endometrial proliferation.

Our results suggest that ovaries are necessary for endometrial thickness;however, completing studies are needed. As in the study of Mitsuyoshi et al,(20) and Wu and colleagues (19),in ourstudy, ETwas significantly thinner in Non-Ovariectomized or normal animals treated with CC alone than thosein sham and controls. That may be due to the blockage of estradiol 2(E2) -induced endometrial epithelial cell proliferation], transcriptional functions of a gene that is responsible to create different parts of estrogen receptor(ER),formation of ER complex with SRC-1(steroid receptor

co-activator-1) and inhibition of mitosis in proliferative phaseby CC(20).However, morphometric evaluation of glandular and stromal structures has been revealed an impaired endometrial development after various treatment protocols.It has been suggested that CC may increases serum levels of estradiol and progesterone and decrease ET there upon (15) and a higher CC dosage usually resulted in greatly diverging morphological alterations(18). We found that the ETwas not related to CC dose when used alone or in combination withhCGin experimental groups, thisare in contrast to the results of a previous study that had led to speculations of a dose-related effect of the CC on endometrial structure and steroid concentrations (33). Also, Our findings were difference to results of a study which showed that increased doses of CC from 1,5 to 10 µ M in culture medium of endometrial cells interrupted natural proliferation and modification of cells (14).The conflicting results of CC may be due to its antiestrogenic effects on endometrium as well as cervix. However,no significant dose-dependent decrease in ETwas observed in the higher than lower dose subgroups, probablydue to experimentalvariability,such as different specimensand dosage of CC or other unknown factors.In our study, a single dose of hCGalone in Non-Ovariectomized or normal animals induced reasonable increase of ET that was similarto that of sham and controls. A possible explanation for this could be thatduring the window of implantation, hCGexerts a positive influence on endometrial epithelium to secrets several growth factors (interleukin-11, CXCL10, granulocyte macrophage colony-stimulating factor) that resulted in more proliferation of endometrium, increase in reception and development of trophoblast (34).Also, it can particularly induce decidualization by rising cAMP synthesis(35).In addition, it has been suggested that multiple paracrine factors (as tissue remodeling parameters) related to the endometrial differentiation include;Insulin-like growth factor-binding protein-1(IGFBP-1) , vascular endothelial growth factor(VEGF) and matrix metalloproteinase-9 (MMP-9) that can be modulated by hCG administration during the luteal phase(36).Additionally , it is confirmed that hCG can modulate secretion of cytokines and growth factors thorough LH receptors and improves ET and implantation.(37, 38).

CONCLUSION

The adverse endometrial effects of CC increased when used alone or in combination with hCG after ovariectomy and administration of hCG (alone) was effective. Also, underwent to CC therapyblocked the full developmental thickening process from occurring and administration of hCG following pre-stimulation with CC,declining the negative endometrial effects of CC, but it could not able to return thickness in normally. In addition,our findings failed to support the previous research that highlighting a dose- related effects of the CC with and without hCG on endometrial structure, although a higher CC dosage (with and without hCG) resulted in more thinning of ET.More studies are recommended in these fields.

ACKNOWLEDGMENTS

Conflict of interest

There was no conflict of interest in this experimental study.

REFERENCES

1.Paria BC RJ, Das SK, Dey SK. Deciphering the cross-talk of implantation: advances and challenges. . Science. 2002;296:2185-8.

2.Hosie MJ, Murphy CR. A scanning and light microscope study comparing the effects of clomiphene citrate, estradiol 17-beta and progesterone on the structure of uterine luminal epithelial cells. Eur J Morphol. 1995;33(1):39-50.

3.Traub ML, Van Arsdale A, Pal L, Jindal S, Santoro N. Endometrial thickness, Caucasian ethnicity, and age predict clinical pregnancy following fresh blastocyst embryo transfer: a retrospective cohort. Reprod Biol Endocrinol. 2009;7(33):1477-7827.

4.Chen SL, Wu FR, Luo C, Chen X, Shi XY, Zheng HY, et al. Combined analysis of endometrial thickness and pattern in predicting outcome of in vitro fertilization and embryo transfer: a retrospective cohort study. Reprod Biol Endocrinol. 2010;8(30):1477-7827.

5.Gonen Y, Casper RF. Sonographic determination of a possible adverse effect of clomiphene citrate on endometrial growth. Hum Reprod. 1990;5(6):670-4.

6.Detti L, Yelian FD, Kruger ML, Diamond MP, Rode A, Mitwally MF, et al. Endometrial thickness is related to miscarriage rate, but not to the estradiol concentration, in cycles down-regulated with gonadotropin-releasing hormone antagonist. Fertil Steril. 2008;89(4):998-1001.

7.RF C. It's time to pay attention to the endometrium. Fertil Steril. 2011;96:519-21.

8.Gonen Y, Casper RF, Jacobson W, Blankier J. Endometrial thickness and growth during ovarian stimulation: a possible predictor of implantation in in vitro fertilization. Fertil Steril. 1989;52(3):446-50.

9.Basir GS, O WS, So WW, Ng EH, Ho PC. Evaluation of cycle-to-cycle variation of endometrial responsiveness using transvaginal sonography in women undergoing assisted reproduction. Ultrasound Obstet Gynecol. 2002;19(5):484-9.

10.Dessolle L, Darai E, Cornet D, Rouzier R, Coutant C, Mandelbaum J, et al. Determinants of pregnancy rate in the donor oocyte model: a multivariate analysis of 450 frozen-thawed embryo transfers. Hum Reprod. 2009;24(12):3082-9.

11.Weissman A GL, Casper RF. The detrimental effect of increased endometrial thickness on implantation and pregnancy rates and outcome in an in vitro fertilization program. Fertil Steril. 1999;71:147-9.

12.Barker MA, Boehnlein LM, Kovacs P, Lindheim SR. Follicular and luteal phase endometrial thickness and echogenic pattern and pregnancy outcome in oocyte donation cycles. J Assist Reprod Genet. 2009;26(5):243-9.

13.Laasch C, Puscheck E. Cumulative embryo score, not endometrial thickness, is best for pregnancy prediction in IVF. J Assist Reprod Genet. 2004;21(2):47-50.

14.M. Khazaei (PhD) FCM, S. Khazaei. The Effect of Different Doses of Clomiphen Citrate on Morphology andProliferation of Human Endometrial Stromal Cells in In-Vitro Culture. Babol Univ Med Sci. 2010;12:7-12.

15.Lacin S. VS, Kuscu N.,Koyuncu F.,Ozbilgin M.,et al Clomiphen citrate does not affect the secretion of $3\alpha\cdot1\beta$,v α integrin molecules during the implantation window in patients with unexplained infertility. Human Reproduction. 2001;11:2305_9.

16.Fazlebas AT, Yeko, T.R., Donnelly, ICM. et al. Effect of clomiphenecitrate on the synthesis and release of the human pMactoglobulin homologue,pregnancy associated endometrial a2-globulin, by the uterine endometrium. Hum Reprod1991;6:783-90.

17.Yeko TR, Nicosia, S.M., Maroulis, G.B. et aL. Histology of raid-lutealcorpus luteum and endometrium from clomiphene citrate-induced cycles. Fertil Steril. 1992;57:28-32.

18.Bonhoff AJ, Naether OG, Johannisson E. Effects of clomiphene citrate stimulation on endometrial structure in infertile women. Hum Reprod. 1996;11(4):844-9.

19.Wu R ZF, Zhou S. Morphometric studies of effects of Clomiphene citrate on histological characteristic ofproliferative endometrium. Zhonghua Fu Chan Ke Za Zhi. 1995;30:673-6.

20.Mitsuyoshi A. TT, Tsutsumi S., Tsuyoshi O., Takata K., Henmi N Molecular Mechanism of the Inhibition of Estradiol-Induced Endometrial Epithelial Cell Proliferation by Clomiphene Citrate. Endocrinology. 2010;151:394–405.

21.Smruta S SB. Clomiphen citrate- a review of its current status. Obstet Gynecol Ind. 2003;53:127-30.

Elnaz Rahbar *et al.*

22.Thatcher SS, Donachie, K.M., Glasier, A. et al. The effects ofclomiphene citrate on the histology of human endometrium in regularlycycling women undergoing in vitro fertilization. FertiL SteriL. 1988;49:296-301.

23.Fritz MA, Holmes, R.T. and Keenan, EJ. . Effect of clomiphene citratetreatment on endometrial estrogen and progesterone receptor induction inwomen. Am J Obstet GynecoL. 1991;165:177-85.

24.Kovacs P, Matyas S, Boda K, Kaali SG. The effect of endometrial thickness on IVF/ICSI outcome. Hum Reprod. 2003;18(11):2337-41.

25.Hosie M, Terry V, Shaw T, Dwarte D, Murphy CR. Expression of glucosamine trisaccharides on the rat uterine surface is altered by clomiphene citrate. II. Combination with ovarian hormones. Acta Histochem. 2000;102(3):309-21.

26.Hosie MJ, Stewart CM. Apoptosis is not altered by clomiphene citrate in pseudopregnant rat uteri. Acta Histochem. 2006;108(2):105-16.

27.Hosie M. AM, Penny C Actin binding protein expression is altered in uterine luminal epithelium by clomiphene citrate, a synthetic estrogen receptor modulator. Theriogenology. 2008;69:700–13.

28.Laura Dazzi ES, Giulia Cherchi, Pier Paolo Barbieri, Alessandra Matzeu, Biggio aG. Estrous Cycle-Dependent Changes in Basal andEthanol-Induced Activity of Cortical DopaminergicNeurons in the Rat. Neuropsychopharmacology. 2007;32:892-901.

29.Theory and practical of histologicaltechniques(1996.).

30.Alcazar JL. Three-dimensional ultrasound assessment of endometrial receptivity: a review. Reprod Biol Endocrinol. 2006;4:56.

31.Zhao J, Zhang Q, Wang Y, Li Y. Endometrial pattern, thickness and growth in predicting pregnancy outcome following 3319 IVF cycle. Reprod Biomed Online. 2014;13(14):00310-1.

32.Carpenter KD HK, Spencer TE. Ovarian regulation of endometrial gland morphogenesis and activin-follistatin system in the neonatal ovine uterus. Biol Reprod. 2003;69:851-60.

33.Bonhoff A, Naether O, Johannisson E, Bohnet HG. Morphometric characteristics of endometrial biopsies after different types of ovarian stimulation for infertility treatment. Fertil Steril. 1993;59(3):560-6.

34.Paiva P HN, Hincks C, Meehan KL, Pruysers E, Dimitriadis E, Salamonsen LA. Human chorionic gonadotrophin regulates FGF2 and other cytokines produced by human endometrial epithelial cells, providing a mechanism for enhancing endometrial receptivity. Hum Reprod 2011;26:1153-62.

35.Tang B GE. Direct effect of gonadotropins on decidualization of human endometrial stroma cells. Steroid Biochem Mol Biol 1993;47:115-21.

36.Licht P, Russu V, Lehmeyer S, Wildt L. Molecular aspects of direct LH/hCG effects on human endometrium--lessons from intrauterine microdialysis in the human female in vivo. Reprod Biol. 2001;1(1):10-9.

37.CV R. Physiological and pathological relevance of human uterine LH/hCG receptors. J Soc Gynecol Investig. 2006;13:77-8.

38.Tesarik J HA, Mendoza C. Luteinizing hormone affects uterine receptivity independently of ovarian function. reprod Biomed Online. 2003;7:59-64.

Elnaz Rahbar *et al.*

Table.1. Endometrial thickness (ET) of Ovariectomizedand Non- Ovariectomized subgroups exposed to Clomiphene Citrate (CC) with and without Human Chorionic Gonadotropin (hCG)

Subgroups(each, n=6)	Ovariectomized group	Non- Ovariectomized group	p^a
CC10 (mg/kg)	206.9 ± 25.98	261.6 ± 100.45	0.878
CC 20 (mg/kg)	161.8 ± 51.55	231 ± 68.78	0.004
hCG (7.5IU/kg)	274 ± 54.81	401 ± 36	0.000
CC 10 (mg/kg) with h C G (I.U)	251.5 ± 43.25	329 ± 95.76	0.000
C C20 (mg/kg) with h C G (I.U)	245.5 ± 65.90	287 ± 44.55	0.594

[a]Note: a values represent mean and the associated standard deviation. $p < 0.05$ is considered statically significant.ETof Ovariectomizedgroup compared with Non-Ovariectomized.
Kruskal-Walis, One Way ANOVA and Tukey tests were used to determinesignificance.

Table.2.Endometrial thickness (ET) of Ovariectomized subgroups exposed to Clomiphene Citrate (CC) with and without Human Chorionic Gonadotropin (hCG), and control

Subgroups (each, n=6)	Ovariectomized group	control group (n = 6)	p^a
CC10 (mg/kg)	206.9 ± 25.98	437 ± 59.43	0.000
CC 20 (mg/kg)	161.8 ± 51.55		0.000
hCG (7.5IU/kg)	274 ± 54.81		0.000
CC 10 (mg/kg) with h C G (I.U)	251.5 ± 43.25		0.000
C C20 (mg/kg) with h C G (I.U)	245.5 ± 65.90		0.000

[a]Note: a values represent mean and the associated standard deviation. $p < 0.05$ is considered statically significant.ET of Ovariectomized group compared with control.
Kruskal-Walis, One Way ANOVA and Tukey tests were used to determine significance.

Table.3. Endometrial thickness (ET) of non- Ovariectomized subgroups exposed to Clomiphene Citrate (CC) with and without Human Chorionic Gonadotropin (hCG), sham and control

Subgroups (each, n=6)	Non- Ovariectomizedgroup	sham group (n =6)	control group (n =6)	p^a
CC10 (mg/kg)	261.6 ± 100.45	413.3 ± 58.77	437 ± 59.43	0.000
CC20 (mg/kg)	231 ± 68.78			0.000
hCG (7.5IU/kg)	401 ± 36			0.993
CC10 (mg/kg) with hCG (7.5IU/kg)	329 ± 95.76			0.000
CC20 (mg/kg) with hCG (7.5IU/kg)	287 ± 44.55			0.000

[a]Note: a values represent mean and the associated standard deviation. $p < 0.05$ is considered statically significant.ETof Non-Ovariectomizedsubgroups compared with sham and controlgroups.
Kruskal-Walis, One Way ANOVA and Tukey testswere used to determine significance

Elnaz Rahbar *et al.*

Finally, we found that the negative effects of CC at a dose of20[in Ovariectomized$(p <0.000)$] and10 mg/kg [in Non-Ovariectomized$(p<0.006)$] on ETwas significantly reversed by hCG.
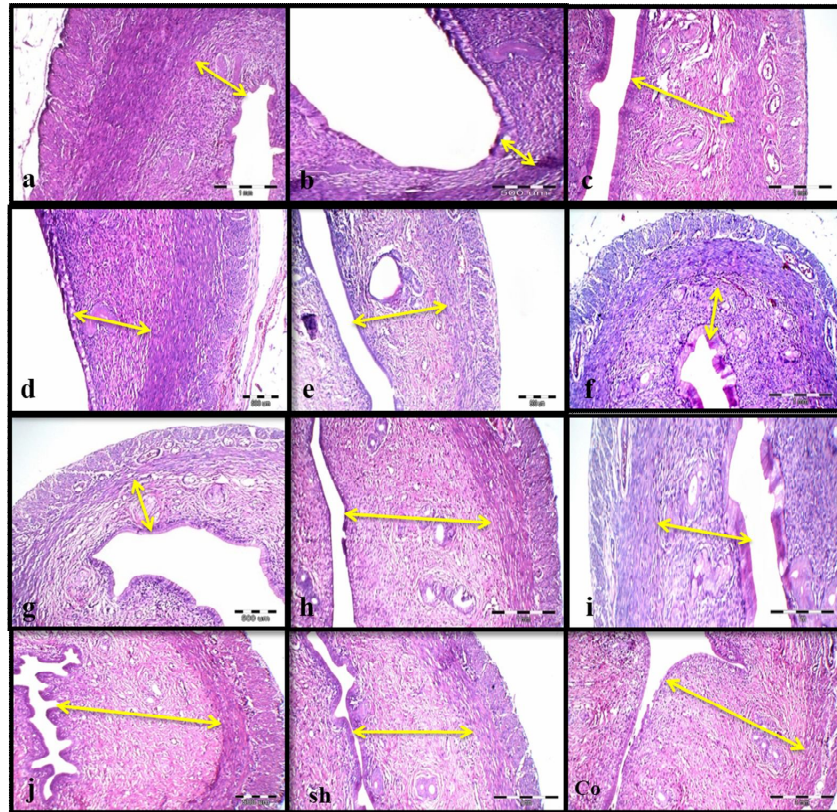
Fig.1. **Endometrial sections, 100X, H&E staining**

a-e sections are related to Ovariectomized subgroups(a: CC10mg/kg, b: CC20mg/kg, c: CC10+hCG, d: CC2+hCG and e: hCG) and **f-j** sections to Non-Ovariectomized subgroups(f: CC10mg/kg, g: CC20mg/kg, h: CC10+hCG, i: CC2+hCG and j: hCG),Subsequently**sh**. and **Co**sections show the ET in sham and control groups. Arrows show the endometrial span, which is significantly reduced as a result of CC alone treatment in experimental groups.

RESEARCH ARTICLE

Evaluating the Effect of Board Characteristic and Ownership Structure on Companies' Stock Liquidity

Saeed Ameeri[1]*, Asgar Pakmaram[2], Saeed Jabbarzadeh[3]

[1]MA Graduated of Accounting, Science and Research University of West Azerbaijan, Urmia, Iran
[2]Assistant Professor, Accounting, Islamic Azad University, Bonab, Iran
[3]Assistant Professor, Accounting, Islamic Azad University, Urmia, Iran.

*Address for correspondence
Saeed Ameeri
MA Graduated of Accounting,
Science and Research University of West Azerbaijan,
Urmia, Iran.
E-mail:

ABSTRACT

In decision making, investors rely on quality and quantity and disclosed information timeless from corporate governance. The manner of investors with this information and their decisions shape demand and supply volume and buy and sell offering price. The corporate governance is one of the most influential factors on the difference of buying and selling price of corporation stock. The difference of buying and selling offered price is also one of the most important liquidity criteria of corporation stock. Therefore, the purpose of this study is the evaluation of the effect of board characteristic and ownership structure on stock liquidity of Tehran stock exchange listed companies. For achievement to the purpose of this research studied 83 companies during five years from 2007 to 2011. The results of the study represent positive and significance relationship between the board independence, the institutional stockholder, the government ownership and authority with stock liquidity.

Keywords: Corporate Governance, Board Characteristic, Ownership Structure, Stock Liquidity.

INTRODUCTION

Since investors and creditors are two main groups of outside users of financial information, the provision of related information for these groups is one of the main apostolate of financial reporting. The financial reporting system should provide information that will be beneficial for users in decisions related to investment, serving credit and other similar decisions. Utility requires that disclosed information will be adequate and sufficient.For making

Saeed Ameeri *et al.*

decision, investors rely on quality and quantity and disclosed information timeless from corporate governances. The manner of investors with this information and their decisions shape demand and supply volume or market depth and offered prices for buying and selling. In other words, the structured and coherent corporation governance has an important role in orientation of investors' decision and role players in stock market and realization of stock markets with high liquidity (Kashanipoor, 2009). One of the most important functions of stock market is the liquidity security. In fact, secondary markets not only provide liquidity by price discovering and ability to transition but also, cause to reduction of capital cost. Non timeless and inaccurate disclosure leads to the increase of adverse selection cost and moral hazard as outcome elements of information asymmetry cause to the reduction of liquidity and increase of capital cost (Ahmadpoor, 2006).The present literature about corporate governance and the difference of buying and selling offered price of stock represent different results, as if some of these results account the corporation governance as increase factor of firm stock liquidity and others account as decrease factor of firm stock liquidity. The only thing that commonly these results show is that if the quality increase of corporate governance cause to the decrease of information asymmetry in firm stock, the difference of buying and selling offered price will reduce too. As a result, stock liquidity will increase or conversely (Etemadi, 2009).With regard to above, the purpose of this research is the evaluation of corporate governance mechanisms effect on stock liquidity. In this research used the criteria of corporate governance that paid less attention in the last research and can be informative for analysts, investors and other users of financial information.

Corporate governance and its basic mechanisms:

Liquidity is explained mainly by adverse selection risk that confronts the investor with information asymmetry. In accordance with investor's viewpoint, the only way for ensuring the accuracy of disclosed information is the strong corporate governance. In fact, some researchers express that the concept potentially cause to information asymmetry reduction. Interest conflict between managers and stockholders, the possibility of expropriation of minority stockholders and defalcation are the examples of this weakness. As a result, they have more chances for aware people that use the advantages of particular information that is in available and will be more expensive for unaware people. Corporate governance is as a setting of mechanism that controls the agency cost reduction by managers' act control and information asymmetry reduction (that imposes by stockholders). So, it is leverage for establishment a relationship between firm and stockholders, new investor absorption andimprovement of stock liquidity (Etemadi, 2009).

The role of board size in corporate governance

One of the factors that determine the effect of board size on liquidity generally relates to the leadership control and the quality of decision process. The agency theory hypothesizes expresses that the board size supports ofleaders' authority by increasing the opposing groups and coalitions. These results are in distributed consultants that have problem in effective tasks and achieved consensus. In this field, Jesen(1992) suggest guidelines for small size. So, the manipulation of managers' evaluation is facilitated that leads to lower quality of published information, increase of information asymmetry and liquidity reduction.

The role of board independence in corporate governance

One of the most important factors of corporate governance system is the independence of board members. The responsibility of board is the independence monitoring on managers' act and managers' commitment to responsibility to stockholders and stakeholders. Board independence is the issue of corporate governance. Although, there is no empirical research that tests this direct relation. Some studies support the signal and agency theory hypothesis by testing of relationship between independence managers and disclosure. Chen & Jaggi (2000) show this positive relation by studying the relationship between external managers and information wide spreading in Hong Kong. This result indicates that independence managers raise company's compliance with regulations, determines

3583

the market transparency and has a positive effect on liquidity.The level of board independence usually measures as one of these methods: tenure or non-tenure two organizational posts by highest executives show that posts of president of the board and highest executives are occupied by a person? Or no, and the other by the members of the board (Rahnamay Rodposhti et al., 2011).

The financial expertise of board

There are some discussions about corporate governance that consist of board composition. About usefulness of managers' expertise, Guner et al (2008) found that the managers who are expert in financial control can effect on corporate reliability by more accurate information and financial statement that are in best audits. So, information asymmetry decreases when liquidity increases. For this Wagner (2008) adds during the board composition, conciliation between independency and competency should be because of having an effective group. Therefore, qualified managers are indicators of published information quality. This may simplifies the absorption of others and then improves the liquidity by entrance of potential new stockholders. Since the law does not define the necessary criteria or skills, there is an implicit way of expertise within the board of director. With the report publication of Baton (2002) the dialogue about the merits of the case managers in the financial recordkeeping began:Financial expertise is a state that every manager that has these criteria, this proficiency has designed in accordance with university (1) or professional experience of office (2).
1. Financial expertise attributes to a manager who has graduated from commercial university or any major of management or accounting of financial.
2. Financial expertise attributes to a manager who has practically experienced or engaged with financial affairs. So, financial managers, inspectors, auditors…are regarded as financial expertise.

The role of CEO Duality

In the most laws of corporate governance recommended that there must be a balance between the board members that no one is able to control the decision making process that is unconditioned. Moreover, responsibility division in best level I firm must be so clear that figures on power balance and board powers (HasasYegane and Baghomiyan, 2006).The lack of separation of board chairman role from CEO Duality causes that one person assumes administrative and supervisory audits. In these cases, board chairman should have more power that wastes stockholders' right. In agency theory, the highest executive posts and board chairman must be separated from each other in order to increase the independent control and supervisory audits of board in firm. Entrusting the post of board president and highest executive in whole setting and increasing of board ability in implement of administrative audits will be done in best condition. In other words, the board of director will have flexibility in evaluation of the performance of the highest executives post and firm monitoring that cause to redistribution of making decision power from managers to board of directors (Rahnamay Rodposhti et al., 2011).

The government role and authority in corporate governance:

In writing of corporate governance remembered of ownership and authority as important mechanisms and it is one of the effective mechanisms that have growing importance. The government can be placed in institutional stockholders definition and is the dominant investor that often authority causes to the changes of firm behavior that rooted from supervisory activities which these investors do it (Veluri and Jenkins, 2006). For example, Abdolsalam et al (2008) in their research found out that there is a direct relationship between government ownership and some firm policies.

Saeed Ameeri *et al.*

The role of ownership and the authority of biggest stockholder in corporate governance

The separation of management from ownership is not the only reason of agency problem and its costs between stockholders and managers. But ownership scattering in some of little stockholder can be a reason. Roee (1990) believes that in the composition of widespreading ownership, none of the small stockholders have any incentive for supervision. So in this case, every stockholder that wants to monitor the firm performance must pay its costs,while the rest stockholders use of its benefits.In empirical studies for measuring ownership concentration introduced different approaches. Such as, Demestez and Len (1985) define the ownership concentration as sum of stock in the authority of 5 or 20 large stockholders of corporation. Rock (1989) and Telgoli et al (2003) define the ownership concentration as sum of the percentages of dominant stockholders with possession of more than 5% (Hassanzadeh baradaran et al., 2011).

The role of institutional stockholders in corporate governance

The dominant stockholders with using of franc influence on decision making and the board structure of firm. So, they can be one supervision source on firm management. In spite of reliable theoretical principles, the empirical results of studies in relation to the relationship between stockholders composition and firm performance joint to each other and sometimes take incoherent results. Stiglitz (1985) argued that one of the most important techniques of controlling and persuading the benefits and the growth of it by management is the growth of institutional stockholder. institutional stockholders is an entity that buys and sells the great volume of securities and it's major function is buy and sell of stock exchange such as, governmental and private banks, pension fund, insurance firms and the social security organization, investment funds and firm, foundations and institutions.Usually, institutional stockholders desire to present accurate and timeless information in firm. And continually deliberate the firm for the precise and accurate presentation about future earnings. They analyze the related information with stock price that are not reflected in current earning and consider it in stock price. Institutional stockholder is one of the mechanisms of corporate governance that can monitor the firm management. So, they would have considerable authority on firm management and assimilate the management interests with stockholders interests (Solomen a.,l 2007).

Stock liquidity

The power of buying or selling asset in at least time and cost has been called the asset liquidity (karami, 2010).the mean of liquidity is simply the facility in buying and selling the stock and the important factor in liquidity of stock market is the difference of offered price of buying and selling stock (Salavati and Rasaiyan, 2007). One of the major characteristic of high liquidity markets is the low difference between buy and sell offered price. It means that the orders of buying and selling have been performed at least time and with suitable price.The effective and quoted difference chooses as liquidity proxy. The difference of quoted price is the transport cost of market, while the difference of effective prices used for illustration of transaction costs (callhen et al., 1997).Heflin et al (2005) show that the effective priced-based measure of the difference would be better for measuring based on price difference for stock liquidity to differences of relative and inexperienced prices. In an ordering market based on efficient price, the best price associated with limited order of sale, whereas the purchasing price is associated with the purchasing of limited order.

THE RESEARCH HISTORY

Namazi and Kermani (2008) in a study with title of the effect of ownership structure on the performance of Tehran stock exchange listed companies demonstrated that there is a significance relationship between the ownership structure and firm performance. They divided the ownership structure in two parts: institutional ownership and private ownership and shows there is a negative and significance relationship between firm performance and institutional ownership. And about the relation of private ownership and firm's performance is not specified.Etemadi

(2009) studied the relation of some of the corporate governance and stock liquidity. They began to study the percentage of independence member in board and the percentage of independence member in board and the percentage of institutional investors as main variable and the difference of buying and selling offered price as dependant variable. In this regard, they studied the five years information of 111 firms (2001-2005). The results show that there is no significance relationship between corporate governance mechanisms and stock liquidity in Tehran stock exchange.Karami (2010) studied the relation of economic value added and liquidity of stock market and in this regard, began to study the related data of 154 listed companies in Tehran stock exchange during the years of 2004 to 2009.the research results show that there is a positive and significance relationship between economic value added and liquidity of stock market and the strong correlation between the variables and firm value show the influence of them to each other.Barbedo et al., (2008) studied the relationship between corporate governance mechanisms and liquidity levels by using the related data of 55 listed companies in Sao Paulo stock exchange in Brazil. They figured out that the probability of transaction based on potential information has been less in firms with more difficult corporate governance.Chung (2008) in a research began to study of the relationship between corporate governance and market liquidity by using the index of governance characteristic affecting on financial transparency and operationally. They used the criteria such as spread, price impact and the probability of transaction based on potential information for liquidity evaluation. And figured out that firms with better governance, narrower spread, the quality index of bigger market have the least impact of price from transaction volume and the reduction of transaction probability based on potential information.Chang et al (2010) studied the empirical relationship between corporate governance and liquidity of stock market. they resulted that firms which have better corporate governance, they have a less difference of buying and selling offered price. They showed probably firms with using of corporate governance standards reduce information asymmetry and therefore increase the stock liquidity.Louckil et al (2010) studied the effect of corporate governance on stock liquidity in Tunisia stock market.

They studied the related data to 49 companies from 1998 to 2007. The research results show that using of corporate governance mechanisms have a direct affect on information asymmetry reduction and therefore increases the stock liquidity.Dumitrescu (2011) studied the relationship between corporate governance and liquidity of stock market. this research results show that firms with better corporate governance and more effective disclosure provisions have a better stock market liquidity and therefore have lower capital cost.Nasrum (2013) in a research studied the effect of ownership structure, corporate governance, investment decision, financial decision and dividend policy of manufacturing listed companies in Indonesia stock exchange. They understood that ownership structure and corporate governance have a positive effect on investment. But, both of them have a negative effect on financial decisions.

RESEARCH HYPOTHESES

As we have said, the present research has been studied for demonstrating the effect of board characteristics and ownership structure on stock liquidity of listed companies in Tehran stock exchange, with regard to last subject, this research contains 2 main hypotheses with 7 secondary hypotheses as this:

H1: The board characteristic effects on stock liquidity of companies.
The secondary hypotheses acquired from first main hypothesis:
H1.1: The board size effects on stock liquidity of companies.
H1.2:The board independence effects on stock liquidity of companies.
H1.3: The financial expertise of board effects on stock liquidity of companies.
H1.4: The separation of CEO Duality effects on stock liquidity of companies.
H2: The ownership structure effects on stock liquidity of companies.
The secondary hypotheses acquired from second main hypothesis:
H2.1:The government ownership and authority effects on stock liquidity of companies.
H2.2:The ownership and authority of the biggest stockholder influences on stock liquidity of companies.
H2.3:The existence of institutional stockholders effects on stock liquidity of companies.

Saeed Ameeri *et al.*

METHODOLOGY, STATISTICAL SOCIETY, STATISTICAL EXAMPLE

The purpose of this research is application and research scheme is declining regression. With regard to formatting of research subject that is a kind of X to Y. The method of this research is correlation method. For collecting required data, we used of different kinds of library method and for collecting the required data in relation to stock exchange has used of Rahavard Novin software and Research and development managing and Islamic studies site. In this research, we studied 5 periods of Tehran stock exchange listed companies from 2007 to 2011.Because of great amount of statistical society and some inconsistencies among members of society, the below conditions are placed for statistical example. So, the statistical example chose with systematic write off method. The considered conditions are:-The companies that listed in stock exchange before 2007.-the end of fiscal year will be in the end of March.-the company doesn't change the fiscal year during the study.-the company is not a member of investment companies that act special like retirement funds, commercial endowment, insurance firms, investment banks.-transaction sample of firms is active and has not stopped in stock exchange more than 6 months.Given the above condition, we studied 83 active firms during the years of 2007 to 2011.

VARIABLES AND RESEARCH METHODS

The research model contains two independent variables i.e. board characteristics and ownership structure and the dependent variable, stock liquidity. For evaluation of corporate governance mechanisms on stock liquidity, we used the model of Chang et al (2009). It has showed as follow:

$$BA = \beta_0 + \beta_1 INSTOWN + \beta_2 IND + \beta_3\ DUAL + \beta_4 BCOMP + \beta_5 BSIZE + \beta_6\ BHold + \beta_7 BAGENT + e$$

BA: the difference of buying and selling offered price of stock and is the important criteria of stock liquidity that has used in Vanktash's and Chiang's research (1986) and its measurement is as follow:

$$BA_i = \frac{AP - BP}{\frac{AP+BP}{2}}$$

I: Case study
AP: the bestselling offered price of firm stock in every day.
BP: the best buying offered price of firm stock in every day.
INSTOWN: the percentage of institutional stockholders that is equal to the ratio of firm stock that preserves by major investment entities to circulated stock and is disposal to stockholders.IND: the board independence that is equal to the ratio of independence member in board to whole member of board.
BCOMP: the financial expertise that is equal to financial graduated between board members (at least 1 member) choose s number 1otherwise 0.
BSIZE: the board size is equal to the members of board of directors.
DUAL: the separation CEO Duality that is equal to the task separation chooses number 1 otherwise 0.
B HOLD: the ownership and authority of the biggest stockholder, that is equal to the percentage of under possession stock or preserved by the biggest stockholder of firm.
BAGENT: the government authority in board of directors, that is equal to if the member of board is the agent of governmental entity chooses number 1 otherwise number 0.
SIZE: For calculation the firm size use the logarithm of firm's total asset.
LEV: financial leverage is equal to the ratio of total liability to firm's total asset.as the degree of financial leverage is bigger; the degree of financial risk is greater.
LN vol: the natural logarithm of trade volume measures with LN annual mean of trade volume.

Saeed Ameeri *et al.*

RESEARCH FINDINGS

The results presented in tables (1), (2) which take from the analysis of data descriptive statistics.
Testing of variable's normal distribution:
For testing the above hypothesis, we used Kolmogorov-Smirnov sample.
With regard to a significance level of Kolmogorov-Smirnov for dependent variable and control variables, it's necessary to mention that normality of dependent variable leads to normality of total model, so data distribution is normal in this model.
The results from hypothesis testing
In this part the hypothesis testing and their results will be present.

Hypothesis testing1-1:

The board size effects on firm's stock liquidity.
The multivariable model used for this hypothesis testing.
$$BA_{i,t} = C + \beta_1(BSIZE_{t,t}) + \beta_2(SIZE_{i,t}) + \beta_3(LEV_{i,t}) + \beta_4(LNVOL_{t,t}) + \varepsilon_{i,t}$$
In table 4,with regard to high probability level of t statistic from acceptable significant for beta coefficient, the results show that board size has a positive effect and from statistical point of view has an insignificance effect on stock liquidity. So, it's not acceptable at 95% reliability.

Hypothesis testing 2-1:

Board independence effects on firm's stock liquidity.
The multivariable model used for second hypothesis testing.
$$BA_{i,t} = C + \beta_1(IND_{i,t}) + \beta_2(SIZE_{i,t}) + \beta_3(LEV_{i,t}) + \beta_4(LNVOL_{i,t}) + \varepsilon_{i,t}$$
With regard to second hypothesis testing, we conclude that the board independence has a positive effect on stock liquidity and correlation rate between variables of this hypothesis is acceptable at 95% reliability.

Hypothesis testing 3-1:

Financial expertise of board effects on firm's stock liquidity.
The multivariable model used for third hypothesis testing.
$$BA_{i,t} = C + \beta_1(BCOMP_{i,t}) + \beta_2(SIZE_{i,t}) + \beta_3(LEV_{i,t}) + \beta_4(LNVOL_{t,t}) + \varepsilon_{i,t}$$
In table 6,with regard to high probability level of t statistic from acceptable significant for beta coefficient, the results show that financial expertise of board has a negative effect and from statistical point of view has an insignificance effect on stock liquidity. so, the third hypothesis is not acceptable at 95%reliability.

Hypothesis testing 4-1

The separation of managing director tasks from chief and vice chancellor of board effects on firm's stock liquidity.
The multivariable model used for fourth hypothesis testing.
$$BA_{i,t} = C + \beta_1(DUAL_{t,t}) + \beta_2(SIZE_{i,t}) + \beta_3(LEV_{i,t}) + \beta_4(LNVOL_{t,t}) + \varepsilon_{i,t}$$
In table 7, with regard to high probability of t statistic from acceptable significant for beta coefficient the results show that the separation of CEO Duality has a negative effect and from statistical point of view has an insignificance effect on stock liquidity. So, the fourth hypothesis is not acceptable at 95% reliability.
Hypothesis testing 1-2:

Saeed Ameeri *et al.*

The government ownership and authority effects on firm's stock liquidity.
The multivariable model used for fifth hypothesis testing.

$$BA_{i,t} = C + \beta_1(BAGNET_{i,t}) + \beta_2(SIZE_{i,t}) + \beta_3(LEV_{i,t}) + \beta_4(LNVOL_{i,t}) + \varepsilon_{i,t}$$

With regard to fifth hypothesis testing, we conclude that the government ownership and authority has positive effect on stock liquidity and correlation rate between the variables of this hypothesis is acceptable at 95% reliability.

Hypothesis testing 2-2:

The ownership and authority of the biggest stockholder effects on firm's stock liquidity.
The multivariable model used for sixth hypothesis testing.

$$BA_{i,t} = C + \beta_1(BHOLD_{i,t}) + \beta_2(SIZE_{i,t}) + \beta_3(LEV_{i,t}) + \beta_4(LNVOL_{i,t}) + \varepsilon_{i,t}$$

In table 7,with regard to high probability level of t statistic from acceptable significant for beta one coefficient, the results show that the ownership and authority of the biggest stockholder has a positive effect and from statistical point of view has an insignificance effect on stock liquidity. So, the sixth hypothesis is not acceptable at 95% reliability.

Hypothesis testing 3-2:

The institutional stockholder effects on firm's stock liquidity.
The multivariable model used for seventh hypothesis testing.

$$BA_{i,t} = C + \beta_1(INSTOWN_{i,t}) + \beta_2(SIZE_{i,t}) + \beta_3(LEV_{i,t}) + \beta_4(LNVOL_{i,t}) + \varepsilon_{i,t}$$

With regard to seventh hypothesis, we conclude that the presence of stockholder has a positive effect on stock liquidity and correlation rate between the variables of this hypothesis at is acceptable at 95% reliability.

CONCLUSION

For doing this research, we tested two main hypotheses that contain seven subordinate hypotheses. The purpose of this research is the evaluation of the effect of board characteristic and ownership structure on stock liquidity of listed companies in Tehran stock exchange. in this research, with regard to data collection of dependent and independent variables the presented model takes from Chang's and his colleagues model(2009)that codified and has been used.While there is a positive and significance relationship between board independence and stock liquidity, the companies which their managers have high independency, have low difference of buy and sell offering price of stock. The increase of manager's independence shows the increase in speedy and facility of buying and selling stock and stock market's ability in investment absorption.The presence of positive and significance relationship between ownership and government authority and stock liquidity shows that companies that have high government ownership and authority, they have low difference of buy and sell offering price. If the member of board of director is an agent of governmental entity represents the government ownership and authority in stock company.With regard to positive and significance relationship between institutional stockholders and stock liquidity, shows that if companies want to reduce the cost of performance monitoring, one of the cost reduction method is the presence of institutional stockholders. The results from this research show that companies which have institutional stockholders the difference of buy and sell offering price is reducing in those companies.The result from this research is in accordance with the result of Kashanipoor research (2009). Kashanipoor studies the relation of some governance mechanisms of company with stock liquidity and the results show that the companies with more independence of board structure and more effective performance of board have more stock liquidity. In fact, the companies which have High concession for the quality of corporate governance, they have lower difference for buy and sell offering price of stock.The findings of this research is not in accordance with the result of Etemadi and his colleagues' research(2009). Etemadi studies the relation of some corporate governance mechanisms and stock liquidity. He began to study the percentage of independence member in board and the percentage of institutional investors as a

majorvariable and the price difference of buying and selling as a dependent variable. The results indicate that there is no significance relationship between corporate governance mechanisms and stock liquidity in Tehran stock exchange.The result from this research is in accordance with Leoz et al research (2003).With using the multiple criteria from corporate governance showed that the strong and effective corporate governance with reduction of information asymmetry leads to the increase of operational and financial transparency and as a result increases the stock liquidity by reducing the difference of buy and sell offering price of stock.The results from this research are in accordance with the result of Chang et al research (2009). They studied the empirical relationship of corporate governance and stock market liquidity. They concluded that companies which have better corporate governance, they have a low difference of buy and sell offering price of stock. They showed that the companies with using the standards of corporate governance reduce the information asymmetry and therefore increase the stock liquidity.

The results from this research are completely in accordance with Louckil et al research (2010). They studied the effect of corporate governance on stock liquidity in Tunisia stock market. The results show that using the corporate governance mechanisms has a direct effect in reducing the information asymmetry and therefore increases the stock liquidity.The results from this research are in accordance with Domiterscue research (2011). Domiterscue studied the relationship between corporate governance and stock liquidity. His results show that the companies with better corporate governance and effective disclosure rules, have better stock market liquidity and therefore have lesser capital cost.

Research limitations:

The major limitations of research are the lack of information and data of some companies in database that cause companies do not present information. Especially, the information about buying and selling offered price of stock made that most of companies were deleted from research statistical sample.With regard to applied limitations in choice of statistical sample, the choice of some companies was limited and some of the industries did not have an agent. As a result, this issue affects the research result and the results are not extendable to the total present companies in Tehran stock exchange.

REFERENCES

1. Abdelsalam O., El-Masry A., and Elsegini S. (2008). Board composition, ownership structure and dividend policies in an emerging market, Further evidence from CASE 50. Managerial Finance, 12: 953-964.
2. Ahmadpoor A., and Rasaiyan A. (2006). The relationship between risk criteria and the difference of buy and sell offering price of stock in Tehran stock exchange, the studies of Auditing and Accounting, No 46
3. Barbedo C. H., Camilo-Da-Silva E., and Leal R. (2007). Probability of Information-Based Trading, Intraday Liquidity and Corporate Governance in the Brazilian Stock Market, ssrn.
4. Chen J., and Jaggi B. (2000). Association Between Independent Non-Executive Directors, Family Control and Financial Disclosures in Hong Kong, Journal of Accounting and Public Policy, Vol. 19, p. 285-310.
5. Chung H. (2008). Investor Protection and the Liquidity of Cross-Listed Securities: Evidence from the ADR Market. Journal of Banking and Finance, 30 (2008), 1485-1505.
6. Chung K., Elder J., and Kim J. (2010). Corporate Governance and Liquidity, Journal of Financial and Quantitative Analysis.
7. Demsetz H., and Lehn K. (1985). The structure of corporate Ownership: Causes and Consequences, Journal of Political Economy, (93) 6 pp. 1155-1177.
8. Dumitrescu A. (2011). Corporate Governance and Market Liquidity, ssrn.
9. Etemadi H., and Rasaiyan A. (2009). The relationship of some of corporation governance mechanisms and stock liquidity, the journal of capital and development, No 5.

10. HasasYegane Y., and Bagomiyan R. (2006). The role of board in Corporategovernance, first part,monthly, year 20, No 173, p. 30-33.

11. Hassanzadeh Baradaran R., Badavarnahandi Y., and HosseinBabaei G. (2011).The study of the Relationship between Corporation Governance Mechanisms with Established Value for Stock Owners and Economic Value Added, Quarterly Journal of Accounting and Auditing, 19, No 2.

12. Heflin F., Shaw W., and Wild J. (2005). Disclosure policy and market liquidity: Impact of depth quotes and order sizes, Contemporary Accounting Research, Vol. 22, p.829-866

13. Jensen M. (1992). The modern industrial revolution, Exit, and Failure of the international control Systems », Journal of Finance, Vol 20, p. 831-830.

14. Karami G., and Nazari M., and Shafipoor S. M. (2010). The economic value added and stock market liquidity, financial research journal, No 30.

15. Kashanipoor M., and Mehrani S. (2009). The study of relation of some of corporation governance mechanisms with stock liquidity, financial accountingresearch, No 2.

16. Louckil N., and Yousfi O. (2010). Does corporate governance affect stock liquidity in the Tunisian Stock Market, MPRA, Paper, No.28697.

17. Namazi M., and Kermani E. (2008). The effect of the ownership structure on the performance of Tehran stock exchange listed companies, the journal of Auditing and Accounting research, 15, No 53.

18. Nasrum M. (2013). The Influence of Ownership Structure, Corporate Governance, Investment Decision, Financial Decision and Dividend Policy on the Value of the Firm Manufacturing Companies Listed on The Indonesian Stock Exchange", Journal Managerial Volume 1 Number 1.

19. Rahnamay Rodposhti F., Nikoomaram H., and Shahverdiyani S. (2011). Strategic FinancialManagement (Value Creation) [Risk Based Management]. The FinancialManagement of Governance, Tehran: Hakim Bashi Publication.

20. Salavati S., and Rasaiyan A. (2007). The Relationship Between Financial Information and Difference of Buy and Sell Offering Price of Stock in Tehran Stock Exchange, the MA thesis of Accounting of Mazandaran University.

21. Solomon J. (2007). Corporate Governance and Accountability. Second Edition, John Wiley & Sons, Ltd, England.

22. Stiglitz J. (1985). Credit markets and the control of capital, Journal of Money, Credit and Banking, Vol. 7, pp. 133-52.

23. Velury U., and Jenkins D. (2006). Institutional ownership and the quality of earnings, Journal of Business Research, 59, 1043-1051.

24. Venkatesh P., and Chiang R. (1988). Information asymmetry and the dealers bid-ask spread: A case study of earnings and dividend announcements. The Journal of Finance 41 (5): 1089-1102.

Table 1: The results from the descriptive analysis of research quantity data.

Variable	BA	Bsize	IND	BHOLD	INSTOWN	SIZE	LEV	LNVOL
Observation	415	415	415	415	415	415	415	415
Average	0/116	0/000	5/036	0/732	0/594	13/461	0/621	18/588
STD	0/123	0/800	0/228	0/148	0/178	1/669	0/181	1/566
Maximum	0/000	0/130	4/000	0/000	0/000	9/336	0/040	15/046
Minimum	0/516	0/240	7/000	0/957	0/886	18/395	0/915	23/065

Table 2:the frequency analysis of research nominal data.

Variable	BCOMP	DUAL	BAGENT
Observation	415	415	415
Answer	attendance/ non attendance	separation / non separation	penetration / non penetration
Frequencies	186 / 229	160 / 240	149 / 266
Frequencies Percentage	55.2 / 44.8	%40 / %60	35.9 / 64.1

Table 3:Kolmogorov-Smirnovsample

variable	Observation	Variable type	Z- Value	Sig	result
BA	415	Dependent	1/404	0/068	Normal
Size	415	Control	0/632	0/820	Normal
Lev	415	Control	1/047	0/223	Normal
LNvol	415	Control	1/386	0/074	Normal

Table 4: The results from first hypothesis regression

Variable	Coefficient	t-statistic		Significant
Constant	0/344	3/719		0/000
BSIZE	0/020	1/282		0/200
SIZE	-0/111	-3/015		0/003
LEV	0/068	2/659		0/008
LNVOL	-0/012	-3/263		0/001
F-statistic	Significant	Durbin-Watson Test	R^2	Adjusted R^2
20/407	0/000	1/813	0/287	0/273

Table 5: The results from second hypothesis regression

Variable	Coefficient	t-statistic		Significant
Constant	0/474	8/484		0/000
IND	0/072	3/511		0/000
SIZE	-0/010	-3/011		0/003
LEV	0/067	2/695		0/007
LNVOL	-0/011	-3/120		0/002
F-statistic	Significant	Durbin-Watson Test	R^2	Adjusted R^2
22/122	0/000	1/761	0/303	0/289

Saeed Ameeri *et al.*

Table 6:the results from third hypothesis regression

Variable	Coefficient	t-statistic		Significant
Constant	0/436	7/871		0/000
BCOMP	-0/013	-1/570		0/080
SIZE	-0/009	-2/627		0/009
LEV	0/068	2/692		0/007
LNVOL	-0/012	-3/278		0/001
F-statistic	Significant	Durbin-Watson Test	R^2	Adjusted R^2
21/085	0/000	1/772	0/223	0/219

Table 7:the results from fourth hypothesis regression

Variable	Coefficient	t-statistic		Significant
Constant	0/572	8/122		0/000
DUAL	-0/023	-1/426		0/096
SIZE	-0/012	-3/376		0/001
LEV	0/041	1/518		0/129
LNVOL	-0/013	-3/414		0/001
F-statistic	Significant	Durbin-Watson Test	R^2	Adjusted R^2
17/820	0/000	1/613	0/148	0/139

Table 8:The results from fifth hypothesis regression

Variable	Coefficient	t-statistic		Significant
Constant	0/494	8/772		0/000
BAGNET	0/038	4/194		0/000
SIZE	-0/012	-3/354		0/001
LEV	0/063	2/546		0/011
LNVOL	-0/013	-3/619		0/000
F-statistic	Significant	Durbin-Watson Test	R^2	Adjusted R^2
23/105	0/000	1/782	0/313	0/299

Table 9: The results from sixth hypothesis regression

Variable	Coefficient	t-statistic		Significant
Constant	0/416	6/893		0/000
BHOLD	0/032	1/061		0/289
SIZE	-0/011	-2/995		0/003

Saeed Ameeri *et al.*

LEV	0/068	2/665		0/008
LNVOL	-0/012	-3/175		0/002
F-statistic	Significant	Durbin-Watson Test	R^2	Adjusted R^2
20/365	0/000	1/813	0/286	0/272

Table 10:The results from seventh hypothesis regression

Variable	Coefficient	t-statistic		Significant
Constant	0/481	8/532		0/000
INSTOWN	0/097	3/932		0/000
SIZE	-0/008	-2/422		0/016
LEV	0/079	3/182		0/002
LNVOL	-0/013	-3/563		0/000
F-statistic	Significant	Durbin-Watson Test	R^2	Adjusted R^2
22/575	0/000	1/770	0/308	0/294

RESEARCH ARTICLE

Optical Absorption Study of Amorphous Silica Glass Doped with Iron by Spark Plasma Sintering

Mojtaba Abbasi, Ali Akbar Farashiani* and Ali Salemi Golozani

Department of Materials Engineering, Faculty of Engineering, Karaj Branch, Islamic Azad University, Karaj, Iran.

*Address for correspondence
Dr. Ali Akbar Farashiani
Department of Materials Engineering,
Faculty of Engineering, Karaj Branch,
Islamic Azad University,
Karaj, Iran.

ABSTRACT

Fused quartz containing 0-3wt% iron with a relative density of 90% has been prepared by the process of the spark plasma sintering at 1200 ° C and its optical properties were investigated.Fourier transform infrared spectroscopy results indicated a network composed of silica and absence of unreacted materials. Fused quartz shows a light transmission of 29% at a wavelength of 800 nm that by increasing the percentage of iron to 3% by weight, the amount is reduced up to 11%.

Keywords: optical properties, silica glass, spark plasma sintering

INTRODUCTION

Transparentfused quartz has so many attractive features such as low thermal expansion coefficient, low electrical conductivity, high chemical resistance and etc. that make it suitable for different applications (including from simple applications of colored glasses to complex applications in optical windows, etc.). Usually transparent silica glass is produced by melting at high temperatures (in the range of 2000-2300 ° C).One of the most important challenges for the preparation of glass istransparent glass production withspecified lighttransmission. For this purpose, different methods of glass preparation have been used including the sol-gel process, vapor phase deposition, casting tape and etc..In this regard, in addition to the method of preparation and raw materials, the amount of doping with other elements is an effective parameter foramount of light transmittanceat different wavelengths (Zhang. J. et al (2012)).

Ali Akbar Farashiani *et al.*

Quick sintering by spark plasma is one of the latest manufacturing processes that due to the growing technology needfor high quality components and homogeneous structures,it has been lately considered. One of the most important and most significant advantage of this method is the production of parts with different combinations such as metal, ceramic metal, composites and etc. (Munir. Z.A. et al (2011)).In this study xerogel silica powder containing iron was prepared by sol-gel process and was converted to glass by the spark plasma sinteringmethod.Optical properties of the glass were also investigated in respect to the weight of iron.

MATERIALS AND METHODS

Materialsused for glass doped with iron preparation are given in Table 1.

Sample Preparation

In this methoda two-step acid-basemethod was used to form silica gel containing different percentages of iron (Munir. Z.A. et al (2011)).Initially, Tetraethyl orthosilicatewas hydrolyzed (hydrolysis)in the presence of a small amount of nitric acid. Addition of iron chloride facilitates the hydrolysis processbecause of its acidity nature (Kajihara.K. et al (2009)).In order to polymerization of hydrolyzed branches, pH of the solution wasincreasedby adding an aqueous solution of ammonia. Increasing pH, in addition to facilitating the condensation polymerization of silica branches, will lead to a macroscopic phase separation and gelation process. Also in this phase, iron hydrate deposits and is trapped within the gel network. Finally the aqueous gel (hydrogel) was obtained at 70 ° C and dried for 24 h and xerogel silica powder containing iron wasprepared.

Sintering and glass preparation method

To prepare silica glass doped with iron, obtained powder Xerogelwas treated under the spark plasma sintering process.First the graphitebar was filled with 6 grams Xerogeland after the manual pressing and putting the rod, the bar was placed into the chamber. By Turning on the unit, the ground pressure of 10 MPa is appliedand then the system is vacuumed while the temperature was controlled by switching the amperage.

RESULTS AND DISCUSSION

Simultaneous thermal analysis

To investigate the thermal behavior ofXerogel silica and determination of glass temperatures, simultaneous thermal analysis were performed using PL1640 in the range of 0-1200-0 ° C. For this purpose, the analysis was applied on the samples silica powder Xerogelcontaining 1 wt% up to temperature to 1200 ° C (Figure 1).As seen in the figure, an endothermic peak is observed at around 100-200 ° C with severe weight loss in the structure of the sample that could be related to the release of water. In the following, the obvious change was not observed until about 1000 ° C andat that temperature, an exothermic peak can be seen which is likely related to the glass conversion process. Gradual weight loss of samples at temperatures more than 200 ° C is due to internal changes and emersion of bands that are not hydrolyzed.

The spark plasma sintering process

The most important part of the studyis glass preparation using the spark plasma sintering method. Finding the right temperature and holding time on the critical temperatures are the requirements for this process to complete that. The critical temperatures are in the range of 200 ° C i.e. temperature of the water emissionand the critical temperature of glass conversion. To avoid stress in these two parts,the temperature is changed with controlled rate. Length Change

insintered xerogelpowder containing 0% Fe in respect to a temperature up to 1200 ° C are shown in Figure 2.As can be seen in Figure 3, three rangesare in a recognizable form. The first zone is below 200 C. In this range due to the removal of structural water and the pressure at the same time reduces the height reduction of the segment (increasing the height) is observed. Gas emersionfrom the sample is traceable with vacuum break. So that the change in temperature of about 100 ° C for 7 min, height powder decreases about 4 mm. The other range is related to the relatively stable situation of the powder. In the range of 200-800 ° C, the powder does not actually changes while at 600 ° C for 1 min, only about 2 mm reduction in height is observed.After this process, we entered the final stage. At 950 ° C, the applied pressure was increased from 10 to 20 MPa that were recorded as a breakthrough moment in the plot. Next, the sample was heated to a temperature of 1200 ° C. Another important point in this process is the height of the sample changed at a temperature of 1200 ° C without increasing temperature. This phenomenon can be attributed to glass state conversion that without increasing the temperature, rearranging of the particles will cause the reduction of the sample. According to this chart andobtained glass, the transformation temperature is determined 1200 ° C and shelf life was considered at a maximum of 15 minutes.

Fourier infrared spectroscopic analysis

Fourier infrared spectroscopic analysis was used to identify the composition of the glass by using Brucker Vector 33. Figure 3 shows IR spectrum of silica glass containing 1.5wt% irons. As can be seen in the figure, there is no band in the spectrum of Silanol groups that represents the completion of the glass formation and the absence of the unreacted compound. The presence of symmetric and asymmetric Si-O-Si bonds also reflects the formation of the silica network.The presence of the peak of the Fe-O and a shoulder in the range of 580 cm-1can be the reasons for the formation of magnetite phase in the sample.The absorption band around 1600cm-1 is related to the HOHthat is probably due to water absorption and porosity of the surface of the glass after the process of measuring the density using the Archimedes method (Fernandes.M.T.C (2013), Predoi.D. (2007)).

Microstructural study

Glass microstructure was examined by scanning electron microscope Philips XL30 model. Scanning electron microscope image of dried silica gel and silica glasses containing different percentages of iron fracture surface is shown in Figure 4.As shown in Figure (a), the average grain size Xerogel powder is about 200-300 nm. It can be seen, the addition of 0.5wt% iron (Figure C) in the silica glass (figure B) causes the smaller grain size. Due to the lack of a glass investigation using microscope systems in the literature, this issue can be attributedto formation of more of germination places in phase of the iron. But with the increase of iron, the grain size growth for glass containing 3 wt% iron (Figure H) has increase compared with other glasses. This can be attributed to increasing the acidity by increasing the percentage of ironin primary cell.

The investigation of light transmittance process

The optical behavior of glass fragments were determined by spectrophotometer model Epoch.Following diagram shows thelight transmittance in the 200-800 nm wavelengthin respect to different percentage of doped iron.

As can be seen in the figure,light transmittance of the sintered silica glass By spark plasma at a wavelength of 800 nm is about 29% that is in good agreement with glass developed by Zhang et aland the amount of loss can be due to the presence of impurities (graphite) in pieces.With the addition of iron to the glass, light transmittance is reduced at a wavelength of 800 nm and light transmittance at the higher wavelengths starts.

CONCLUSION

In this project, silica glass with the relative density of 90% is produced using a Tetraethyl orthosilicate and acid-base method and process of spark plasma sintering at 1200 ° C and the effect of adding iron to iron-doped silica glass light transmission properties were investigated. The results show the addition of iron to chloride Tetraethyl orthosilicate in one hand accelerates the hydrolysis process and in other hand it causes the delay in the process of gelation and also it increases the grain size due to the more acidity of primary celland this issue decreases the light transmittance of silica glass up to 11 percent.

REFERENCES

1. Aravind. P. R, (2008), 'Mixed Oxide Silica Aerogels Synthesised Through Non-Supercritical Route for Functional Applications', Ph.D thesis of Cochin university of science and technology.
2. Fernandes. M.T.C., Garciaa. R.B.R., Leite, C.A.P., Kawachi. E.Y, (2013), 'The competing effect of ammonia in the synthesis of iron oxide/silica nanoparticles in microemulsion/sol–gel system', Colloids and Surfaces A: Physicochem. Eng. Aspects, 422: 136– 142.
3. Kajihara. K., Hirano. M., Hosono.H, (2009), 'Sol-gel synthesis of monolithic silica gels and glasses from phase-separating tetraethoxysilane–water binary system', Chem. Commun., 18: 2580–2582.
4. Munir.Z.A, Quach.D.V, Ohyanagi. M, (2011), 'Electric Current Activation of Sintering: A Review of the Pulsed Electric Current Sintering Process', J. Am. Ceram. Soc., 1: 1–19.
5. Predoi. D., Crisan. O, Jitianu. A., Valsangiacom. M.C., Raileanu. M., Crisanc.M., Zaharescu.M, (2007). 'Iron oxide in a silica matrix prepared by the sol–gel method', Thin Solid Films, 515: 6319–6323.
6. Zhang. J., Tu. R., Goto. T, (2012), 'Fabrication of transparent SiO_2 glass by pressureless sintering and spark plasma sintering', Ceramics International, 38: 2673–2678.

Table 1.Materials used in the preparation of silica glass doped with iron

Name	Chemical formula	Company	ID
Tetraethyl ortho silicate	$Si(C_2H_5O)_4$	Merck - Germany	8.00658
Iron chloride III	$FeCl_3$	Merck - Germany	103943
Aqueous solution of ammonia	NH_4OH	Merck - Germany	1.05432
Nitric acid	HNO_3	Merck - Germany	1.00443

Table 2. The composition of samples containing different percentages of Fe (mole)

Component	Solution 1				Solution 2	
	Tetraethyl ortho silicate	Iron chloride	Nitric acid	Water	Ammonium	Water

Ali Akbar Farashiani *et al.*

0% Fe	1	0	0.002	5	0.02	5
0.5% Fe	1	0.009	0.002	5	0.02	5
1 % Fe	1	0.018	0.002	5	0.02	5
1.5% Fe	1	0.027	0.002	5	0.02	5
2% Fe	1	0.036	0.002	5	0.02	5
2.5% Fe	1	0.045	0.002	5	0.02	5
3% Fe	1	0.054	0.002	5	0.02	5
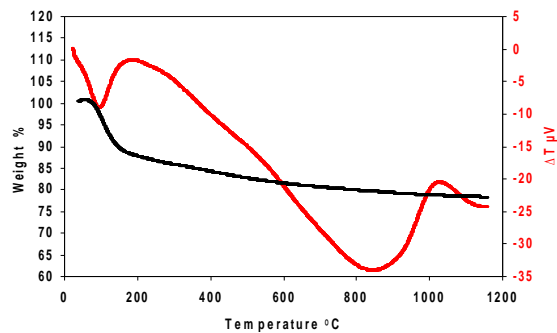
Figure 1. Simultaneous Thermal Analysis of Xerogel powder containing 1% iron
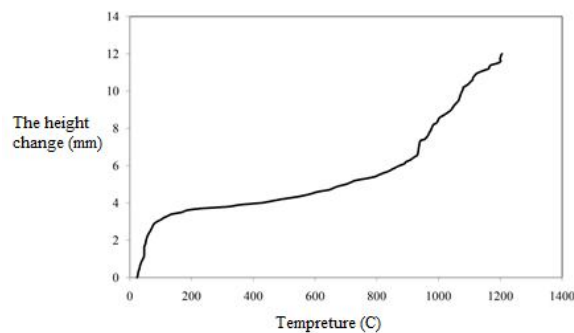
Figure 2: Changes in the height of the powder for powder containing 0% iron temperature up to 1200 ° C
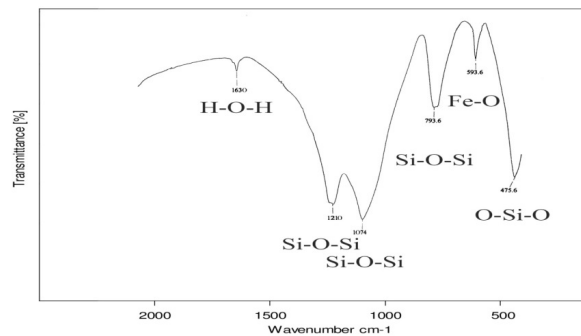
Figure 3: Fourier infrared spectroscopic spectroscopy of silica glass samples containing 1.5wt% Fe
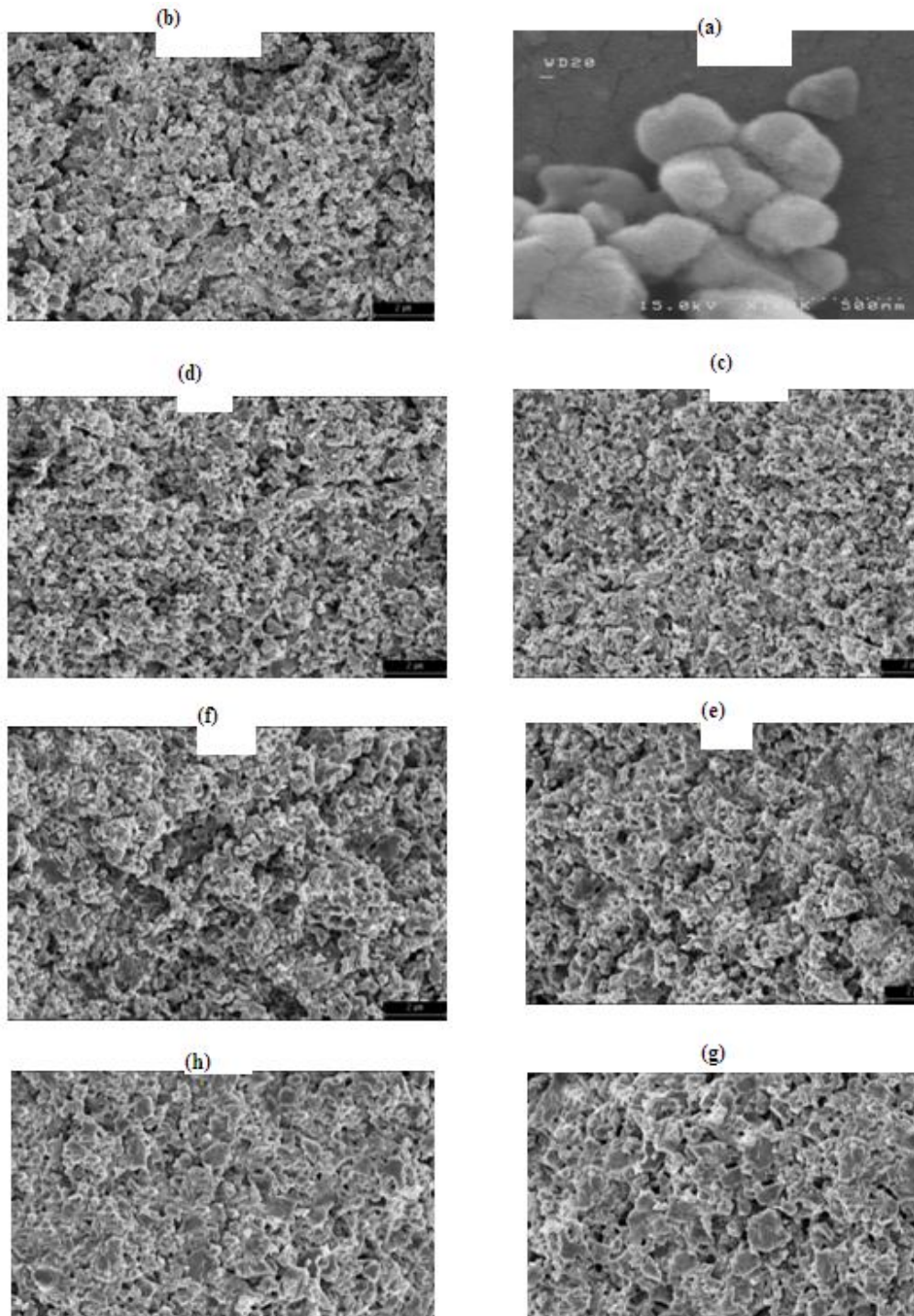
Figure 4: Scanning electron microscopy (a) dried Xerogel silica and silica glass containing (B) 0, (c) 0.5 (d) 1, (e), 1.5, (f) 2, (g) 2.5 and (c) 3 wt% iron

Indian Journal Of Natural Sciences

www.tnsroindia.org. © IJONS

Vol.5 / Issue 29/ April 2015

International Bimonthly

ISSN: 0976 – 0997

Ali Akbar Farashiani *et al*.
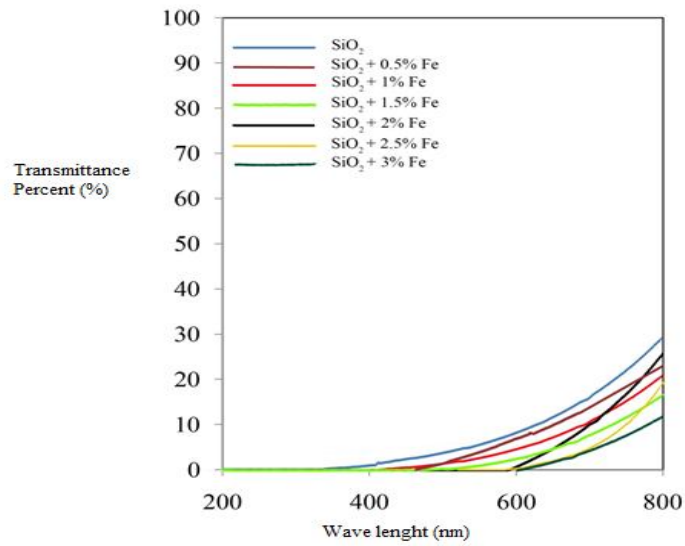
Figure 5: Light transmittance versus wavelength for different percentages of iron-doped

RESEARCH ARTICLE

Ranking of Compensation System of Knowledge Workers by Means of Fuzzy Multi- Criteria Decision Making Technique (Case Study: Islamic Azad University, West Tehran Branch)

Mersedeh Adabi*

PhD student in Governmental Administration human resource trends Islamic Azad University, UAE branch.

*Address for correspondence
Mersedeh Adabi
PhD student in Governmental Administration human resource trends,
Islamic Azad University,
UAE branch.

ABSTRACT

The business strategy experts argue that this steering determines the direction of corporate trend to achieve sustainable competitive advantage in the given environment. In other words, the steering is deemed a as tendency tool, which the organization possesses to allocate its important long term resources. Such a steering system serves as a tool to address the important issues or success factors at levels of universities and or some part of them and importance of this issue is related to services compensation system and taking approach toward globalization trend, Healthcare and Security of personnel (HSE) in organizations, welfare plans for organizations, analysis of job regarding the Human Resources jobs and planning, concept of customer's satisfaction versus thoughts, skills, and expertise of planning for academic students, which should be further studied and explored in today and global organizations so that we are able to acquire customer's satisfaction. We tend to subject of services compensation system in the present investigation that includes (economic, motives, justice, and cultural) factors among knowledge workers, which have been employed for ranking via questionnaire and polling from the experts and it indicates the results came from Fuzzy Multi- Criteria Decision Making technique in which the maximum importance rate among knowledge workers belongs to variables of Quality of Working Life and Extroversion with significance levels 0.57 and 0.55 respectively and they are assumed as most effective factors in compensation system among other knowledge workers so if they are implemented they may contribute the university in the path of realization of the its given outlooks and goals.

Mersedeh Adabi

INTRODUCTION

The services compensation system is defined by different concepts. The personnel assume compensation system as a result of efforts for the outstanding work bonus (reward) while the employer attributes it to their measures and potentials in return of investment and/ or training and education of their own experts. Often, the personnel consider the services compensation as the salaries, which they receive versus working (Ittner et al, 2007). The compensation system management is a term that has been posited in American books but it is only assumed as a claim. The payment and salaries and wages management are the proposed terms in this system (Brandes et al, 2006). The services compensation system is not required being assumed as only the concept including salaries and wages, but it comprises of financial and non- financial benefits so with respect to this fact that the life culture and standards in various communities include certain parameters for quality of life as well as quality of working life, the services compensation in any organization should be designed and implemented proportional to conditions in extra organizational and intra organizational environment (Hofstede et al, 2004). In any organization, the compensation system should be designed as expedient to other organizational changes proportionally and it is better for this system to be dynamic and flexible in terms of everyday changes under environmental conditions of compensation system and other organizational infrastructures and the work flow of manpower in human resources may be described as similar to a water source or pool (Kury and Kenneth WM, 2007). The researchers believe that the achievement of Japan in industries and management is one of the important reasons for their attention to organizational culture. Paying attention to culture of the organization is deemed as the paramount factor to create transformation, development, and restoration plan in the given organization and using it is considered as strong point for that organization. In other words, if we assume change and development as a tree, the organizational culture is considered as its root (Hassabelnaby et al, 2005). The attributes of services compensation system is not only deemed as an effective factor in management of performance and motivation in personnel, but also it is considered as an important factor in personnel's retention model in that organization and prevention from quit their services, job satisfaction, and organizational commitment. Furthermore, it is considered as one of the efficient levelers in control of corruption and improving efficiency in private and public sectors. Whereas the subject of services compensation in public sector namely the personnel who are included in National Employment Law as well as in private sector i.e. the persons who are included in Labor Law is deemed as a challenging and unclear issue thus the necessity for analysis on this issue with scientific attitude has been emphasized by the experts and related practitioners for several times (Huang, C. et al, 2004).

Subject interpretation

The working motive of personnel is one of the foremost and most essential qualitative attributes in personnel that may improve their performance in doing their tasks and at the same time it plays basic role in enhancement of personnel's productivity. The presence of working motive may serve also as a factor to increase job satisfaction among the personnel per se. But, the basic point in subject of working motive is related to an issue called motivation that has devoted a wide and extensive chapter in discussion about organizational culture and Human Resources Management (HRM). The personnel's motivation is related to other topics and concepts such as feelings, beliefs, paradigms, and requirements of personnel (Nilakant and Rao, 1994). But, what is deemed unanimously in all of theories and paradigms of motivation is certainly the role of leading manager in improvement of working motive in personnel and in this regard some concepts including director's beliefs, director's defaults, management attitude, director's management method, and type of management perspective to human and his/ her position inside organization may play essential role in improvement the level of working motives for personnel (Wright, P. et al,2011). Administration of services compensation system is one of the other tasks of Human Resources Management. The directors may employ appropriate design for services compensation system in order to supervise and affect on

Mersedeh Adabi

behaviors of organizational members and improvement of personnel and organizational productivity. The appropriate services compensation system may lead to attraction, retention, and training of manpower. For this purpose, services compensation system should be motivational. Overall, wherever it is explained about the proportion of services compensation system, the motive- related subjects are mentioned. Therefore, with respect to role and affect of the given system in changing behavior and motive in organizational personnel and improving productivity, the directors should pay due attention to design it appropriately (Bickley and Nowak, 2005). Knowledge creation and expansion of borders of sciences in the world arena, improving the position of Islamic Azad University among the world leading universities, application of knowledge to meet the requirements in the community and realization the goals of academic 10- year plan in the course of 20- year outlook development plan of Islamic Republic of Iran including tasks and practices of academic deputy of research and technology. This deputy is responsible for policy-making, planning, and leading all of the related affairs to research and innovation activities, which are implemented and organized within the framework of three general departments (i.e. research affairs, applied researches, and educational and research equipments). The final approval of procedures, determination of policies, and also creating the needed coordination at academic level are done by academic research council. The coordination council for editorials of academic journals, coordination council of academic scientific poles, and coordination council of supervisors of academic libraries act as subordinates in this deputy. Similarly, establishment of demand and supply system, innovation system, and making effort to commercialize research and technological achievements of academic teachers, which have formed recently in line with achieving the aforesaid objectives by implementation of activities to establish academic research and technology comprehensive system, include creating motive among knowledge workers and academic teachers as services compensation system.

Method of payment to knowledge workers and talents is one of the problems in organizations, which have increased changing nature of works and turning the economy from production into services and knowledge- based economy, application for knowledge workers, and knowledge agents and laborers and this substitution trend for knowledge workers instead of touch laborers will be continued in the forthcoming decade. Ever-increasing employment of knowledge workers is accompanied with many implications for human resources management. The method of presentation of feedback, training nature, occupational development, and evaluation criteria for performance of knowledge workers varies and human resources management should be taken into consideration (Marcon, J. et al, 2009). The management style of knowledge workers should be different because of expertise potentials and their specialty in order to retain and develop human capital in organization and attraction and training of knowledge workers but they have not to share their knowledge. At the same time, a lot of job opportunity for knowledge workers may cause them to possess good business market and they may go to other organization if there are adverse conditions in their current organization while the rival organizations are lurking for these workforces and tending to hunt their talents in order to attract them for their own organizations (Nikkinen and Sahlström, 2005). In this study, it has been dealt with analysis on concepts of services compensation, effective environmental important variables in services compensation including economic status, governmental and cultural regulations, payment strategies and policies, and also analysis on dimensions of fair payment, adequate level of proportion, and paying attention to competitiveness and this study proposes the relationship of services compensation system in interaction with organizational strategies from the birth to revival of the given commodity. The current research is tended to explore ranking of services compensation system including (economic, motives, justice, and cultural) factors among knowledge workers so that the universities pay special attention to knowledge workers and research and by creating motive among knowledge workers they are able to have better research structure in the universities and they can put the results of researches at disposal of industries and organizations. So, we currently tend to rank compensation system of knowledge workers.

Subject literature and theoretical framework:

Definition of services compensation: Services compensation system includes all forms of financial payment and tangible services and benefits, which the personnel receive as one side of employment contract and whereas the new

salaries and wages systems have moved toward more flexibility with respect to business strategy and environmental issues thus various payment compositions (in cash, stocks, and welfare benefits etc) have formed (Roberts, J. 2005). Term 'services compensation system' has been considered as synonymous to salaries and wages management in some books but this term covers wider concept as it. Services compensation system not only includes external receipts like salaries and benefits but also comprises of all other received items based on nature of given job such as recognition and identification, promotion, providing opportunities for progress, rich and full- fledged job and favorable working conditions as well as appropriate organizational culture. Hence, with respect to above-said explanation, services compensation denotes any type of receipts and values, which are paid or created by employer or organization against doing task by personnel for organization and services compensation that is provided by the organization includes both financial and non- financial services compensations (Marcon, J. et al, 2009). Financial services compensation is divided into two parts: direct financial services compensation and indirect financial services compensation with benefits. Direct financial services compensation comprises of a cash fund that the employee receives as salaries, wages, commission and the like. Indirect financial services compensation and benefits include all of financial receipts, which may not be included within the salaries, wages, and commissions, but they play financial role indirectly for the employees. These received items or benefits are highly various including type of insurance projects, retirement plans, and services etc given by the organization. Non- financial services compensation may be divided into two groups: 1) Non- financial services compensation is derived from the job and this is the resultant satisfaction and joy from method of doing significant and very important occupational tasks for the given employee; 2) Non- financial services compensation is derived from job environment and that includes preparation of appropriate organizational conditions and environment and culture so that to make those conditions and culture pleasant for the employees and also to contribute them to meet personnel's important requirements like social needs. The above-mentioned items cover organizational services compensation plan totally (Wright, P. et al,2011). As it observed, the members who are employed to work in the organization are not working only for the sake of receiving money or salaries and benefits for hours but additionally they look for meeting their own requirements at higher levels such as social needs, self- expression, and acquisition of success. Many employees love their work despite of receiving inappropriate salaries and they fulfill their tasks with utmost efforts. Inversely, there are some other personnel, who quit their relationship with organization despite of receiving good salaries in an organization because of environmental conditions and or inappropriate organizational culture as well as ignoring human's growth and excellence (Nilakant and Rao, 1994).

Services compensation with approach toward global trend

Payment of special salaries to personnel and directors in multinational enterprises and the organizations, which employ personnel with different nationalities, is exposed to certain complexity. The personnel who do their tasks in such organizations include two groups: One group is usually called the host personnel and the other group is guest ones. Due to several reasons, certainly the rate of payment to guest personnel and directors will be higher, particularly if they come from industrialized developed countries. Often, different living levels, absence of welfare facilities and healthcare and medical services etc in host countries may create serious concerns for this type of personnel and especially their families so inevitably these shortages and inadequacies should be compensated with higher payments. On the other hand, higher level of salaries and benefits for guest personnel and especially directors require creating jobs similar to the appropriate jobs for the guest personnel (Wright, P. et al,2011).

Objectives of services compensation system

Organizations look for several goals in designing services compensation system and the experts of organizational manpower should adequately identify their related goals and way of their achievement. Principally, the organization should be aimed at design of services compensation system with attraction and retention of competent and qualified personnel as well as improving their motive as follows: 1) Attraction of competent (qualified) applicants; 2) Retention of competent personnel; and 3) Improving motive in personnel and legal considerations (Berger and Di Patti, 2006).

Attraction of competent applicants

The job applicants usually acquire information from rate of payments by various organizations for similar jobs and compare the rates of payments. Likewise, many applicants with related expertise and experience pay more attention to other services compensation like opportunities for progress and the services given by that organization (Bickley and Nowak, 2005). The organizations should notice wages of different jobs and determine the rate of salaries, which may lead to attraction of competent applicants with respect to this factor. Also, the non- financial services compensation system should be duly designed in such a way that to prepare the grounds of growth and progress for the personnel. With transferring the related information to services compensation outside the organization, the organizational personnel cause the expert and experienced applicants to be attracted by the given organization; unless, the organizations may not possess their needed manpower for their future (Tihanyi and Ellstrand, 1998).

Retention of competent personnel

After attraction and employment of appropriate applicants in the organization, services compensation system should deal with retention of competent, inventive, and productive personnel. Many factors may cause the personnel to leave an organization. But, the inappropriate services compensation system is deemed as the foremost factor for quit service and displacement of personnel. For this reason, the experts of field of manpower should be assured that services compensation system is fair and encouraging since if the personnel feel that they are not paid and rewarded appropriately they may reduce making their efforts for the organization and this is often led to leave their services. Likewise, if personnel think that they can achieve better status in another organization, they will probably leave their current organization. Directors should evaluate different jobs in organization to provide fair salaries and they should consider and allocate the fair salaries with respect to tasks and their complexity and complication as well as the required qualifications for the given job. In addition, directors should design the jobs in such a way that to prepare opportunities of growth and progress for the personnel by doing the related tasks (Preece, D. C. et al, 2004).

Increase of employee motivation

Employees expect their performance will be directly related to reward they receive. Initially employees' demands or expectations about the amount of reward that they can receive will be shaped in case of increasing performance. These expectations, set objectives or performance level for them (Preece, D. C. et al, 2004). Employees who attain the desired level of performance expect a certain level of reward commensurate with receiving function. Naturally, management focuses on performance evaluation to pay bonuses. Rewards can be financial compensation, promotion, recognition, and so on. Subsequently, the employees investigate the relationship between their performances and the amount of reward that organization considers for them .New expectations and objectives is formed according to the results of previous experience (Tihanyi and Ellstrand, 1998).If employees perception is that hard work and excellent performance are considered, They actually expect this relationship to be shown; In this case, they will have the high level of performance. If the relationship between performance and reward is poor, employees will work to the extent to keep their jobs ((Wright, P. et al,2011).

Legal considerations

Final aim of developing compensation system is that the system should not be inconsistent with applicable laws. Usually governments by determining level of payments influence the structure of organizations' payment especially in government agencies. Governmental laws usually define the minimum wage, hours of the work, minimum age for employment, physical conditions of work environment and things like that. Therefore, human resource experts need to be aware (Wright, P. et al,2011)

Mersedeh Adabi

Factors determining service compensation

There are many factors that influence the tasks of human resource management. Naturally, there are factors that effect on determination of financial compensation. These factors are both within and outside the organization. Factors such as including labor market, the organization's policies, and job and employee characteristics will be explained.(Javadin, 1999)

Labor force market

The first factor influencing the determination of financial compensation is labor market. The labor market is the geographic area from which employees are attracted to a particular profession (same reference) .Labor force market of some jobs may be away from the work area of the organization. Some organizations may attract their labor market from some jobs far from the place of the organization. Managerial and professional employees are often attract from different geographic regions. In fact, the recruitment from the community is not unusual for some jobs. In addition, rate of payment pay rates for jobs in the area of labor and labor market may vary considerably (Peter Wright, Peter, 2011) .Salary experts must be aware of these differences to attract needed people by the appropriate policy in payment. The current fee for each region is an important indicator in determining the payment and many employees consider it as a standard rate. To conduct research on status of the labor market studies, including a) Law studies: Many organizations regularly surveys payment to determine rate of current payment in the labor market. These studies provide information to establish direct and indirect salary. Before legal reviewing, the geographic region, investigated specific organizations and considered occupations needed to be examined. Geographical area that is needed to me investigated mostly is determined through report on of human resources. Information of this source indicates the maximum distance that employees will passed from home to work. Type of investigated organizations obtain from same industry, so investigated organizations are those that are similar in activity and work with tithe desired organization. Also those jobs and skills that exist in labor market must be considered (Tihanyi and Ellstrand, 1998).

The organization's policies

Usually, the labor costs form fifty percent of the total cost of an organization. Salary affects employees' behavior and encourage them to achieve to the goals of organization through further efforts. Therefore, managers of organizations must seriously follow payment and salary's program (Preece, D. C. et al, 2004) Institutional policies affects the financial compensation. Some organizations their policies in such a way that can be a leader in society in terms of payment. Some try to have an intermediate position in the labor market. And possibly others may have the following policy. Leading organizations in terms of payment, expect reduction of the labor costs in a unit of production through this method. Because they have come to the conclusion that are able to attract people with high level of expertise and experience (Bickley and Nowak, 2005)

Applying average rate of policy is appropriate for the organizations that need average expertise and skills. For instance in a company that needs a lot of assembling line workers, the worker with high ability are not more active than those who have average ability. Therefore, Individuals with moderate and normal rate can be attracted(Preece, D. C. et al, 2004)

Occupation

Occupation that people are responsible for, is the most important determinant of salary. Salary payment by organizations is for the value that people make in duties, responsibilities and participation in achieving to the goals and other factors related to the job. In fact, value of occupation arises. For this reason, many organizations are evaluating jobs. The explanation of that will be discussed here.

Organization's employees

In addition to status of labor market and Occupation and organizations policies, another factor is employees and related characteristics that can affect the determination of salary and equality of individual salary. Factors that will be considered are: a) individual performance, individual performance and efficiency are the most important factors in determining the amount of compensation. In case of applying, increase employee motivation for better performance will be provided. If employees feel people with different performance are treated equally, motivation for the better performance will be removed. Therefore, it is necessary for the organization's management to evaluate employees' performance and the payment to increase the performance and job motivation.B: Seniority, length of time a person has worked with an organization or a particular occupation, referred to as seniority. Persons with a history of long association with the organization is required to increase their payment and the annual fee for the continuation of their work need to be considered. C: Experience: For many businesses, the experience is really necessary and, in many cases, managers pay the salary according to that. There are many jobs that people in charge will be expertise through experience and productivity will change accordingly. During recruiting in many organizations useful and relevant experience of applicants will be considered and salary will be determined based on that. According to some managers, experience is useful of occupation even if it will not be related to the job and it must be valued.D: Membership in the organization: membership in the organization affects the salary. For example, an employee at the lower levels of the organization shall be equal for the holidays, insurance and training costs with an officer. Establishing such a system, makes the employees colleague and to continue their membership and cooperation with organizations.E: Talents: Some organizations are paying attention to the talent of the people in determining the salary. It is useless until use of individual's potential talent. But, salary payment based on individual's talent lead to attract the competent and talented applicants. The organizations can use them in the oversight and management positions in future. Organizations will find potential talent of the employees through tests and evaluations and will attention to the increase of their salary (Phan and Yoshikawa, 2000).

Culture of the organization

Organizational culture might be the most important effective factor on job satisfaction and nonfinancial compensation system. In organization with the strong culture, the importance of beliefs, values and key values of the members are eagerly preserved and widely distributed throughout the organization. The probability that the employee leaves the job is much lower than other organizations in these type of organizations, because this type of culture as powerful tool as a substitute for formalization of the organization. Even it can be more penetrating than Official structural control. And that because of the issue that culture controls mind and spirit. The more power and greater coherence of the organization' culture and more consistency between individual needs and cultural values, the more job satisfaction will have. In such a situation, the ideal organizational culture is a part of the compensation for non-financial services(Hazledine, 2009)

Justice

although justice in distribution of wealth was continually a considerable issue for sociologists and religious leaders, the concept of justice in working environments after World War II that the psychosocial processes used within organizations have not drawn attention that the sense of justice and fairness are having significant role in daily life; specifically this issue within organizations that the workers are sensitive towards issues like their salaries in comparison with others is getting true (Javadein, 1999).

Motivations

motivation is defined in different ways, but it depends on that motivation is asked from whom and for which purpose, for example if you ask someone in street about the meaning of motivation, he will reply you "motivation is

what show you the way and direction or motivation leads us to do our duties better. Now, if we want to define motivation theoretically and scientifically. Motivation is a force that pushes person to do his job well and accurate with interest. Motivation in fact is a force that assists managers to do their tasks better (Bickley and Nowak, 2005).

Economic

society's economic features is effecting on decisions related to determining salary and wage, for example, in an ailing economy, probably labor supply is high and this issue is effecting on salary rates decrease and within a growing economic it will increase costs, prices, salaries and wages (Bickley and Nowak, 2005).

Conceptual model and research hypotheses

Recommended method is a combinational-applicable method that is based upon two models described by Atchison and Thomsen 2010 and the previous studies. It is indicated in Figure 1.The present research is conducted as a case study in Azad University, Tehran West branch. Qualitative and continuous variables were transformed into quantitative variables in order to be applied as fuzzy data. As mentioned earlier, the problem of the present study is to find an answer to these questions:How factors in compensating knowledge workers' services are rated? What steps should be taken to compensate for knowledge workers' services?It should be noted that according to what was discussed above, the research questions could be summarized as follows:What are the priorities of compensating Tehran West Azad University knowledge workers' services using the technique of Fuzzy TOPSIS?

RESEARCH METHODOLOGY (survey, library…)

The present research study is "practical" and "descriptive-exploratory" in terms of goals and the method of data collection respectively. Since Tehran West Azad University is studied, the research could be regarded as a case study. To achieve the aforementioned objectives, two types of investigations are conducted; first services compensation is studied through field study as well as library research in order to extract fundamental concepts and principles. Here, the emphasis is put on how conceptualization and services compensation principles should be determined and formulated in competitive as well as non-state environments. In this regard, it is essential as well to study concepts and definitions related to services compensation. The present research study, attempts to determine and propose the best comprehensive definitions for these concepts. This part of the study constitutes a major part of activities in the article. Then, in order to improve the criteria for determining services compensation, questionnaires are designed. After checking the validity of the questionnaires by a team of experts at corporate issues and management, copies are distributed in the population as a brainstorming activity. Then using the classic method of TOPSIS, prioritization is performed

Research population and sample

The main information resource in the present study is consisted of faculties and researchers who constitute the statistical population of the study. The number of Tehran West Azad University professors and researchers, who were easily accessed, was 35 that constituted the research sample. Since the employed techniques required questionnaire to be distributed among these individuals, the questionnaire was designed by the researcher through consultation with experts; and then distributed among the research sample. The developed questionnaire was distributed among the sample and finally 34 forms were completed and returned.

Mersedeh Adabi

Data collection method

In the present study, both primary as well as secondary data were collected. Primary data was collected using a questionnaire and interviews with university professors as well as researchers; it should be noted that interviews and observation techniques were merely to improve the results of the questionnaire data, therefore, their reliability and validity was not checked. In addition, secondary data were collected from the available data and information at the Islamic Azad University, Tehran West, the Internet, books, journals, seminars and organizations associated with the subject.

Validity and reliability

To make sure that the validity and reliability of the questionnaire is appropriate, comments and opinions of professors and experts of human resource management were used. In each stage of data collection, the questionnaire forms, before being distributed among the sample, were delivered to experts of the subject under study and then after being modified and confirmed, were distributed among the sample. On the whole, factors affecting the validity and reliability of the questionnaire used in this study are summarized as follows:

Using comments and opinions of professors, experts and specialists of the subject under study;Studying similar questionnaires, articles, books and journals;Initial distribution of the questionnaire among a number of managers and beneficiaries and performing modifications based on their opinions There are a variety of methods to test reliability. In the present study "Cronbach's Alpha" is used. The method is used for calculating the internal consistency of the measurement tools such as questionnaires or tests that measure different attributes. To calculate the Cronbach's Alpha value, data obtained from a number of pre-test questionnaire forms were statistically analyzed with SPSS software. The results of Cronbach's Alpha test indicated a consistency between the questionnaire items and each parameter as well as the whole questionnaire. Typically, if α value is greater than 0.7, the reliability of the questionnaire is assumed as acceptable. It is worth noting that the questionnaires used in this study had the desired reliability, so that α values for the parameters of the questionnaire are as shown in Table 1.In this stage, services compensation factors were prioritized using the fuzzy TOPSIS method. In the following the procedure is discussed: in this step, as one of the most sensitive stages of the project implementation, the author applies TOPSIS technique to prioritize and select, as most precise as possible, knowledge workers' services compensation factors. This means that the selected (services compensation) item should have minimum deviation from the ideal point, and at the same time, should be farthest from the negative ideal point.

Prioritizing services compensation using the technique of fuzzy TOPSIS (Chen's TOPSIS method)

Developed the TOPSIS method in the fuzzy environment. Since, in most cases, concepts used in decision data are vague and unreal, the definite values seem unreal in real life conditions. In this method of prioritization/rating, each option as well as the weight of each criterion is determined to be expressed as a trapezoidal fuzzy number by linguistic variables. Definition 1.4: Let $\tilde{a} = (a_1, a_2, a_3, a_4)$ and $\tilde{b} = (b_1, b_2, b_3, b_4)$ are two trapezoidal fuzzy numbers. Here, to calculate the distance between the above numbers, the fuzzy Archimedes' distance is used:

$$D\left(\tilde{a},\tilde{b}\right) = \sqrt{\frac{1}{4}\left[\left(a_1 - b_1\right)^2 + \left(a_2 - b_2\right)^2 + \left(a_3 - b_3\right)^2 + \left(a_4 - b_4\right)^2\right]} \qquad (1)$$

In this method, the weight of different criteria and the rating of qualitative criteria are specified according to the linguistic variables; the linguistic variables could be expressed as positive trapezoidal fuzzy numbers that are presented in the table 2. Suppose a group of decision making is composed of K individuals. In this case, weight of each criterion ranking of alternatives according to each criterion will be calculated as follows:

Mersedeh Adabi

$$\tilde{x}_{ij} = \frac{1}{K}\left[\tilde{x}_{ij}^1 \oplus \tilde{x}_{ij}^2 \oplus \cdots \oplus \tilde{x}_{ij}^K\right] \qquad (2)$$

$$\tilde{w}_j = \frac{1}{K}\left[\tilde{w}_j^1 \oplus \tilde{w}_j^2 \oplus \cdots \oplus \tilde{w}_j^K\right] \qquad (3)$$

In which $\tilde{x}_{ij}$ و $\tilde{w}_j$ given rating and weight of is by Kth decision maker, a fuzzy multi-criteria group decision-making problem can be summarized as below:

$$\tilde{D} = \begin{bmatrix} \tilde{x}_{11} & \tilde{x}_{12} & \cdots & \tilde{x}_{1n} \\ \tilde{x}_{21} & \tilde{x}_{22} & \cdots & \tilde{x}_{2n} \\ \vdots & \vdots & \cdots & \vdots \\ \tilde{x}_{m1} & \tilde{x}_{m2} & \cdots & \tilde{x}_{mn} \end{bmatrix}$$

$$\tilde{W} = \begin{bmatrix} \tilde{w}_1, & \tilde{w}_2, & \cdots, & \tilde{w}_n \end{bmatrix}$$

That $\left(i = 1, 2, ..., m, \quad j = 1, 2, ..., n\right)$ $\tilde{x}_{ij}$ و $\left(j = 1, 2, ..., n\right)$ $\tilde{w}_j$ are linguistic variables that can be presented

as trapezoidal fuzzy numbers $\tilde{x}_{ij} = \left(\tilde{a}_{ij}, \tilde{b}_{ij}, \tilde{c}_{ij}, \tilde{d}_{ij}\right)$ and $\tilde{w}_j = \left(\tilde{w}_{j1}, \tilde{w}_{j2}, \tilde{w}_{j3}, \tilde{w}_{j4}\right)$.

A linear scale is used conversion is used to avoid complexity of normalizing the formula to convert different measures scale to one scale. Therefore, we can show the normalized fuzzy decision matrix with $\tilde{R}$.

$$(4) \quad \tilde{R} = \left[\tilde{r}_{ij}\right]_{m \times n}$$

If we suppose B and C respectively are criteria of profit (+) and expenses (-), then we have:

$$\tilde{r}_{ij} = \left(\frac{a_{ij}}{d_j^*}, \frac{b_{ij}}{d_j^*}, \frac{c_{ij}}{d_j^*}, \frac{d_{ij}}{d_j^*}\right), \quad j \in B \qquad (5)$$

$$\tilde{r}_{ij} = \left(\frac{a_j^-}{d_{ij}}, \frac{a_j^-}{c_{ij}}, \frac{a_j^-}{b_{ij}}, \frac{a_j^-}{a_{ij}}\right), \quad j \in C \qquad (6)$$

$$d_j^* = \max_i d_{ij} \quad if \quad j \in B$$

$$a_j^- = \min_i a_{ij} \quad if \quad j \in C$$

3611

Mersedeh Adabi

The normalization method has this feature that keeps range of t normalized trapezoidal fuzzy numbers at a distance $[0,1]$

According to the fact that the degree of importance of each criterion is different, it is possible to create normalized weighted fuzzy decision matrix as below:

$$\tilde{V} = \left[\tilde{v}_{ij}\right]_{m \times n}, \quad i = 1, 2, ..., m, \quad j = 1, 2, ..., n$$

$$\&\ \ \tilde{v}_{ij} = \tilde{r}_{ij} \otimes \tilde{w}_j \tag{7}$$

.

Now it is possible to define Fuzzy Positive Ideal Solution and Fuzzy Negative Ideal Solution as below:

$$\tilde{v}_j^* = \begin{cases} \max\limits_{i=1,...,m} \tilde{v}_{ij} \, ; j \in B \\ \min\limits_{i=1,...,m} \tilde{v}_{ij} \, ; j \in C \end{cases} \qquad\qquad \tilde{v}_j^- = \begin{cases} \min\limits_{i=1,...,m} \tilde{v}_{ij} \, ; j \in B \\ \max\limits_{i=1,...,m} \tilde{v}_{ij} \, ; j \in C \end{cases}$$

$$FPIS = \{\tilde{v}_j^* \mid j = 1, ..., n\} \tag{8}$$

$$FNIS = \{\tilde{v}_j^- \mid j = 1, ..., n\} \tag{9}$$

.

Distance for each option from positive and negative ideal is calculated according to the following formula:

$$D_i^* = \sum_{j=1}^n D\left(\tilde{v}_{ij}, v_j^*\right), \quad i = 1, 2, ..., m, \tag{10}$$

$$D_i^- = \sum_{j=1}^n D\left(\tilde{v}_{ij}, v_j^-\right), \quad i = 1, 2, ..., m, \tag{11}$$

In which (. , .) is the distance between two fuzzy number that has been defined in equation1.

Proximity coefficient must be determined for each option to calculate options ranking due to D_i^* و D_i^- ،. Proximity coefficient of each options is calculated as follows:

$$CC_i = \frac{D_i^-}{D_i^* + D_i^-}, \quad i = 1, 2, ..., m$$

Finally, the option which is closer to the positive ideal and is far from negative ideal is the option with proximity coefficient closer to 1. Therefore, With regard to the proximity coefficient, we will be able to rank all options and select the best option among all options.Knowledge Workers compensation service prioritization using fuzzy TOPSIS method includes the following steps:First step: a hierarchical matrix using knowledge workers compensation service of main factor (option), which is described above.

Second step: choose the linguistic variables for weighting the criteria and appropriate linguistic ranking to determine the ranking of each knowledge workers compensation. A range of 7 option include (very low-low-less than average-average-more than average, much, very much) has been used to increase the accuracy of this step which is concern with quantitative comparisons. Qualitative indicators of knowledge workers compensation that was determined in 5 domains were considered as a benchmark for judging the strategies. At the end of this step, paired comparisons were adjusted in the table 3. A qualitative matrix of paired comparisons was used to quantify the matrix of fuzzy data. Quantitative Matrix of paired comparisons or "fuzzy decision matrix" is presented in the table 4. It must be noted that the researcher designed paired comparisons questionnaires as qualitative measures to ease of obtaining information from experts and then started to mix and quantifying their comments. Third step: In this step we calculate normalized fuzzy matrix of decision making and in fourth step: normalized weighted fuzzy matrix of decision making will be created .In this step, all weights related to each variable on factors of knowledge workers service compensation will be derived and multiplied by the weight of each success factor.

Fifth step: Total positive and negative ideal will be calculated and in sixth step: distance of each option respectively from positive and negative ideal will be calculated. Seventh step: proximity coefficient of each option will be calculated.

Eight step: Finally, the option which is closer to the positive ideal and is far from negative ideal is the option with proximity coefficient closer to 1. Therefore, With regard to the proximity coefficient, we will be able to rank all options and Prioritization of strategies will be done (Tables 5,6,7).

CONCLUSION

Various methods have been introduced in the prioritization of compensation and employees' reward; the main drawbacks of existing methods are the loss of a significant portion of the information gathered during the process, lack of attention to uncertainty, formulation of Imprecise issues that have complex nature and involving minds of the decision makers by large number of factors involved in the decision-making as well.A technique of multi-criteria decision making (MADM) must be used to increase the safety factor of University officials decision making .These techniques have the benefit that can evaluate different options based on various criteria without any same units. Another important advantage of multi-criteria decision-making techniques is are able to simultaneously analyze both quantitative and qualitative criteria. Version of fuzzy TOPSIS method was used to consider ambiguous situations as innovation of the research. The most important compensation service strategies using a methodology developed by the researchers to the specific requirements for the researchers of mentioned universities have been identified and ranked. As mentioned in the previous section, "the quality of working life "and "extraversion" each with the degree of 0.57 and 0.55, respectively, were the most influential compensation service ,un case of implementation in university contributing to the realization of overlooking and goals.

Mersedeh Adabi

SUGGESTIONS

Despite the importance of human resources as stimulating of entrepreneurship, paying attention to human resource management and its sub-subsystem can be felt more than ever. With regard to the role of providing compensation systems, maintenance and motivation of human resources, as well as fair compensation, encouragement and based on performance has a significantly positive effect on organizational entrepreneurship. This means that it is possible to improve entrepreneurship through making flexible compensation structures. The same token, it is recommended to the university authorities in order to increase the motivation and performance of knowledge workers:Establish coordination and alignment among behavior and performance of knowledge workers, objectives of the organization and management focus will be on establishing and maintaining this coordination and coherence.Let consider the needs and demands of university. In other words, only when a comprehensive reward program achieve to its objective that elements of this program will be meaningful and valuable for knowledge workers and have effect their participation in universities.Costs and probable risks that may arise in the design and implementation of compensation programs should be measured and managed. There must be a balance between costs and effectiveness of programs. Moreover, probable risks associated with reward programs, such as financial risks must be identified and they must be managed to minimize their impact on the effectiveness of reward programs.

Performance management systems must be continuously improved. It is for this reason that there is needed to make relationship between performance and reward that belongs to the knowledge workers. Moreover, required changes in current operating systems of universities must be made to improve performance of individuals.Clearly, it is needed to distinguish between performance and other operations. For this purpose, employees with the excellent performance must be identified. And they must receive more rewards than others in various forms of monetary and non-monetary and development opportunities. Use more incentives in payments. One of the ways that can give rewards to knowledge workers with excellent performance and moreover, promoted them in improving more operation and achieving to more success .Organizations that use these programs to create motivation in performance improvement, are more profitable.To understand the application of total service compensation program to knowledge workers, teach them and communicate with.Besuase this the only way that employees support these programs. If this communication will be weak, knowledge workers may attention to annual increase in their salary rather than attention to other rewards programs. Correspondingly, their motivation to improve their performance decreases. Obviously, this will eventually harm the organization itself.

Use Long-term incentive programs, these applications include knowledge workers' participation in decision-making of the university.Use rewards management in complete coordination with other management tasks, such as financial management. Many organizations do not have the necessary effort. Coordination and coherence of the different activities of management, are necessary for organizations to achieve to the results of comprehensive compensation system program and success of university in all areas.

REFERENCES

1. Berger, A. N., & Di Patti, E. B. (2006). Capital structure and firm performance: A new approach to testing agency theory and an application to the banking industry. Journal of Banking & Finance, 30(4), 1065-1102.
2. Bickley, M., & Nowak, M. (2005). The Austrian Way: Director Conduct in the Context of Legal and Cultural Frameworks of Corporate Governance. Corporate Governance: Does Any Size Fit?, 11, 145.
3. Brandes, Pamela. , Dharwadkar, Ravi.,& Das Diya., Understanding The Rise And Fall, 2004.Of Stock Options Compensation : Taking Principal – AgentConflicts to the Institutional (Battel) Field , Human Resource ManagementReview, 2006
4. Hassabelnaby, Hassan.R. &Mosebach ,Michael., Culture's ConsequencesInControlling Agency Costs: Egyptian Evidence, Journal Of InternationalAccounting,Auditing And Taxation ,Volume 14,Issue1 ,2005

5. Hazledine, T. (2000). Agency Theory Meets Social Capital: The Failure of the 1984-91 New Zealand Economic Revolution.

6. Hofstede, Geert.,VSM 94, An Inventory Of Question Regarding, 1994.Practices Gelfand, M.J,. Lim, B.c. Raver, J.I culture and accountabilityinorganizations: Varitions in forms of social control across cultures. Humanresource Management Review. Vol 14 , 2004

7. Huang, C., Huang, P. W., & Chen, Y. J. (2004). A study of Taiwan's travel agent salary system: an agency theory perspective. Tourism Management, 25(4), 483-490.

8. Ittner, C. D., Larcker, D. F., & Pizzini, M. (2007). Performance-based compensation in member-owned firms: An examination of medical group practices. Journal of Accounting and Economics, 44(3), 300-327.

9. Kury, Kenneth Wm., Decoupled earnings: An institutional perspective of theconsequences of maximizing shareholder value, Accounting Forum,Volume 31,Issue 4, December, 2007

10. Marcon, J., Gagliardi, B., Balosso, S., Maroso, M., Noé, F., Morin, M., ... & Ravizza, T. (2009). Age-dependent vascular changes induced by status epilepticus in rat forebrain: implications for epileptogenesis. Neurobiology of disease, 34(1), 121-132.

11. Nikkinen, J., & Sahlström, P. (2005). Risk in audit pricing: The role of firm-specific dimensions of risk. Advances in International Accounting, 18, 141-151.

12. Nilakant, V., & Rao, H. (1994). Agency theory and uncertainty in organizations: An evaluation. Organization studies, 15(5), 649-672.

13. Phan, P. H., & Yoshikawa, T. (2000). Agency theory and Japanese corporate governance. Asia Pacific Journal of Management, 17(1), 1-27.

14. Preece, D. C., Mullineaux, D. J., Filbeck, G., & Dennis, S. A. (2004). Agency theory and the House bank affair. Review of Financial Economics, 13(3), 259-267.

15. Reza Seyed Javadin, 1999, knowledge of Management, No. 45, "compensation

16. Roberts, J. (2005). Agency theory, ethics and corporate governance. Advances in Public Interest Accounting, 11, 249-269.

17. Tihanyi, L., & Ellstrand, A. E. (1998). The involvement of board of directors and institutional investors in investing in transition economies: an agency theory approach. Journal of International Management, 4(4), 337-351.

18. Wright, P., Mukherji, A., & Kroll, M. J. (2001). A reexamination of agency theory assumptions: extensions and extrapolations. The Journal of Socio-Economics,30(5), 413-429.

Table 1. Prioritizing services compensation

Economic	*0.872*
motivations	*0.983*
Justice	*0.769*
Cultural	*0.883*

Mersedeh Adabi

Table 2. linguistic variables to determine weight of each criterio

Very low	VL	(0, 0, 1, 2)
low	L	(1, 2, 2, 3)
Less than average	ML	(2, 3, 4, 5)
Average	M	(4, 5, 5, 6)
More than average	MH	(5, 6, 7, 8)
Much	H	(7, 8, 8, 9)
Very much	VH	(8, 9, 10, 10)

Table 3. fuzzy decision matrix and fuzzy weights

C_1	C_2	C_3	C_4	C_5
More than average	Much	Much	Very much	More than average

Table 4. fuzzy decision matrix and fuzzy weight

C1	C2	C3	C4	C5
(5, 6, 7,8)	(7, 8, 8, 9)	(7, 8, 8, 9)	(8, 9, 10, 10)	(5, 6, 7, 8)

Table 5. fuzzy weight normalized matrix

Si	CCi	Proximity Coefficient
S1	CC1	0.5704624
S2	CC2	0.3364042
S3	CC3	0.5033551
S4	CC4	0.4008372
S5	CC5	0.3287629
S6	CC6	0.549381
S7	CC7	0.5580765
S8	CC8	0.3771368
S9	CC9	0.3474838

Table 6. proximity coefficient and final rating of option

S1	(0.35, 0.48, 0.56, 0.72)	(0.35, 0.48, 0.56, 0.72)	(0.49, 0.64, 0.64, 0.81)	(0.64, 0.81, 1, 1)
S2	(0.4, 0.54, 0.7, 0.8)	(0.14, 0.24, 0.32, 0.45)	(0, 0, 0.08, 0.18)	(0.16, 0.27, 0.4, 0.5)

S3	(0.1, 0.18, 0.28, 0.4)	(0.07, 0.16, 0.16, 0.27)	(0.56, 0.72, 0.8, 0.9)	(0.64, 0.81, 1, 1)
S4	(0.1, 0.18, 0.28, 0.4)	(0.35, 0.48, 0.56, 0.72)	(0.28, 0.4, 0.4, 0.54)	(0.56, 0.72, 0.8, 0.9)
S5	(0.35, 0.48, 0.56, 0.72)	(0.14, 0.24, 0.32, 0.45)	(0, 0, 0.08, 0.18)	(0.32, 0.45, 0.5, 0.6)
S6	(0.25, 0.36, 0.49, 0.64)	(0.49, 0.64, 0.64, 0.81)	(0.56, 0.72, 0.8, 0.9)	(0.4, 0.54, 0.7, 0.8)
S7	(0.35, 0.48, 0.56, 0.72)	(0.28, 0.4, 0.4, 0.54)	(0.56, 0.72, 0.8, 0.9)	(0.4, 0.54, 0.7, 0.8)
S8	(0.1, 0.18, 0.28, 0.4)	(0.49, 0.64, 0.64, 0.81)	(0.07, 0.16, 0.16, 0.27)	(0.56, 0.72, 0.8, 0.9)
S9	(0, 0, 0.07, 0.16)	(0.35, 0.48, 0.56, 0.72)	(0.35, 0.48, 0.56, 0.72)	(0.16, 0.27, 0.4, 0.5)

Table 7. Correlation Coefficient And Final Alternatives Ranking

Quality of working life	First
Power of payment	Fifth
Hegemonism	Eighth
Achievement	sixth
internal justice	Fourth
External Justice	Ninth
Seeking livelihood	Third
Introverted	Seventh
Extroverted	Second

Figure 1: Conceptual model

RESEARCH ARTICLE
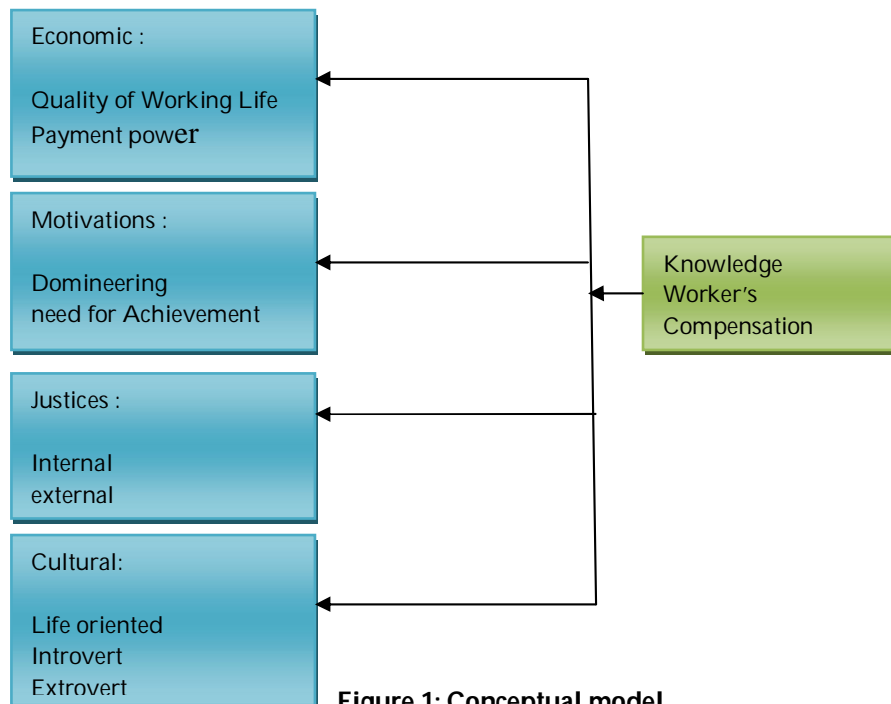
Elegizing in the Safavid Era and Contemporary Arab Literature.

Hoshang Zandi[1] and Zeinab Lalvand[2*]

[1] Arabic Language and Literature, Islamic Azad University, Tehran Science and Research, Tehran, Iran.
[2] Arabic Language and Literature PhD student at Azad University, Faculty of Language and Literature, Science and Research Branch of Tehran, Tehran, Iran.

*Address for correspondence
Zeinab Lalvand
Arabic Language and Literature PhD student at Azad University,
Faculty of Language and Literature,
 Science and Research Branch of Tehran,
Tehran, Iran.

ABSTRACT

This study, as its title implies, studies elegies the Safavid era and contemporary Arab literature. Elegy is found in pre-Persian literature (Even in Persian literature before Islam); these elegies had been composed on the death of loved ones and the war victims, which is reflected in the poetry of Ignorance Age (Jahiliyyah). The elegies of Ignorance Age and Abbasid have had a profound effect on the Persian elegies. Persian poets have imitated Arabic laments in both contents and manifestations, but there is some sort of excitement in Persian elegies that the Arabic lacks. In Persian Safavid poetry, elegies and admiration of religious figures is very common and ordinary, this is the natural result of policy of the Safavid kings. Hence, elegies on and admiration of Imams walked in the path of perfection in Safavid era. This article studies the Safavid era elegies and the related literary styles in Persian literature as well as Arabic literature through document mining approach. It also investigates the manners and processes of elegizing in Persian and Arabic literature; it mulls over the start points, the prominent figures, and the skill of each of the elegy composers.

Key words: comparative literature, Contemporary Arab literature, elegizing, Safavid era.

INTRODUCTION

In Persian and Arabic literature, Marthiya (elegy) means to cry for a dead person, to say one's good character, lament, and regretting his death. Elegy is poetry in the memory of a person who has died. In terms of literature, elegy or lament is referred to a kind of poetry for representing one's death. It also refers to the sorrow for the death of kings,

great men, tragedies of religious saints and Imams particularly Imam Hussein (AS) and other martyrs of Karbala, mentioning the virtues traits, and dignity of a dead person and exaggerating an event, exaggerating the disaster, inviting a stricken to patience and stillness, etc. (Mohseni Nia and Kermani, 2009).It is known that the first elegy is composed by Adam, the first man, for the death of his son Abel to represent his regret and sorrow in a sad manner. Shaeri, the author of "Love laments," argues in this regard, "Thousands of years have passed from the day Abel was killed innocent and Adam compose an elegy in his parting sorrow, this shows that lament has a long history" (Shaeri, 2006).Great and catastrophic events of Ashura in the year 16 Hijri is one of the most prominent events injured human emotion at the beginning and many poets have composed elegies in the memory of this great event in different languages from different races. The poems composed by the famous Arab poet, Da'bal Khazaei, and the lament written by tenth century Persian poet, Mohtasham Kaashaani, are the excellent examples. From the advent of Persian poetry, elegy came into being alongside other literary contexts in imitation of Arabic poetry, it has been formed in various types at the passage of time. In Persian poetry, elegy has not a specific rhyme and rhythm, but some of the forms of Persian poetry have been known common due to their rhythms. Studying the evolution of elegy indicates that elegy has transformed from official styles to religious styles so that it is known as laments for Imam Hussein in classic and contemporary literature.From the beginning of Persian poetry to the eighth century Hijri, the official elegy form was Qasida. Gradually, Tarkib band became common form of elegies with the governance of the Safavids. The peak of religious laments dates back to the classic age of Persian poetry when two new forms of elegy called "Nohe" and "Masnavi of Manzum Maqatil" were invented. In the last hundred years and due to uprisings, poets have combined the religious themes with socio-political concepts to create some sort of national-social elegy; it has enhanced the role of elegy from a personal lament to an element to stimulate people's awakening as a social and political responsibility.

Thus, if we agree that more emotion and imagination in poetry results in more beautiful poetry and more pleasant poems, elegy should originate from human emotions and it should pave the way for mental development of listener or reader. Arab moods, which invoked them to cry for their dead friends, and continue their cry by articulating their good traits cause elegy to be an active element in the life of Arabs (Imami, 1990). These elegies were composed mostly in the memory of killed people in war in Ignorance Age (Jahiliyyah).After Ignorance Age, the Abbasid Age should be considered as the promotion period of elegy in Arabic literature because they lamented for their caliphs, generals, and warriors and even destroyed cities.

In Persian literature, elegy referred to poems composed in sorrow of dead persons, relatives, caliphs, generals, etc. Nowadays, elegy bears a special meaning; it is poems composed in the sorrow of the holy Prophet (PBUH), Ahl al-Bayt (AS), Imam Hussein (AS) and the martyrs of Karbala.Due to the importance of this style for the Iranian and the Arab and cultural, social, and political differences, it is important to look at the formation of elegy in both nations' challenges, and developments from a comparative perspective because this aspect of literature has not been studied comparatively.In general, elegies are classified in two groups of religious and non-religious elegies:Religious elegies are composed due to the death of a religious person according to religious beliefs. Non-religious elegies include all poems composed in the sorrow of family members, relatives, kings, princes, warriors and... .Some poets write only religious elegy, and others composes just non-religious elegy. Some write both types of this literary style.

Religious Elegy and its Evolution

Religious elegies of Persian poetry are mostly written in about Imam Hussein and the martyrs of Karbala; but it does not mean that there had not been composed an elegy before Karbala event in 681. The trace of religious elegies is found before Karbala; for instance, Imam Ali (AS) had declared his sorrow of the prophet's death when washing and enshrouding him in these words:"May my father and my mother shed their lives for you. O' Messenger of Allah! With your death the process of prophet hood, revelation and heavenly messages has stopped, which had not stopped at the death of others (prophets).Your position with us (members of your family) is so special that your grief has become a source of consolation (to us) as against the grief of all others;your grief is also common so that all Muslims

share it equally.If you had not ordered endurance and prevented us from bewailing, we would have produced a store of tears and even then the pain would not have subsided, and this grief would not have ended, and they would have been too little of our grief for you. But this (death) is a matter that cannot be reversed nor is it possible to repulse it.May my father and my mother die for you; do remember us with Allah and take care of us." (Seyed Radhi, 2003)Or in the funeral of the prophet's daughter, Fatemeh (AS), He represents his inner senses the burial of Sayyidatu'n-nisa' (Supreme lady) Fatimah (p.b.u.h.) while addressing the Holy Prophet at his grave:"O' Prophet of Allah, peace be upon you from me and from your daughter who has come to you and who has hastened to meet you. O' Prophet of Allah, my patience about your chosen (daughter) has been exhausted, and my power of endurance has weakened, except that I have ground for consolation in having endured the great hardship and heart-rending event of your separation. I laid you down in your grave when your last breath had passed (when your head was) between my neck and chest.... "Verily we are Allah's and verily unto Him shall we return." (Qur'an)Now, the trust has been returned and what had been given has been taken back. As to my grief, it knows no bounds, and as to my nights. they will remain sleepless till Allah chooses for me the house in which you are now residing.

Certainly, your daughter would apprise you of the joining of your ummah (people) for oppressing her. You ask her in detail and get all the news about the position. This has happened when a long time had not elapsed and your remembrance had not disappeared. My Salam (salutation) be on you both, the Salam of a grief stricken not a disgusted or hateful person; for if I go away it is not because I am weary (of you), and if I stay it is not due to lack of belief in what Allah has promised the endurers." (Ibid: 1992)However, it can be said with certainty that the most elegies have been written in the mourning of Imam Hussein (AS) and the martyrs of Karbala; their number increases every year. There would be a great exhibition if one decides to collect all elegies on the Karbala event.It is found from available references that elegy about Karbala has begun immediately after the event of Karbala. For example, Ommolbanin (SA) has composed the following lines after hearing about the death of her son Abolfazl (AS):

<div dir="rtl">

تُنكِّرينــي بليُوثُ العَرين   لاتد عوّني وَيكَ أُم البَنين

كانَت بَنـون لِـي ادعـي بهم

واليَوم أصحَبتُ ولا مِن بَنين

</div>

"Now, do not call me Ommolbanin (meaning the mother of boys) because I have no son on the earth." Afsari Kermani, 1992).

As it was stated, although elegy about Karbala has begun immediately after the event of Karbala, it has faced ups and downs throughout the history.

Repression and Oppression (from Karbala Event to the Fourth Century)

Generally since the bloody events of Karbala (year 61 Hijri) to the fourth century, with the establishment of oppression, distortion and destruction of valuable works of Shia, imprisonment, torture and massacre of Shia scholars the Umayyad close all ways to support Shiite thinking. Soma Abbasid governors have prohibited travel to Karbala to prevent people of Ashura ideology. Mutawakkil ordered to plow the grave of Imam Hussein (AS) and allowed to plant wheat. In this situation, the eligists did not dare to express their love and interest in Alavi families; thus, elegy was not prospered. The problems of Shiite persons are as follows:

1. The Shiite hid Alavi books, works, and poems from fear.
2. Some works were buried under dust.
3. The Shiite did not dare to express their poems and propagate them (For instance, writing Persian poems).
4. Many of the Ahl-al Bayt poems were banned.
5. Some Shiite scholars and poets tended to secrecy, hiding, and dissimulation.
6. Alavi works spread throughout the world due to the migrations for saving one's life or family.
7. There was no center for absorption and gathering of dispersed Alavi works. On the other hand, the gathering after disperse needed continuous and economical means of travel, which would not be fulfilled due to Migration, wandering, isolation, poverty and destitution.

8. There were some court poets composing hundreds verses in praise of kings and rulers for a small grant. On the contrary, there were some poets having been killed because teir crime was speaking the truth and defending Shia. Not only did not they encourage poems about Imam Hussein but also the threats and excommunicated by enemy discouraged them. These poets were declared as wanted person and they would be hanged (Hejazi, 2006).

The reign of Shia (Buyid Dynasty, Ziyarid Dynasty and Dailamites)

By overthrow of repression and suppression age and with the rise of the Shia, political and social situation changed and Buyid religion, Dailamites and Ziyarid dynasty that were located in the northern regions of Alborz Mountains and the shores of the Caspian Sea and brought serious inconvenience to the Caliph of Baghdad. The change had continued so that not only Shiite scholars find the opportunity to show their devotion to the family infallible Imam (as) but also it has changed the fourth century to age of translation and edition of Islamic works. in this century, the first Persian laments about Ashura was written; some verses are stated in the following.

> Zephyr came out, paradise became desert,
> April embellished garden with Diba carpet,
> I will disregard universe, nor look for dignity,
> I will not compose praise and lyric, I kill all my willing,
> Heritage of Mustafa, son of Murtaza,
> Karbala victim, I just love,
> That head cut warrior, laid on the earth,
> While he was thirsty, prisoner of melee,
> Seeds of the infertile world, and even more,
> The more important enemy is less, and the wise enemy is stupid,
> Oh Kasaee, you argue about Maqtal,
> If you do this, dates became without thorns,
> Continue until you are alive; sadden our hearts,
> Always praise Zahra's Ahl al-Bayt.
> (Shadkam Oghani, 2007)

It should be noted that, the situation had continued untill the fall of Buyids (1055). Therefore, Shia was at its best situation fourth century and early fifth century.

Turkish Dynasty Era (Ghaznavids, Seljuks and Kharazmshahian)

Ghaznavids and Seljuks eras were the age of pressure and difficulties for Sia; persecution of the Shia was very intense after the reign of Sultan Mahmoud Ghaznavi. The Seljuks placed persecution of Shia sects on its agenda after overcoming Iran and banned them of occupying state apparatus.Everybody declaring the love of Ahl al-Bayt would be called Fatemi, Rafedhi, and Qarmati, tortured, and even murdered. The story of Hasanak the Vizier is an example of being hanged this manner. They had imposed even some pressures on Nāsir Khusraw Qubādiyānī who had composed some verses about Imam Husein and Karbala, Ferdowsi and Asadi Tousi.

Suitable atmosphere emerged for Shiites in the end of the Seljuks, Shiites could easily train narrators, and they used them to promote Shiites culture. Since the narrators used elegies, composing religious elegies were common; this continued the sixth century, followed by the extension and expansion of laments. In this era, Sanayi Ghaznavids, Qavami Razi, Anvari, Jamal al-Din Abdul Razaq and Zahir Faryabi began to write poems on Imam Husein. For instance, Sanayi Ghaznavids has expressed such elements in his famous book Hadighatol Haghighat and ShariatoTarighat are as follows:

Hoshang Zandi and Zeinab Lalvand

The son of Murteza, Amir Husein,
He was unique in Coniine,
His traits were all faith and joy,
All faith and joy,
Preferably Karbala and his greatness,
That brings wind to beings from heaven,
That head cut body in dust and blood,
That heart beaten by sword,
Such the evil deeds,
Insist on their own sins.
(Moddares Razhavi, 1989)

It should be noted that with the fall of the year of the reign of al-Malek Shah, Shia entered in the political system so that an Alavi was nominated for the caliphate by King Mohammed Kharazm Shah. In this regard, the country's leaders were convinced to declare a fatwa on the insufficiency of Al Abbas and confirm openly the legitimacy Husseini Sadat.

The Seventh and Eighth Centuries Hijri

In these two centuries, Shia acquired an appropriate opportunity for the development of Shiite culture, they engage in bereavement easily, and authors composed poems recklessly in memory of leaders and martyrs so that Rumi who is Sunni refers to the event of Karbala in his poem:

You do not know that Ashura,
Is the sorrow of heart, more than a century?
When believers understand this story, you?
The value of ear's love, love of earing,
For believers, the sorrow for the saint,
Is bigger than hundred Noah's storm,
As he was the king of religion,
At happiness, they tear links,
The invade to the curtain of governance,
They destroy all stump and chains.
(Nicholson, 1984)

In this century, another Sunni poet such as Seif Faraqani have composed some poems with their love and affection to Shiite Imams including Imam Husein (AS). The following is an example of poem about Imam Husein and Karbala Martyrs:

O people! Cry in this funeral,
Cry for the Karbala victim,
How long can we laugh with our dead hearts,
Cry today on this event,
They killed the son of Rasoul,
Cry for the sake of God,
Drop tears from your pains,
Cry for the sake of Mustafa's heart,
From the mine of heart to the pearl-like tears,
Cry for murteza's gem,

> With the God's bless,
> Cry for the victims with hundred eyes,
> Sad of Hsein's sorrow,
> Oh, cry you the sad people,
> Do not be quite in this mourning,
> Even speak or yell, or
> (Safa, 1962)

Needless to say that when Sunni poets compose poems on the glory of Imam Husein (AS) and the martyrs of Karbala, Shiite s poets can express freely their love and interest to the family of Holy Prophet (pbuh).Salman Savoji, Khajoo Kermani, and Ibn Yamin are the most famous poets of this age. For example, the verses by Khajoo Kermani say:

> That earing of the Throne,
> That heaven is its customer with a handful of jewel,
> A generous dervish and down to earth rich man,
> The king mark Sufi and Heidari king,
> Clear in his face or his character,
> The light of bless and the traits of prophet,
> In the sea of religion a king gem,
> He is sank in himself like a gem in sea,
> Hur confessed as one of his servants,
> He is open to everyone who seeks him,
> Dry lips and wet eyes from thirsty,
> While the wetness and dryness have been made for his sake,
> Karbala gives him only pain and difficulty,
> This is the result of growing angles.
> (Soheili Khansari, 1990)

Timurid Period

In this age, Shiite poetry did not face serious problems the same as the two past centuries and poets like Kamal al-Din Ghiasi Shirazi, Nezam Astarabadi, Faghani Shirazi and others wrote poems on the virtue of Ahl al-Bayt in a peaceful and suitable atmosphere. More important, some fanatic Sunni poets like Jami have narrated about Ahl al-Bayt with a special honor in their poems.Shia did not limit itself to the normal procedures of Shiite culture and they tried to establish their religion as the official religion. It was fulfilled in the tenth century as the result of Timurid weaknesses. Thus, Shiites overcame Sunnis. In this regard, Ibn Hesam is regarded as a prominent poet due to his poem about traits and virtues of Shiite leaders.

The Safavid

Safavid was emerged from the context of Shia movement that had been started in the previous period. With the establishment of this dynasty, formalization of Shiism, and special interest of some kings of this dynasty like Shah Tahmasp in the revival of religious values and beliefs, Persian literature, especially poetry, was led to a new direction, and narrating the virtues of Ahl al-Bayt (AS) and elegy reached its peak. The religious poems recalls cataclysms imposed the Imams.Mohtasham Kashani, who had reached a high place by writing his famous about the Karbala event after nearly four centuries of the life of Shiite literature, is still a master in Persian literature. In this section, only the first lines will be mentioned.

Hoshang Zandi and Zeinab Lalvand

Paragraph 1:

Again, what a riot in the creation of the universe?
Again, what a mourning and lamentation is?

Paragraph 2:

Ship broken of Karbala storm,
Pulsed in blood and soil of Karbala,
Paragraph 3:
I wish the tent of universe were fallen,
This high- pilar space were lost its pillars,

Paragraph 4:

When they call all beings for sorrow,
First, they call the dynasty of Muhammad,

Paragraph 5:

As the blood falls from his thirsty throat,
Mourning reaches the peak of Supreme Throne,

Paragraph 6:

I worry when his murderer is being punished,
Suddenly, they wrote like that of mercy,

Paragraph 7:

The day his great head was put on the spears,
The sun came naked from the mountains,

Paragraph 8:

When the caravan aimed at the battlefield,
With passion, fear overcome the thoughts,

Paragraph 9:

This killed person in the Hamoon is your Husein,
This caught prey in the blood is your Husein,

Paragraph 10:

Oh you the accompany of broken heart, see us,
Look at us the isolated, strange and forlorn people

Paragraph 11:

Keep quite Mohtashem! That stone's heart was melt,
The foundation of patience was destroyed.

Paragraph 12:

Oh sky, you do not know what you have done,
By anger, what have you done in this oppressed land?

(Mohtashem collection of poems.)

However, the increasing shining and development of religious literature and elegy in this era is very important.
In this era, kings disregard poets who wrote poems for persons rather than Imams. For instance, when Mohtashem Kashani wrote a poem in the praise of Shah Tahmasp, he said that he was not pleased that a poet praise and glorify him. He believed that it is better for poets to write on the status of Imam Ali and the Infallible Imams to earn their award first from their purified soul, and then they could ask for king's mercy. As the result of this type of thinking in Safavid era, the poetry had developed; many books, theses and collection of poems were written narrating the virtue of and the Infallible Imams and the martyrs of Karbala; but a review of the literary works in this age shows that they are not firm poems in terms of literary devices, figures, and conventions. Some poems were less documented, which reduces their literary value.

The Status of Elegy from Safavid Era to Contemporary Age

The popularity of poetry reached its peak in the Safavid era and in Qajar age, the culture of ta'zieh expanded and elegy was common. In the age of Reza Khan, although he attend barefoot in the religious rituals to deceive public opinion, he banned many mourning and lamentation sessions to glorify Imam Husein (Shaeri, 2006). Despite the oppression and tyranny in the mourning ceremony of Imam Hussein (AS) and the martyrs of Karbala, elegy passed almost its natural course and many elegies were written in this age.Then, elegy faces a shining and unique prominence in the Islamic Republic… however, there has been introduced about 250 famous poets who compose poems in the virtue of Imam Hussein (AS) in the contemporary age (centuries 14 and 15) (Hejazi, 2006).It is noteworthy that heroic poems and elegies played important role in motivating soldiers and fighters against Iraq attack to Iran after the Islamic Revolution.

Elegy in Arabic Literature

Laments were very common in Arabic literature and it seems that Arab poets pay more attention to laments rather than other types (Shamisa, 2004).Some scholars believe that elegy dates back to the ages before Islam in Arabic literature. The source of laments is found in the tribal relations and conflicts. Ibn Rashiq Qirvani says in "Al-Amdeh" about the elegies: in the Ignorance Age and they gave examples on the fall and annihilation of great persons, talked about the annihilation of various countries and powerful nations, they described the goats hidden in the mountains, explained the fall of lions lurking in woodland, wild donkeys in the plains, and angry and old vultures, eagles and snakes (Al-Amdeh: 74).Undoubtedly, elegy on the event of Ashura began in Arabic and its origin should not be regarded far from Ashura due to the coexistence of Arabs with poetry .Afsari kermai argues that the first religious elegies were written in the sorrow of Imam Hussein (AS) (1993).Bas ibn Jozi states that Aqabe ibn Omar al-Sahmi is the firs poet elegizing the glory of Imam Hussein (AS). This is one of the most subtle and most eloquent poems about Hussein ibn Ali (AS):

اذا العين قوت فى الحيات و انتم تخافون فى الدنيا فاظلم نورها

If our eyes are going to be clear and content and you will be depressed and frightened, the eyes should be blind (Ibid, 1992).The greatest Arab elegist is Do'ban ibn Ali Khazaee who wrote many elegies on the pains of Imam Hussein (AS).

Elegy in Persian Literature

There is no strong evidence about Persian elegy in pre-Islamic age, but the first Persian elegy I'd probably "Marzko Resa"; some books refer to the lament for the death of Siavash as the first one.In Islamic Age, the oldest elegy is the poem "Abol yanbaghi" about the destruction of Samarkand. The author of Sistan History argues that the oldest elegy is composed about the deterioration of Safaris state by Muhammad ibn Seif Sistani Safaris court poet.According to the history of elegy in Iran, it is divided into four classes:

Elegies on the death of famous people

National elegies
Elegies on the death of dear person
Religious elegies

Religious elegies are mostly written in the sorrow of Imam Hussein (AS). The most significant elegies of Persian poetry have been written in centuries 6 to 8. However, the Safavid era is the peak of elegy and Mohtashem Kashani the greatest elegist of the age is a court poet in the court of Shah Tahmasb (Kafi, 2007).

In Persian literature, elegy is mostly written in poetic forms such as qasida, Qete, Tarji Band, Tarkib Band, lyric, Robaee, and Masnavi (Shamisa, 2004).Maohtashem Kashani's Tarkib Band in the sorrow of the fifth one f Ahl al-Kisa, which is not only remembered in Muharam of every year but all days of a year. Religious elegies are the most recent type of elegy in Persian literature (Mo'tamen, 1991).

In terms of the influence of Arab elegists on the Persian elegists, it should be said that elegy was not written by lovers of the Imams and the prophet's family like Komeit and Do'balal and others to strengthen the feelings of heart during the Umayyad and Abbasid. It means that these poets would not like to make tearful the eyes of the audiences and affect them in the sorrow of Karbala martyrs.The first natural aim of early elegists was to create sense of hatred of the usurpers of the caliphate of the Prophet (pbuh) and to stimulate public emotions to recognize the splendor of truth of Ahl-Bayt against crime and banality of their enemies. Thus, it is observed that recitation of religious truths, insertion of historical events, and disclosure against the usurpers of the caliphate and prophet enemies is one of the most prominent themes and concepts.In this regard, Shia has devoted many martyr poets writing poems about Ahl al-Bayt in the history of elegy. If they did not write political poems and did not attempt to change the current situations to a promised one, they would not be killed. Do'bal Khazaee said that ha had expected his killer for forty years. Therefore, the poems who write about Imams have always been threatened because of truthfulness and protesting cruelty by the followers of hatred and sin.However, Muslims did not disregard easily the right of Imam Ali and his sons because it has confirmed and ordered by the Holy Quran. In fact, the origin of all historical cruelties from the death of Muhammad (pbuh) is the usurpation of the caliphate of Ali (AS). The usurpation has resulted in countless tragedies like Ashura.Understanding and insight in understanding this issue is so important that invoke Komeit Asadi the famous Shiite martyr poet to declared , "I aam so thirsty that if I drink the blood of all Umayyads [and all usurpers], I will not be watered. After the third century, this aggressive tone was declined in the elegies on Ashura and the tragic and painful aspects incresed.In Persian poetry, there is less passionate and aggressive sense because Iranian poetry has not been developed before the age of the Great Absence and Iranian poets did not encounter directly with usurping caliphs. Thus, Persian poetry has not been influenced by Arabic fellow to the extent that is expected.

Elegy in Ashura Poems

In Ashura, about seventy-two or a maximum of one hundred and fifty brave and noble men deal with agents of oppression and heresy in the limited time. Although the tragedy of Ashura in terms of the number of martyrs and the occurrence very limited time, the impact of Ashura is truly unique in human history.In human history, we have witnessed huge battles in which hundreds of thousands of people have fought against each other and some fighting continued for months and years; but Ashura is considered the biggest bloody event of humankind in the shortest time with the least number of fighters. The tragedy has several dimensions; epic can be cited as an example of the dimensions. It is interesting that the armies of the Umayyad (who murdered Karbala martyrs in their own hands) quoted, "We have seen men who seek death, and the death ran away from them." In addition, the last speech of Imam Hussein (AS) in Ashura is one of the most heroic ones in the history.The sermons indicate that death and disasters is so humiliated for Imam Hussein that he is considered as a conqueror that tread on the corpses of enemies and sings the songs of victory. Therefore, some Ashura poems are heroic and some are mystical. Some elegists also insist on the social aspects such as anti-oppression, philanthropy, submit to justice, etc. Hence, the general aspects of Ashura should be regarded because it is necessary to explain the issue in such a way to present all aspect for different

Hoshang Zandi and Zeinab Lalvand

people according to their level of comprehension. Ashura is like a beautiful spectrum affecting people from all idea based on the angle one looks at the spectrum; it follows a specific logic as well.

Ashura literature is one of the richest and epic treasures of Siite sensations and intellects. Some poets owe all of this popularity to this treasure of sensations and intellects; Mohtashem Kashani is one of the most notable examples who tried to portray and describe Ashura by composing his famous piece "Again, what a riot in the creation of the universe?" as the most known piece of poem about Ashura.Since the sacred body of Imam was placed in the soil of Karbala and the caravan of love walked in the course of history, all Shia, even free men, like circumambulating the shrine because the land does not contain only the Imam's body. Ashura is a time and Karbala is a place for battle of good and evil. It is a place for justice to fight against oppression. There is accommodation for freemen who preferred death to dishonor. They preferred to be killed with honor rather than staying alive with transgressors and oppressed killers.Ashura occurred in a society bearing calm before the storm; it responded positively (with some delay) to the call of a free man. Ashura occurrence destroyed the houses of oppressors like a fire.

Event of Ashura was an uprising against all the tyrants of the world in everywhere. Unquestionably, such haunting event became a great event; it is the inception of a revolution in Arabic and Persian literature.The name of Imam Hussein became slogan of the revolution against oppression. Many great poets have emerged in this field that the most famous ones are Komei Asadi, Do'bal Khazaee, and Abu Feras Hamdani. They help the decline of the tyrant governance of Bani Umayya and Bani Abbas. The uprising of Imam Hussein has entered Persian literature since the third century. Of course, it was not serious at first, but they referred to Imam Hussein's death and Karbala martyrs in the form of stories, allegories and allusions. About two centuries late, Sanayi referred directly to Imam Hussein death in his poems in fifth and sixth century.After the fifth century and at the time of Naser Khosro, there are some connotations and allusions to the event of Ashura, but the issue was detailed subject of poems in Timurids and afterwards. After Safavids, the poets tended to write Ashura poems as the result of Shiism, the change in system of government, and the prevalence of Shiite thought. Ibn Hesam is a prominent figure in addressing Ashura before Safavids. The great amount of his works is classified in the category of Ashura poems.After Ibn Hesam, many poets have tended to write Ashura poems so that collections of poems were edited about Ashura poems in Qajar period; some of them are as follows:Sabahi Bigdeli, twelfth and early thirteenth century's poet, was contemporary with the zandyeh Kings; he wrote a Tarji Band elegizing the death of Imam Hussein (AS) in imitation of Kalim Kashani.

> Fall worried alongside the horizon at evening,
> His head was like a fallen container,
> I said that he is intimate to the red twilight,
> Like a grief-stricken man's nail in the blood.

Mohammad Taghi Bahar, the poet of constitutional period, has mourned the death of Imam Hussein as he says:

> Oh sky, you ran Ali's family from their homeland,
> You led them to Karbaa and did not help them,
> Led the gazelles out of the land,
> Imprisoned them in the hands of cannibal wolves.

Mohammad-Hossein Shahriar, great contemporary poet, who loved and was fond of Ahl al-Bayt and the Imams, has written many poems in the praise of Imam Hussein and martyrs of Karbala, he has a lyric titled "Karbala Caravan" that begins by the following:

> Oh Shiite, Hussein aims to Neinava,
> His desires aimed at Karbala,
> Relentless enemies and disloyal friends,

Deal with whom? Hussein has two problems.

The reflection of Ashura in Arabic Poetry

The poetic realm of literature has a particular place for Shia since the beginning. Probably, Shiite Imams' skills and abilities in writing poems and glorifying committed and sincere poets have led the verses not to be composed for material sakes, but they were written to satisfy the Lord and defend Allah's friends.Besides, political conflicts and Shiite revolutionary insurgency in Umayyad and Abbasid eras played important roles in the development of Shiite literature, particularly in poetry. Shiite heroic spirit was manifested in the form of passionate proses and verses after Ashura in Karbala, innocent martyrdom of Imam Hussein (AS), and martyrdom of the family of the Prophet (pbuh). In addition, Ghadir has also a perch in the Shiite literature and many Ghadiria have written early Islamic centuries.

Ashura: The Compass Point of Arab poets

Almost all of the major Arabic literature poets have allocated poems to the event of Ashura. In fact, Karbala revolution has injected elements into Arabic literature that were rare or scarce. The first Ashura poems of Arabic literature were written in the strangled Umayyad and Abbasid eras; poets wrote poems in the praise of Imam Hussein despite of their fear to lose their lives. Some poets like Komeit, Seyed Ismael Homeiri, Mansour Namari, Abdi Koufi, had written valuable poems in order to avenge the blood of Imam Hussein (AS) in the intimidating and frightening situation of the Umayyad period; they cursed and mocked Umayyad dynasty.Komeit Asadi said, "Aand Imam Hussein (AS) is a killed person fallen among some hooligans." Seyed Ismael Homeiri, whose book of poems is full of poems describing Ahl al-Bayt and Karbala event, as well as recantation of Ahl al-Bayt's enemies, says, "Oh Al-Yasin, I trust you, you are the masters of my life, I disavow your enemies Al-Harb, Al-Marwan and Al-Ziad. Ibn Ziad hit Hussein ibn Ali's teeth by his stick while I saw many times that Muhammad kissed the teeth, and I have many witnesses for this." In the age of Bani Abbas, a poet called Mansour Namari counts Bani Abbas the same as Bani Ummayad in his poems after seeing that Mutavakil destroyed the shrine of Imam Hussein (AS). They pursued him, but many poems about Ashura have remained from him. In Arabic literature, poets who composed poems under the influence of Ashura can be classified into three groups:Shiite poets, Sunni poets, and non-Muslim poets.Many of the Shiite poets in this regard are in fact Shiite scholars who wrote poems for getting close to Ahl al-Bayt. Leading scholars such as Hashim al-Kaabi, Allama Bahr al-Oloom, and Syed Haider Helli are particularly important in this regard. Nevertheless, these poets just mentioned the virtues of Ahl al-Bayt (AS), especially Imam Hussein (AS) and his companions.

There was another group of Shiite poets involving in the Ashura event and immortalized it the best form of their works and poems. Do'bal Khazaee is the best representative of this group who describes beautifully event of Karbala and the pains of of Ahl al-Bayt (AS); in Taiyeh, he says, "The sons of prophet wander thirty in the desert while Yazid family lives in mansions and luxurious tents." The Shiite poet who lived at the age of Imam Reza (AS) says in another part of Taiyeh, "Oh Fatemeh (S), if you knew that Hussein would swim in his blood, and would die with thirsty lips along the Euphrates, you would slap in your face, tears would be running on your face. They died thirsty; I wish I had died before."Seyed Ismael Homeiri when engaged seriously to write poems about Imam Hussein (AS), says in one of his qasida, "I love continuously the friendship with Hussein, I know myself a devotee for him, and I always praise him and his companions frankly." Shiite poets have always created distinctive literature by allusions to Ashura. In the light of this effort, they have invent new expressions with the centrality of love and sacrifice indicating that the specificity of the event in Arab literary texts.Komeit, another Shiite poet, wrote poems in defense of Imam Hussein (AS) and Ahl al-Bayt for ceremonies. It seems that Shiite poets have mostly point at the main objectives and idealistic goals of Imam Hussein (AS) especially promotion of virtue and prevention of vice. Nevertheless, the poets and scholars of other religions and sects have focused on the subject of reformation in their descriptions. Accordingly, the aim of Imam Hussein was deep correction of society at that time in the light of sacrifice.Ahmad Amin, the Egyptian critic, says, "Indeed, Shiite literature has enriched Arabic literature because of the Shia condition

motivating emotions naturally; emotion that are the best literature support.Sunni poets have clearly attempted to create poems about Imam Hussein (AS). Ibn Thana al-Malek is a Sunni poet owing all his personal credence and value to his interest in Imam Hussein (AS); he regards both Shia and Sunni as the mourner of this disaster. Some literary critics argue that Shiite poets look at the event in the lens of truth and holiness while Sunni poets look at it from the perspective of politics.

Nizar Qabbani, Sunni poet, regards resistance in Palestine and southern Lebanon as following of Karbala; he describes south as a wearer covering Imam Hussein's cloak and an image from the scene of Karbala. In another poem, Qabbani writes, "If we like to be born again, the sign of martyrdom would be installed from the tent of Imam Hussein and his Ahl al-Bayt on your skin. The message comes out of ages like spring of water; a message that shouts Karbala, Ohod, Badr, Hussein and Fatemeh calls us to correct our history."Abdol Rahman Sharqavi, an Arab literary man, argues, "The position of Hussein's head is in my heart. Do not search for his head, but be aware of his martyrdom value and place."The ongoing influence of Ashura event in the literary text=s of Arab poets is so far that some words like dedication, sacrifice, fighting oppression, etc. draws attentions unconsciously to the event; the influence is still progressive after 14 centuries. In addition, terms like thirst, water, poisoned arrows, camp, Euphrates, Sarallah, Yalsarat, Ra'salhussein, etc. have became the symbol of love and devotion. The use of these symbols can be observed even in Socialists poetry.Bayati, an Iraqi poet, can be introduced as an example in this regard. He has continued his life in in successive deportations and the terms Karbala, Euphrates, and martyr are highlighted in his poems. The poet says in one of his poems, "The sound of cry for the Karbala martyr is high since thousands years ago; Hussein's blood have watered the palms and redden water of Euphrates." Ashura terms are so frequent in Arabic literature that they have become keywords in Arabic thesaurus. The terms indicate the number of written poems for Karbala.The significant point is that the frequency has not been unabated while many ages past from Ashura. Most Arab poets and writers have not looked at Ashura event as a personal issue, but they introduced it as an event related to the destiny of people at its time implying peace and freedom for all humankind.From the tenth to the thirteenth century, imitation and similarity was very common in Arabic poetry. Moreover, many persons who write poems in this field were not experts in literature. Some were jurists and religious scholars who wrote poems to be close to Ahl al-Bayt. Preaching was at its peak in this era and reading books on the death of Imam Hussein was very common. Examples and lessons of Ashura were most forgotten in poems, and the beautiful victory of Imam Hussein (AS) is not seen in the poems. However, Mola Kazem Arzi, Allama Bahr al-Oloom, Hashim al-Kaabi and Syed Haider Helli wrote beautiful epic and emotional poems.Mola Kazem Arzi (born, 1796) wrote:

قد غير الطعن منهم كل جارحه   الا المكارم في امن من الغير

Sword and spear impact injured on all parts of their bodies, but
"Their virtues, magnanimity, and greatness of souls were at a safe place that will never be wounded."
        (Shabar, 2001)
Syed Haider Helli (born 1304 Hijri) was a thirteen-century poet; his poems are more brilliant than his contemporaries and Husseini poems in other ages. As the pioneer of new movements in modern Arabic poetry, he writes:

عفيراً متى عاينته اكلماه   نحتطف الرعب الوانها
فما أجلتّ الحرب عن مثله   فتيلاً يجبن شجعانها

"When the warriors see this killed man on the earth, the faded from fear. Noe one has ever seen winners fear at the end of a war."
        (Amini, 1954)

Since the mid-thirteen century, a spark of renewal appeared in poetic style and a new perspective emerged in the poems Ashura.
Our time is the age of renewal and new literature; Ashura poetry is at its peak. With the advent of freedom uprisings in Islamic countries, elegy is rapidly replaced by glory and epic. Eulogizing Imam Hussein, his family, and his

Hoshang Zandi and Zeinab Lalvand

companies' virtues enriches poetry. Poets describe ambitious and grandeur heroes in Ashura. Satire and invective occupy a small part of the contemporary poetry. Social conditions are a reason for this reduction of emotions in elegy. Although eulogizing is employed less, it is implied from the inner senses of the poet. This wisdom will stay as an everlasting element in poetry and decorate the contemporary qasida.

A famous Sunni poet, Dr. Zaki Al-Mahaseni (born, 1972), uncovers his inner emotions:

عاطني دمعاً و خذ مني عيناً	واحسيناً واحسيناً واحسينا
انا في الشام و تيار حناني	ينتحي من ذكرک المحزون حينا
يسـأل الريح اذا هبّت رخـاء	في البوادي عن هوي قدكان دينا
يا مهاداً في العراقين اجيبي:	اين مثوي ذلک المحبـوب اينـا؟!

"In profitable deal, I am ready to give my eyes and receive one drop of tear in the path of Imam Hussein (AS). Oh the tragedy of Hussein! Alas! I am now in Syria while the storm of my affection blows in the sorrow of Hussein. In its blows, the storm spread my sorrow everywhere. Oh, Tigris and Euphrates' basin, shoe the place of my beloved to me."(Shabar,2001)

In Safavid era, Ashura elegy has occupied a particular place in Persian literature; the encouragements by great figures have significant effect in its development. In this age, many poets have tested their taste in elegy. This heritage pays more attention to the tragic aspects of the incident; thus, it is different from poems written by early Arab poets because the early poems include revolutionary and fighting spirit in addition to tragedy. Many of early elegists spent years of their lives in prison, homelessness, or carry their gallows by themselves; as Do'bal Khazaee wrote: I carry my gallows on my shoulders. There is not little number of poets who lost their lives in this path." (Adab al-Lotf, 2001)

CONCLUSION

Certainly, moaning and mourning for dead person has long history in the culture of all nations. Meanwhile, style of expression and intensity of emotions vary. In this regard, elegy for martyrs of Karbala has taken a specific form due to religious destination. Hence, religious elegizing in Safavid era was led to a way that opened a new chapter of Persian poetry. Since then, hundreds poets have written thousands lines epic of sacrifice about heroes of Karbala and other martyrs of Islam; they cover the poems with the garment of immortality. The everlasting Ashura is one the most influential events reflected in Shiite literature. A glimpse at the poems written by Arab poets reveals that Ashura - probably Shiite literature- imitates the sayings of Commander of the Faithful Imam Ali (AS) about action based on revenge of tyrants on the one hand, and waiting, Faraj and trust to a better future. According to the ups and downs of Ashura poetry, poets' dignity, generosity and tolerance have been growing and evolving with political and social transformation.

REFERENCES

1. Afsari Kermani, A. (1992). Exploration of the elegies in Iran. Tehran: Etelaat publication.

2. Amini, A. (1954). Al-Qadir. Tehran: Islamic Library.

3. Faraghani, S. (1962). Seif Faraghani's book of poems. Edited by Zabihollah Safa, Ferdowsi publications, Tehran.

4. Hejazi, A. (2006). Historical research on Ashura poetryarticle. Resalat newspaper, Qom, No. 6072.

5. Imami, N. (1980). Elegy in Persian literature. Tehran: Publications of Jihad University Central Office.

6. Modares Razavi, M.(1989). Sanayi's ḥadīqat al-ḥaqīqah. Tehran: Tehran University press.

7.   Mohseni Nia, N. Pour Yazdan Panah Kerman, A. (2009). Elegizing in Persian and Arabic literature: with emphasis on a comparison between Abol Hasan Tahami and Khaghani Shervani. Comparative Literature, issue. II, No. 8.

8.   Nicholson, R. (1984) Masnavi. Tehran: Mola publications.

9.   Shabar, Javad (2001). Adab al-Lotf au Shoara al-hussein (AS). Beirut: history Institute.

10. Shadkam, O. (2007). Ashura in ancient Persian poetry, article, websites (Islamic Propagation Organization).

11. Shaeri, M. (2006). Love elegy: An introduction to elegizing and new nohe in the mourning ceremony of Karbala martyrs and Ahl al-Bayt. Qom: lasting legacy publications.

12. Shamisa, S. (1994). Literary Styles. Eighth edition, Tehran: Ferdows.

RESEARCH ARTICLE

Principles and Standards of Iranian - Islamic Architecture in Line with Sustainable Architecture

Soheila Aghlmand*

Ms, University Lecture, Department Of Architecture, School Of Architecture, Urbanization &Art, Urmia University, Iran.

*Address for correspondence
Soheila Aghlmand
Ms, University Lecture, Department Of Architecture,
School Of Architecture, Urbanization &Art,
Urmia University, Iran.
E-mail: Soheilaaghlmand@yahoo.com.

ABSTRACT

Exploring the manifestations of Islamic-Iranian architecture confirms the fact that many of the principles of sustainable architecture are the basic principles and integral part of Islamic-Iranian architecture that has been used in this country by much lower technologies than the present situation. This article aims to achieve a set of Iranian-Islamic architectural principles and criteria for sustainable architecture. This will be carried out by using descriptive-analytical method as a survey (survey of experts and professionals). First, Iranian-Islamic concepts related to architecture and sustainable architecture were examined by investigating the scientific and authoritative sources. Then, a set of principles was listed through various manifestations of Iranian-Islamic architecture in environmental, social, cultural, physical, economic aspects. Afterwards, basic principles were screened and they were limited to the main principles and criteria. These principles and standards have been analyzed many times due to their frequency in many studies; they have been established in this way. Next, a questionnaire has ben derived from these indicators. Finally, a suitable set of principles and criteria of Iranian-Islamic architecture for sustainable architecture were presented after studies and a survey from experts and professionals' opinions on the subject (including 20 professors, architects and researchers).

Keywords: Islamic Iranian architecture, sustainable architecture, sustainable design, criteria

Soheila Aghlmand

INTRODUCTION

Valuable experiences of the past have always been the capital of scientists in unraveling the problems and movement towards a better future. Transition of experiences from one generation to others causes scientific and technical progress, cultural continuity, strengthening of national identity and enhancing the sense of self-reliance as well as paving the way for new breakthroughs in science and technology to achieve sustainable development (Jameie & Ismaili, 2013). Architecture of Iran's past is replete with examples of the application of methods of processing so as to optimize the efficient and achieve what today is called sustainable architecture (Naghizadeh, 2002). Despite this clear fact, unfortunately, contemporary history of Iran is facing cultural discontinuity and rupture of historical experience and principles of its own cultural traditions due to many reasons and in different dimensions. Moving away from indigenous identity and values of the Iranian-Islamic architecture in the works of today architecture is one of the effects the break (Mellat Parast, 2009; Haghighi & Sahaf, 2014). Lack of proper use of valuable experience in the field of architecture, organization of artificial environment and its technologies in achieving sustainability in the building, are examples in this regard.

Several decades have passed since the introduction of sustainable architecture and many methods have been proposed to resolve the current crisis; but there are still difficulties in the creating sustainable architecture. It seems that it can be completed by removing obstacles with respect to the values and characteristics of Islamic architecture because the buildings have matched the goals of sustainability approach in their place and time based on the works of Islamic architecture and library documents. The formation of Islamic architecture reflects subtly some social and economic relations with the natural environment and cultural symbols. Thus, the continuity of sustainable architecture topics can be seen in Islamic architecture.

Sustainable Architecture

Architects, along with other scientists, are finding new ways to provide better human living (de Garrido, 2011) Obviously, life, work, entertainment, rest and … are activities carried out in spaces designed by architects. Since the strengths and weaknesses of a building have direct impacts on ecosystems in the world, the responsibility of architects is very critical. The application of sustainability concepts has opened new topics in the field of architecture called sustainable architecture, ecological architecture, green architecture and architecture of environment; all the concepts have the same connotation meaning Environmentally Friendly Architecture (Keitsch, 2012). The primary basic roots of movement of environmental protection and sustainable architecture dates back to the 19th century. John Ruskin, William Morris and Richard Lethaby are the vanguard of sustainable architecture (Sherman & Hadar, 2012). Sustainable architecture can be defined as architecture of the smallest inconsistency and incompatibility with the surrounding natural environment and with the region and the world in a larger scope. According to theorists, it is the achievement of high standards of quality, safety and welfare that actually provide human health and the goals of sustainable architecture (Sinha, 2009).Sustainable design, the creation of manmade environment, and its committed management are based on ecological principles, consistency and efficiency of the resources (de Garrido, 2011); it includes minimizing the use of nonrenewable resources, upgrading and improving natural environment, and minimizing ecological damage to the environment. This design focuses on several fundamental points mentioned below:

uality-orientation

Attention to the future

Considering the environment. (Contal-Chavannes & Revedin, 2013)They believe sustainable design is not a formal style derived from the momentary impulse, but it possesses concepts connecting man, nature and architecture.

3633

Soheila Aghlmand

Another important point in this regard is sustainable construction meaning management of a clean and safe environment based on effective utilization of natural resources and ecological principles (Keitsch, 2012). The purpose of sustainable construction is the reduction of damages to environment in terms of energy and exploitation of natural resources, which include the following rules:Reducing consumption of non-renewable resourcesDeveloping the natural environmentEliminating or reducing the use of toxic materials or harmful to the nature in the construction industry. (Lee, 2011)

Advantages of Application of the Principles and Norms of Islamic-Persian Architecture in Sustainable Architecture Approach

Convergence of principles of Iran's past architecture with the principles of sustainable design is not coincidence, but sustainability, continuation and perpetuation of excellent architectural concepts and ideas reflect the presence of such views in the past of Iranian architecture (Pakdaman, 2013). Iranian traditional architecture focused primarily on the following items:

Regarding nature and its sacred associations:

Inspiration from nature can be seen in many aspects of the building. The use of natural herbs, natural lighting, natural ventilation and thermal properties of land and other natural resources are included in this architecture (Pirnia, 2003).

The design process and human designing:

In Islamic Iranian architecture, satisfying the physical and psychological needs of the residents is very important (Soflayee, 2004). The most essential role of architecture is the creation of an environment sustaining security, health, physical comfort, mental health and productivity of its inhabitants.

Building reliability:

Using the geometry in its plans is one of the characteristics of Iranian architecture. The use of geometric rules in designing leads to better understanding of size, proportion, beauty in relation to construction. Accurate understanding of geometry and issues relating to the Iranian architecture is useful to present a stable and valuable forma (Pirnia, 2003).Contradiction and conflict between the principles commonly used in the field of contemporary architecture and sustainable principles (in both traditional and ecological approaches) is the outcome of the historical process (Asad Pour, 2006). Over the centuries, the houses were constructed by their residents or local builders. They were trying to meet their needs with available resources, techniques and ancient traditions, and simple tools. The remarkable thing is that the principles of sustainability have been shaped more or less with the titles, forms, and manner consistent with the principles of sustainable architecture when the environmental and energy crises have not been at the current level. Nowadays, one can be more familiar with these features with respect to available evidences and examples. In modern times, Due to the problems of culture and identity, along with environmental and energy crises, traditional approach is not responsive to the above principles and it is inevitable to adapt and align the principles with the present instances and examples according to modern technology is inevitable. Therefore, the old sustainable principles should be made consistent with present decoration and techniques based on ecological issues.

RESEARCH METHOD:

The Process of Designing and Explaining Iranian-Islamic Principles and Criteria for Sustainable Architecture

Soheila Aghlmand

This article aims to achieve a set of Iranian-Islamic architectural principles and criteria for sustainable architecture. This will be carried out by using descriptive-analytical method as a survey (survey of experts and professionals). The statistical methods such as mean and softwares such as Excel and SPSS were used to analyze the data. First, a set of principles was listed according to various manifestations of Iranian-Islamic architecture in environmental, social, cultural, physical, economic aspects. Afterwards, basic principles were screened and they were limited to the main principles and criteria. These principles and standards have been analyzed many times due to their frequency in many studies; they have been established in this way. Next, a questionnaire has ben derived from these indicators. Finally, a suitable set of principles and criteria of Iranian-Islamic architecture for sustainable architecture were presented after studies and a survey from experts and professionals' opinions on the subject (including 20 professors, architects and researchers). Accordingly, the process of designing and explaining principles and criteria of Iranian-Islamic architecture (framework and process) is depicted in Figure 1.

sustainable architecture

To assess progress towards the goal of designing and testing principles and criteria for Iranian-Islamic architecture in line with sustainable architecture, it is necessary to test and evaluate both documents and research studies (Table 1)This article tries to present an integrated practical method to assess and monitor progress towards the identification of Iranian-Islamic architecture in line with sustainable architecture within a specified period, not in the absolute level of stability and isolation. In assessing progress towards identifying the dimensions, reliable and scientific documents should be examined from different perspectives to provide three main elements of balance with nature, human design and reliability of building in the process of sustainable architecture.

Second step: Identification of the basic elements of sustainable architecture

Fundamental component of sustainable architecture cannot be irrespective of purposes and principles of Islamic-Iranian architecture approach because the components are indeed the main characteristics of each dimension of Iranian-Islamic architecture that help us to make reasonable decisions and strategic orientation to identify and determine dimensions of Iranian-islamic in line with sustainable architecture. Hence, it is necessary for the realization of the principle of integrity, concurrency and synergy among the Iranian-Islamic architectural dimensions or aspects of its interaction (environmental, social, economic, cultural and physical) to specify components of sustainable architecture based on the main characteristics or properties of each dimension to determine principles and criteria of more accurateIranian-Islamic architecture in line with sustainable architecture. The main components of sustainable architecture that can be the starting and connecting point of Iranian-Islamic architecture approach and its principles and values in the phase of designation are as follows (Norton, 1999):

The comprehensive use of existing materials and equipment in local transportation.
The use of available resources to meet the general requirements so as not to destruct the environment.
Lack of dependence on equipment that is not prepared simply.
Using the skills developed practically in society.
The possibility of being achieved in indigenous socio-economic context.
The creation of valuable results.
Respond to local climate
Having flexibility to meet local needs and habits.
Having been replicated by local people.

The conceptual ideas should be applied based on the theoretical perspectives of Iranian-Islamic architecture according to territorial and local requirements because holistic and integrated Iranian-Islamic architecture contains all dimensions and components of sustainable architecture; holistic approach is considered its default assumption (Figure 2).

Soheila Aghlmand

Third step: Explaining the design criteria and selection of principles and criteria of Iranian-Islamic architecture in line with sustainable architecture

The manner of choosing principles and criteria is one of the main steps in the process of preparing principles and values; the question is: what are the measures for selection of principles and criteria to cover goals and integration with social realities. Therefore, selection criteria mean that what are the manifestations of proper principles and criteria. In this regard, the measures for selection of criteria and the principles of Iranian-Islamic architecture in line with sustainable architecture should have some basic characteristics and it should be studied in detail with respect to each score and indicator. Therefore, since the selection criteria should be comprehensive, their number should be enough to cover all topics and not to makes evaluation complicated. Given that the measures for choosing indicators have been introduced by experts, the presented principles and criteria are: (1) Relationship with the issue, (2) Access to the data (capacity for collecting and processing), (3) Reliability of information, (4) Clarity and the ability for users to understand, (5) Compatibility over time and across jurisdictions or regions (Figure 3)

Fourth Step:

Initial screening of experience and identification of main principles and norms of Islamic-Iranian architecture in line with sustainable architecture

In order to achieve a set of comprehensive principles and criteria for Iranian-Islamic architecture for sustainable, one should present a practical conceptual and structural concept among some levels of theoretical foundations, requirements of sustainable architecture, and goals of Iranian-Islamic architecture.From this perspective, first, a wide range of principles and criteria were gathered and classified according to experiences and review of Iranian-Islamic architecture. They were mostly main dimensions of Iranian-Islamic architecture with emphasis on sustainability, which are as follows:**Economic**: avoidance of emptiness, frugality, saving, flexibility of building, taking into account local resources, lack of equipment that are not available.

Social cultural:

Introversion, compatibility, public direction, retrospection (bad habits or avoiding unnecessary things), retrospection (bad habits or avoiding unnecessary things), considering the expectations, wishes and needs of the local culture, creating an environment that has the flexibility to match the habits and needs of the people, the cultural-religious sensitivity issues ....Environment: a meaningful nature in architecture, local designing, using local materials, resource continuity preservation, conservation, use of water and...Physical: Centralization, reflection, geometry, transparency, continuity, hierarchical, vertical and horizontal coordination, balance, grandeur, simplicity and....

Fifth step: Initial screening of experience and recognized principles and criteria

Because of the impossibility of comparing principles and criteria in experiences and given the repetitive and uniqueness of some of the principles and criteria that are not consistent with sustainable architecture, the researcher tries to eliminate repeated and unnecessary cases. Finally, 31 principles have been identified and they were listed in compound dimensions, principles and criteria. Then, the screened principles and criteria were analyzed due to their frequencies in some studies. 31 final principles and criteria were derived. In the next phase, the indicators will be evaluated through questionnaire and interview with experts and professionals in this regard (Table 2).

It should be noted that the first column of the table represents the results of this phase of research that is the extraction of principles and standards of Iranian-Islamic architecture from experiences and review of the literature. In addition, the explanation and analysis of this phase is carried out in the eighth step to compare the ideas presented by experts and thinkers.

Soheila Aghlmand

Sixth Step: Operating principles and standards of Iranian-Islamic architecture from the perspective of experts

To find more operating principles and criteria in this phase, the main principles and criteria were investigated and evaluated by a group of specialists and experts in architectural and urban planning using the proposed checklist (Table 3). Here, according to the presented standards of operating principles and criteria by scholars and due to checklist, a score between 1 to 3 was determined for each principle in each criterion (score 1 means the least important, a score of 2 means the average, and score 3 refers to the high importance of the principle in terms of the relevant selection criteria). With respect to the coefficients of each indicator, the total grades, mean and calculated standard deviation for each of them, some principle and value were selected for sustainable architecture, which will be mentioned in detail in the following. The results of the analysis of the evidence indicate that the explanation of related concepts to sustainable architecture is consistent with the available definitions on the centrality of Iranian-Islamic architecture and sustainable architecture in harmony with local conditions. On this basis, infrastructure is considered to meet the objectives of sustainable architecture to meet the needs of residents and ensure their satisfaction. In this approach, two key elements (harmony and sustainability with the sites) are considered. In this manner, 31 indicators were selected due to their frequencies. 16 final principle and criteria (table) were selected based on the ideas of experts; these principles have capability more compatible with the objectives of sustainable architecture.These principles and criteria present concepts such as coordination and consistent with the climate of sustainability and so on along with their subsets to pave the way for sustainable architecture.Thus, one can summarize the most important Iranian-Islamic architecture principles and criteria for sustainable architecture in Table 4.

DISCUSSION AND CONCLUSION

The purpose of this paper is to explain the principles and criteria of Islamic-Iranian for sustainable architecture. Investigating manifestations of Islamic-Persian architecture is well confirmed that many principles of sustainable architecture have indeed been basic principles and integral part of Islamic-Persian architecture. They have been implemented in the past of this country by applying much lower technology than the present condition. Principles such as respect for nature, energy conservation and exploit the benefits of nature such as wind, solar and … results in the creation of a synchronous architecture with nature that is in harmony with the spirit of man. Unfortunately, contemporary architects' improper imitation of the West and modern architecture causes the spread of a kind of architecture with the least consistent with geographic and climatic conditions, and even at the higher levels with the psyche of consumers. It can be argued that return to Iranian-Islamic architecture with respect to its implications, which is rooted in teachings of Islam and the country's rich culture, can pave the way for solving many problems such as energy crisis, environmental degradation, etc. that have raised concerns for many governments and the international community. Of course, this return means the restoration of principles and their synchronization with new technology and the present needs of society, not mere imitation of old architectural principles that results in recession. To reach this important point, it is necessary to identify Iranian-Islamic principles and criteria in the current situation to fulfill the needs of society through the restoration of these principles and their synchronization with new technologies. The principles and criteria are a set of different measures that help architects and urban planners to contribute in reforming activities and processes of sustainable architecture; it can be used as a tool for sustainable design and operate a framework for the design of future activities. According to researches in the field of Islamic-Iranian architecture, 16 principles and criteria form the underlying concept of sustainable architecture. Furthermore, according to the experiences and expert opinion, the operation of principles and criteria results in other outcomes about the extracted principles and criteria that are stated in the following.

1- Internal and external consistency of the principles and criteria: Designing and organizing principles and criteria using an integrated approach adopting are methodologically all aspects of Islamic-Iranian architecture and include its stable context. Therefore, the selected principles and criteria are linked together in content and ideological terms,

Soheila Aghlmand

requirements of planning and administrative structure. While they are complementary, they are coordinated and consistent with the external environment as well.

2- The possibility of operating principles and criteria in experimental test: The selected principles and criteria have been developed according to the existing requirements, architectural spaces, and data collection systems, etc.; since they are considered as appropriate factors in measurements and sustainability, and they are capable of being tested and operated.

3- Sustainability and operating principles and criteria: Iranian-Islamic architecture provides a suitable framework and a powerful explanatory approach for principles and criteria of sustainable architecture, and its measurement. It indicates that it is inevitable to use it in defining and extracting principles and criteria for sustainable architecture.

REFERENCES

1. Asad Pour, Ali (2006). Sustainable patterns in the Iranian desert architecture. Ma journal, No. 25, Tehran, pp. 63-71.
2. Pakdaman, Arezo (2013). Representations of Iranian architecture in the Islamic period. Portrait of knowledge, Tehran.
3. Pirnia, Mohammad Karim (2004). Styles of Iranian architecture, architect publication.
4. Pirnia, Mohammad Karim (2003). Islamic architecture of Iran, University of Science and Technology.
5. Jameie, Agmad & Nastaran Arab Ismaili (2013). Authentication and the Islamic architectural features: The principles of Islamic-Iranian architecture in contemporary architecture. The National Congress of architecture, culture and urban management, Karaj.
6. Hosseini Moghadam (2014). Iranian-Islamic Urban Development. Dina, Tehran.
7. Haghighi, Mona Motavalli & Seyed Mohammad Khosro Sahaf (2014). Imitation of contemporary architecture to the principles of Islamic-Iranian architecture. First National Conference on architecture, Civil and Environmental city of Hamadan, Hegmataneh Association of Environmental Assessment.
8. Diba, Darab (2003). Inspiration and the interpretation of the basic concepts of architecture, architecture and culture Journal No. 1.
9. Soflayee, Farzaneh (2004). An exploration of the concepts and practices of sustainable architecture of village. Journal of Urban Planning and Architecture, No. 42, Tehran, 62, 67.
10. Selseleh, Ali (2009). The effect of identity (Iranian-Islamic) on esthetics of the city. Utopia, Second issue, 47-58.
11. Soltan Zadeh, Hossein (2006). Password processing in architecture of Iran. Tehran Chartaq.
12. Falamaki, Mohammad Mandour, Alpagonovolo, Adriano, Mehryar, Mohammad, Robobo, Mostafa, Dadkhah, Mahyar, Shariat, Azarandokht, Iqbali, Rahmani & Siamak Saneie (2005). Vernacular architecture. Space publication, Tehran.
13. Deh, Jamshid (2007). Characteristics of Iranian-Islamic architecture and urban planning. Identity of City Journal, Second Issue, No. 12-23.
14. Meshkat, Rohani, Khademi, Vahidreza & Mozhgan Khademi (2010). Values and principles of architecture and urban planning. National conference of architecture and urbanism in contemporary Iran, Beiza, Beiza Islamic Azad University.
15. Meshkini, Abolfazl & Kiyomars Habibi (2008). Traditional principles of construction in Islam. Deputy of Planning and Architecture. Planning and Architecture Studies and Research Center.
16. Memarian, Gholam Hossein (2013). An introduction to Islamic-Iranian architecture. Naw Andish Naghmeh, Tehran.
17. Mellat Parast, Mohammad (2009). Sustainable Architecture in the desert cities of Iran. Journal of Utopia, No. 3, pp. 121-28, Tehran: autumn and winter.
18. Naghizadeh, Mohammad & Maryam Dorodian (2008). Explanation of transition in the principles of Iranian civilization identity. Identity of City Journal, second issue, summer, 73-86.

Soheila Aghlmand

19. Naghizadeh, Mohammad (2002). Cultural foundations of Iranian sustainable architecture. Housing, Issue 10, winter, pp. 31-48.

20. Naghizadeh, Mohammad (2008). City and Islamic architecture. Isfahan, Mani.

21. Norbayan, Alireza, Moieni, Seyed mahmood & Bahareh Shavandi (2012). Flexibility and interaction in Iranian-Islamic Space Agency of housing. Second National Conference on Housing oriented architecture and identity of Iran, Hamadan; Sama educational and cultural center in Hamadan.

22. Contal-Chavannes, M. H., & Revedin, J. (2013). Sustainable design: towards a new ethic in architecture and town planning. Walter de Gruyter.

23. De Garrido, L. (2011). Sustainable architecture containers. Monsa.

24. Keitsch, M. (2012). Sustainable Architecture, Design and Housing. Sustainable Development, 20(3), 141-145.

25. Lee, S. (Ed.). (2011). Aesthetics of sustainable architecture. 010 Publishers.

26. Norton, John (1999), "Sustainable Architecture: a process for achieving shelter that will keep going"

27. Sherman, S., & Hadar, I. (2012, June). Identifying the need for a sustainable architecture maintenance process. In Cooperative and Human Aspects of Software Engineering (CHASE), 2012 5th International Workshop on (pp. 132-134). IEEE.

28. Sinha, R. (2009). Green Building: A Step towards Sustainable Architecture.ICFAI Journal of Infrastructure, 7(2), 91-102.
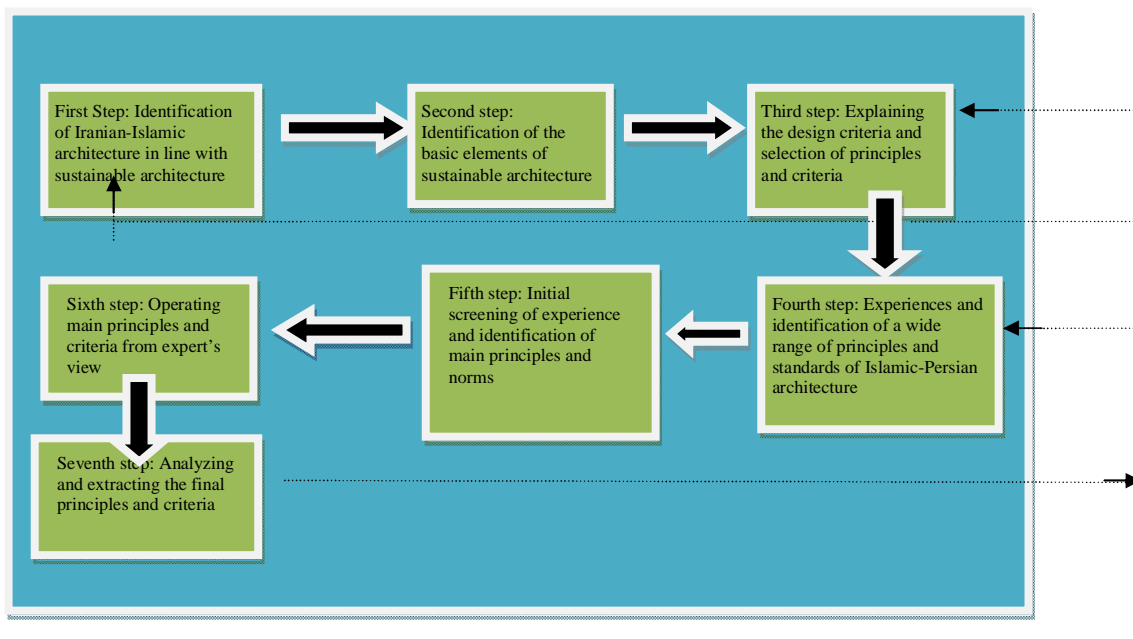
Figure 1: The principles and criteria of designing Iranian-Islamic architecture process in line with sustainable architecture

Soheila Aghlmand

Table 1: the framework for evaluation of Iranian-Islamic architecture in line with sustainable architecture based on documents and expertise opinions.

Dimensions	Principles and criteria	The information needed to assess the components of the subject	Data collection methods
Social-cultural	. . . .	Distribution of the benefits of sustainable architecture for the needs of residents	- Documents: Study the valid and scientific documents - Expertise survey (or depth interview or interviews with target groups of experts or specialists)
Economic			
Environmental		Distribution of the benefits of sustainable architecture to sense the environment and adapt to the environment	
Physical		Distribution of the benefits of sustainable architecture for the needs of residents and compatibility with the surrounding environment	

Figure 2. The basic components of sustainable architecture

3640

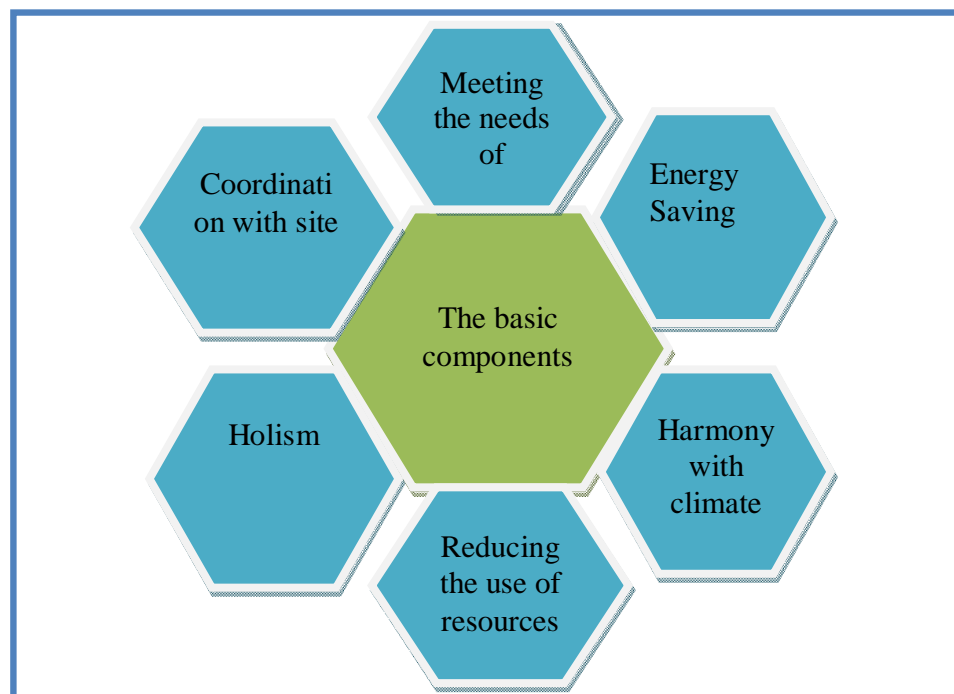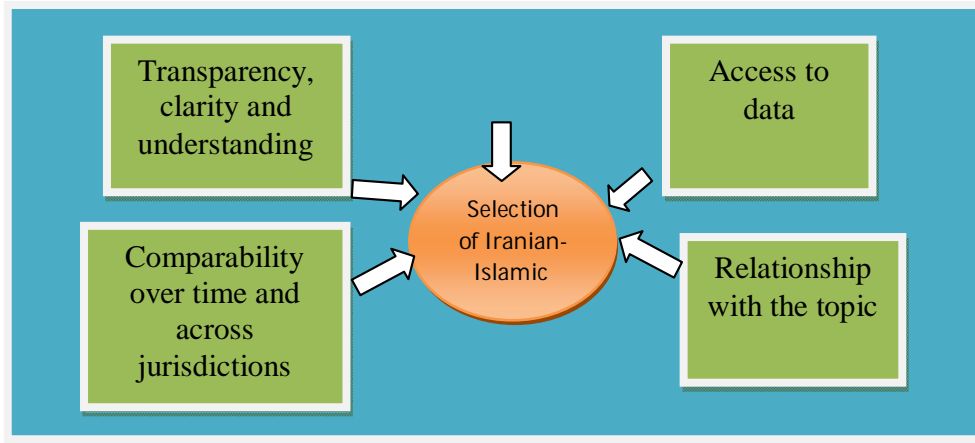**Figure 3: the measures of selection of principles and criteria of Islamic-Iranian architecture in line with sustainable architecture**

Table 2: selecting list of Iranian-Islamic architectural principles and criteria

Total	Article											Book							Principles	Dimentions
	Haghighi and Sahaf	Jameie and Ismaili, 2013	Nour bian et al., 1391	Meshkat and Khademi, 2010	Mellat Parast, 2009	Naghizadeh, 2009	Selseleh, 2009	Naghi zadeh and Doroodian, 2008	Karim Zadeh, 2007	Asad Pour, 2006	Diba, 2013	Hosseinin moqadam, 2014.	Memarian, 2013	Meshkini and Habibi, 2006	Naghizahdeh, 2006	Soltan Zadeh, 2006	Falamaki et al(2005)	Pirnia 2013		
14		√	√		√	√		√	√		√	√	√	√	√	√	√	√	Significant nature of architecture	Enviorenment
12		√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	Climatic design	
11	√		√		√		√		√	√	√	√	√		√	√	√		Local materials	
								. . .												
10		√		√	√			√		√	√		√	√	√	√			avoidance of emptiness (contentment)	Economic

Table 3: Checklist for selection of principles and criteria of Iranian-Islamic architecture for sustainable architecture from the perspective of experts

Dimensions	Principles and criteria	Selection criteria, operational principles and values of the Iranian-Islamic architecture for sustainable architecture				
		Relationship with the topic	Access to data	Reliability of information	Transparency, clarity and understanding	Comparable over time
Environmental	Significant nature in architecture	1-3	1-3	1-3	1-3	1-3
	Climatic design	1-3	1-3	1-3	1-3	1-3
	....					
...	....					

Table 4: The most important Iranian-Islamic architecture principles and criteria for sustainable architecture

Dimension	Principles and Values	Frequency of experiences (Researchers)	The frequency of local experts' ideas (percent)			Mean
			A lot	Average	Low	
Economic	Avoidance of emptiness (contentment): Leading to savings in resources and costs will decrease.	10	50	33.6	15.1	2.31
	The flexibility building: Increasing its life and reduces the need to create new spaces and damage abandoned spaces.	14	54.1	30.9	13.7	2.21
	Niaresh: Creating strong structures that reduce maintenance costs	12	54.1	27.6	17	2.01
Environmental	Significant nature of the architecture: Attention to semantic features of the nature that leads to a feeling of contentment, respect for nature and a the meaningfulness of the built environment	14	57.9	27	13.8	2.45
	Climate design: Attention to the material properties of nature and the design of adaptation to climate and environment.	11	68	12.2	18.4	2.30
	Autonomy of local materials: Using safe, healthy, local materials, available technology, accountability and feasibility of the performance resulted from arranged construction	10	65.9	21.6	11.2	2.45

	activities. Focused energy and consequences such as the concepts of sustainability, maintainability, serviceability and simplicity are considered.					
Social-Cultural	Introversion: Introversion means considering the needs of users, the need for privacy and security.	12	50.3	26	22.4	2.05
	Compatibility	14	56.7	21.7	9.1	2.03
	Public direction: Regarding the social and cultural needs of a building user with respect to social rank	12	61.3	24.2	13.2	2.39
	Retrospection (changing bad habits): Avoiding unnecessary things that lower efficiency. The ability and readiness to change our minds we can possibly solve some problems, even more than to find a definitive solution to a problem.	10	55.4	20.3	23	2.07
Physical	Centralization: Evolution of the scattered elements (plurality) to the central unity in most areas of architecture	12	59.5	24.2	15	2.09
	Reflection: Ingredients have always had an increasing growth in the vertical and horizontal axes to achieve the vision center (picture), vertical motion in open spaces is set towards sky signifying the connection of architecture, light, sky and reflection as a visual result.	11	48.2	21.6	16.4	2.25
	Geometry: Using geometry that is composed of a set of surfaces and points like nature.	12	57.2	29.6	11.8	2.46
	Transparency and continuity: Space opening in horizontal and vertical lines leads to transparency and respect for the continuation of hierarchy.	14	50.8	28.8	19.1	2.20
	Mystery and ambiguity: Sense of the spiritual greatness in perfection, purity of form and composition of the glass	12	65.5	10.9	12.4	2.15
	Harmonic balance / delicate balance: Harmonious balance between the buildings and the natural environment and coexistence with the climate and the environment.	11	55.5	20.9	12.4	2.15

RESEARCH ARTICLE

Determining the Weight of Main Activities in the Oil and Gas Industry Projects by FUZZY TOPSIS Model; Case Study: Olefin 13 Project of Elam Petrochemical Industry

Mohammadali Keramati and Saeid Batooei*

Department of Industrial Engineering, Arak Branch, Islamic Azad University, Arak, Iran.

*__Address for correspondence__
Saeid Batooei
Department of Industrial Engineering,
Arak Branch, Islamic Azad University,
Arak, Iran.

ABSTRACT

To determine the percentage by weight is one of the most important parts of management and project control, because the progress made by projects is calculated by percentage by weight. Definition of information, planning, updating and reporting structure of a project is fully influenced by accuracy of the manager in determining the percentage by weights. This is critical in some projects, which are in Lump Sum Price or fixed price and payment is based on calculated progress using the percentage by weight. Determination of project progress underlies many problems and legal relations between the employer and the contractor. This paper identifies the measures effective on weight of main activities using a questionnaire. By paired comparisons, the weight of measures is determined and the range of weights related to different parts of the project is calculated by FUZZY SAW model. FUZZY TOPSIS is used to calculate the weight of activities and its accuracy.

Keywords: percentage by weight, paired comparison, physical progress

INTRODUCTION

In modern industrial projects such as oil industries, power plants and large infrastructure projects which are clearly influenced by changes in technology, it is inevitable to use new management techniques and structures. Long successful executive experience shows that major projects such as construction of oil and gas refineries, petrochemical industries and other gas and oil and petrochemical sectors are not only effective in promoting national technology, but also allow the support for national contractor companies. According to experts, project managementinvolves four basic elements including knowledge, skills, tools and techniques to manage the flow of administrative activities in order to provide requirements of the project. In other words, project management as a set

of methods, procedures and systems is able to take responsibility of growth and development in post-industrial era. In Iran, it is essential to use and improve new methods of project management in order to achieve economic and social development due to the growing trend of investment in large projects, particularly oil, gas and petrochemical industries.In Iran, percentage by weight of most projects is determined by intuitive measures of the employer. The difference in perception of progress causes many disputes between employer and contractor [1]. Usually, managers determine weights of main activities by empirical measures by which they calculate some indicators of the project; however, they may not be able to provide convincing scientific reasons. Thus, progress of a project may be based on the personal opinions.In order to reduce conflicts between employer and contractor, this study finds a suitable method for calculating percentage by weight. First, the available methods to calculate the progress of projects are studied. Using decision models, then, the acceptable weights of activities are measured and evaluated.Available methods to calculate the progress of projects:

The earned value:

Earned value management approach has emerged in 1960s to respond the challenges inherent in cost-based contracts using sophisticated technologies. By decades of change, this technique is still one of the most effective tools to manage those contracts [2]. Earned value management is a tool for project planning manager to manage the project performance [3].Accounting system calculates the amount of fees paid for completion of a task. Payments can be compared to planned payments to evaluate the cash flow [1].

Weight of activities and progress curve:

In the assumed progress curve well known as cumulative progress curve, time (horizontal axis) is evaluated versus progress (vertical axis) in Rials or percentages [1].

Time method:

Time is the source of weighted value; this method calculates the total time of all activities; then, the percentage by weight is calculated by the ratio of the time required for an activity to the total time of the project [4].

$$w_i = \frac{D_i}{\sum_{i=1}^{n} D_i}$$

Workload as a measure of weighted value:

The workload of an activity is considered as the weighted value of that activity; that is:

$$w_i = W_i$$

The following equation is used for workload of the activity, where we have one source:

$$w_i = \sum_k [\alpha_k \, r_i^k * D_i * \text{number of hour in a day}]$$

Where α_k is the adjustment factor of the source k [5].

Mohammadali Keramati and Saeid Batooei

Cost of activities as a measure of weighted value: project costs are estimated by following three methods:

leveling
price list
activity-based costing
According to the following equation, the weight of an activity is calculated by [4]:

$$w_i = \frac{c_i}{\sum_{i=1}^{n} c_i}$$

A combination of these three measures as a source of calculation:

in this method, the weighted value is calculated by above methods; the weighted value of activities is calculated by averaging method. In this method, the weights of measures are considered equal [5].The progress of projects is calculated by this percentage by weight; therefore, definition of information, planning, updating and reporting structure of the project is fully influenced by accuracy of determined percentages by weight. In some projects, which are in fixed price or Lump Sum Price and payments are based on percentage by weight of activities, the contractor tends to perform projects with higher weighted value initially to receive a higher percentage of its funds from employers. Conversely, employers tend to perform activities with lower weighted value initially to keep their financial resources until the end of the project. Thus, determination of project progress underlies many problems and legal relations between the employer and the contractor. The weighted value has been calculated intuitively or by above three measures based on deterministic data. It seems there are other measures to calculate these weights.

Main activities of the project and measures effective on the weight of activities

Overall, activities, listed in the contract between the main employer (Elam Petrochemical Industry) and the contractor, are divided into ten groups, as follows:

Civil works
Steel structure works
Installation of fixed equipment
Installation of rotary equipment
Installation of furnaces and boilers
Piping
Electrical and telecommunications
Instrumentation
Insulation
Painting

MATERIALS AND METHODS

Data was collected by field studies using questionnaire. The purpose of questionnaire was to specify the measures effective on weighted value of an activity and then specify the weight of measures for decision-making. There was no time limit to respond to items, prepared for employer managers and experts and contractor management in Olefin site. The purpose of this study was to identify percentage by weight of main activities in Olefins 13 project.

Mohammadali Keramati and Saeid Batooei

Validity and Reliability of Material

Validity refers to a state when material can measure the desired qualities and characteristics [6]. Validity finds out how material can measure a trait. Without the knowledge of validity, the accuracy of data cannot be assured [7]. Reliability of the material shows logical consistency of responses and helps to evaluate the goodness of material. Reliability is a technical characteristic of material which determines the extent to which the material provides similar results under similar condition [8]. There are different techniques to determine and calculate reliability, including test-retest, equivalent forms (parallel and peer), split half (split the questionnaire and calculate the scores), Kuder-Richardson and Cronbach's alpha, which is the most important one. The present study used Cronbach's alpha to calculate and estimate the reliability of the questionnaire [7]. The value of reliability varies from zero to one. The results can be interpreted, as shown in Table 1:If $\alpha > 0.70$, the reliability is acceptable. To calculate the reliability, the prototype consisted of 14 pre-test questionnaires. Using data obtained from questionnaires and SPSS software, reliability was calculated for dependent and independent variables (0.84).

RESULTS AND DISCUSSION

Decision Measures: Using a questionnaire, project managers and technical and planning managers as well as experts working in this field were asked for measures effective on the weight of main activities. The results are as follows.

Cost: Cost is the amount of funding required to conduct an activity from beginning to the end. Cost is an important measure to assign weight to activities. Because contractors must earn in compliance with the cost of activities, an activity is assigned a reasonable weight relative to the cost of that activity.

Time: time, or in other words, the time required to perform activities can be a source for calculating weights. Activities which take more time are assigned higher weight and activities which take less time are assigned lower weight.

Special tools: considering the wide range of main activities, some activities certainly require special tools. Their costs should be seen in financial resources; however, cost does not mean supply. For example, installation of a heavy equipment needs a crane with different capability. Given the limitations of this type of machinery, it cannot be provided even in higher expenses. It requires more time and investigations. Even, a team is required to provide these tools. This makes differences between activities which need these tools and activities which does not require them.

The number of subcontractors: most contractors of construction projects tend to assign their works to subcontractors in the form of smaller contracts. Thus, activities with higher number of subcontractors are more convenient for contractors; thus, weight of activities is lower.

Number of specialized workforce: One of the most basic resources needed to implement activities is specialized workforce. Thus, workforce can be one of the measures for assigning weights to the main activities of the project.

The importance of quality: quality control involves monitoring specific results of project to determine their compliance with relevant quality standards and identifying ways to eliminate causes of unsatisfactory outcomes. These processes should be carried out during the project. Project results include both product results such as achievements and results of project management, including the timing and cost. Quality control is often responsibility of a quality control department or an organizational department with a similar name; however, this is not necessary. Certainly, the quality of different parts of a project is differently important; therefore, activities using this measure have different weights.

Mohammadali Keramati and Saeid Batooei

The degree of importance given the critical path: critical path is the longest path from the beginning to the end of the project, which its time is certainly equal to the total time of the project. If main activities are divided into smaller activities and percentage of smaller activities is measured in the critical path, activities with a higher percentage of sub-activities in the critical path will be assigned higher weight and activities with smaller percentage of sub-activities in the critical path will be assigned lower weight.

Weights of Measures

First step: According to the explanations above, measures are considered, as follows.

C1 = Cost
C2 = Time
C3 = Special tools
C4 = Number of subcontractors
C5 = Number of specialized workforce
C6 = Quality
C7 = The degree of importance given the critical path

Second step: To obtain the weight of measures, above measures were compared in pairs by the experts. The weight of measures was determined by Buckley method using the formed paired matrix.

Third step: The formed matrix was normalized by the following formula: [9]

$$r_{ij} = x_j / \sum x_j$$

Fourth step: The weight of measures was calculated by following formula: [9]
$$w_{ij} = \sum r_{ij} / n$$

Range of Weights Using FUZZY SAW

Lotfi Asgar Zadeh (1965) introduced the concepts of fuzzy set with non-steep and non-transparent boundaries. In a classic set with sharp boundaries, each element is either a member of the set or not. Unlike classic sets with sharp boundaries, there are no sharp boundaries in fuzzy sets. In other words, membership of an element in a set does not depend on a full membership or a full non-membership in that set. An element may have a more or less degree of membership than any other element. For this project, all measures were considered fuzzy.

First step

The first step involves qualitative and quantitative measures.

Qualitative measures: for qualitative measures, the following diagram was used to obtain the relationships between activities through questionnaires by the experts. Results are as follows.

Quantitative measures:

Since the probable duration of an activity is estimated based on previous experience of relevant experts rather than samples, the three-point estimation of beta distribution or triangular distribution is used to calculate the mean and variance of time for an activity.

Mohammadali Keramati and Saeid Batooei

Optimistic time (a): is the least time to perform an activity. First, few experts guess the time. Second, they predict the time optimistically; therefore, the time is almost minimal.

Most likely time (m): is the likely or most likely time to perform a time activity with the maximum frequency in the time distribution function. In most cases, this is equal to the time of activity, or maximum number of experts predict this time.

Pessimistic time (b): is the most time to perform an activity. First, few experts guess the time. Second, they predict the time pessimistically; therefore, the time is almost maximal.

Since the cost of an activity is usually based on the ratio of person-time cost to resources used, time plays a decisive role in cost of an activity. In PERT (Project Evaluation and Review Techniques), the time of activities is likely. Therefore, the cost of activities is usually stated likely. Instead of a definitive cost, three costs were suggested here, optimistic cost (m), most likely cost (b) and pessimistic cost (b). The obtained data is listed in Table 6.

Second step

All measures were in the form of profit normalized by the following formula:

$$\tilde{r}_{ij} = \left(r_{ij}^{L}, r_{ij}^{M}, r_{ij}^{U} \right) = \left(\frac{a_{ij}}{c_j^+}, \frac{b_{ij}}{c_j^+}, \frac{c_{ij}}{c_j^+} \right), \quad i = 1, \ldots, m; \quad j \in K_b,$$

Third step

The conditioned matrix was formed using the following formula:

$$\tilde{v}_{ij} = \tilde{r}_{ij} \,(.)\, \tilde{w}_j$$

Fourth step

The scores were calculated:

$$\tilde{S}t = \sum_{j=1}^{n} \tilde{r}_{ij} \, . \, w_j = \sum_{j=1}^{n} (x_{ijl} \, . \, w_j, x_{ijm} . \, w_j, x_{iju} . \, w_j)$$

Fifth step

Normalization was done using the formula:

$$\tilde{z}_i = \left(\frac{s_{il}}{\sum_{i=1}^{n} s_{iu}}, \frac{s_{im}}{\sum_{i=1}^{n} s_{im}}, \frac{s_{iu}}{\sum_{i=1}^{n} s_{il}} \right)$$

Fuzzy TOPSIS Model

Most of the used fuzzy numbers are fuzzy triangular and trapezoidal numbers. Triangular fuzzy numbers are widely used because of their simpler calculations.Hence, the triangular fuzzy numbers were used in this study. TOPSIS model, proposed in 1981, is one of the best multi-attribute decision models in which m options are evaluated by n attributes. The method is based on the concept that the option should be in the least distance from positive ideal solution (the best scenario) and the most distance from the negative ideal solution (the worst scenario). It is assumed that utility of each attribute is consistently incremental or decremental. Given the fact that data was fuzzy, the fuzzy TOPSIS developed in 2006, was used for this study. The problem was solved by following steps:

Step 1: quantifying and unscaling the decision matrix $(\tilde{D})$. The linguistic variables available in the decision matrix were assigned fuzzy numbers to quantify all elements of this matrix.

Mohammadali Keramati and Saeid Batooei

Step 2: in accordance with steps 1, 2 and 3 of SAW.

Step 3: the positive and negative ideal solution were determined. The following equation was used to find these values:[10]

$$A^- = (\tilde{v}_1^-, \tilde{v}_2^-, \ldots, \tilde{v}_n^-)$$

where:[10]

$$\tilde{v}_j^- = \max_i \{u_{ij1}\}$$

$$\tilde{v}_i^- = \max_i \{u_{ij3}\}$$

$$i = 1, 2, \ldots, m \quad \& \quad j = 1, 2, \ldots, n$$

Index 1 and 3 in u_{ij1} and u_{ij3} represent the first and third number, respectively, in a triangular fuzzy number.

Because all main activities were calculated by weight in 100%, the positive ideal option and the negative ideal option are considered (1, 1, 1) and (0, 0, 0), respectively.

Step 4: the distance was calculated from each option to the positive and negative ideas. The following equations calculated the Euclidian distance from an option to the positive and negative ideal.[10]

$$a^+ = \sum_{j=1}^n d_v(\tilde{v}_{ij}, \tilde{v}_j^+), \quad i = 1, 2, \ldots, m$$
$$d^- = \sum_{j=1}^n d_v(\tilde{v}_{ij}, \tilde{v}_j^-), \quad i = 1, 2, \ldots, m$$

where, $d_v(.,.)$ is the distance between two triangular fuzzy numbers.

Step 5: the relative proximity (CL) of an option to ideal solution was calculated.

$$CL_i = \frac{d_i^-}{d_i^- + d_i^+}$$

Step 6: the weight of the main activities were calculated.

$$W_i = \frac{CL_i}{\sum_{i=1}^n CL_i}$$

CONCLUSION

Currently, determination of the actual progress of projects is one of the challenges facing managers in the construction industry. This paper presented an algorithm for calculating the weight range of main activities performed in a project to measure different methods of weighting. Any of those methods with better performance in the range can be used for weighting the activities. FUZZY SAW is a tool which allows to specify the range of percentage by weight of activities for the project manager. In the proposed algorithm, the weight of measures effective on the weight of main activities were calculated using the paired comparisons; then, the weight range was determined by FUZZY SAW. This algorithm provided satisfactory results in Olefin 13 project of Elam Petrochemical Industry and reduced the conflicts between employers and contractors and project delays. Another advantage of this

Mohammadali Keramati and Saeid Batooei

method is that the middle of fuzzy numbers can be used as the main weight of activities.All weights calculated by FUZZY TOPSIS are in the calculated weight range; they can be used as weight of the main activities of the project.The weight by cost or weight in Rials can be calculated as follows:

$$W_t = \frac{C_i}{\sum_{i-1}^n Ci}$$

Obviously, the weight in Rials does not fit the defined range; therefore, it cannot be a good measure for percentage by weight.

REFERENCES

1. Ravanshadian, M., 2012. calculation of physical prohress in a project using paired comparisons. s.l., s.n.
2. Earned value management, office of the Deputy under Secretary of Defense (Acquisition Reform). October 2007. www.acq.osd.mil
3. Khaki, G., 2010. Reserch method in management ,4th edition , Tehran ,baztab emission
4. Sabzeparvar, M., 2011. project control textbook. tehran: termeh.
5. Skitmore, R. M., Stradling, S. G., & Tuohy, A. P. (1989). Project management under uncertainty. Construction Management and Economics, 7(2), 103-113.
6. Danaeifar , Alvandi., 2010. Quantitative Reserch methodology in management , first edition , tehran ,safar publication
7. Sarmad , Bazargan, 2007. Reserch method in the Behavioral Sciences , 13th edition , Agah Publication
8. Chan, L.K., Wu, M.L., 2005. A systematic approach to quality function deployment with a full illustrative example . omega 33, 119-139
9. Asgharpour, M, J, , 2013. Multiple crireria decision making , 11th edition , Tehran Publication
10. Amir, M. P. (2010). Project selection for oil-fields development by using the AHP and fuzzy TOPSIS methods .expert systems with Applications, 37 , 6218-6224

Table 1: reliability by Cronbach's alpha

Unreliability	Low reliability	Average reliability	High reliability	Complete reliability
$\alpha = 0$	$\alpha = 0.45$	$\alpha = 0.70$	$\alpha > 0.95$	$\alpha = 1$

Table 1: Preference in paired comparison [8]

Preference in paired comparison	The numerical value
The same preference	1
identical to relative preference	2
Relative preference	3
Relative to strong preference	4
Strong preference	5
Strong to very strong preference	6
Very strong preference	7
Very to extreme preference	8
Extreme preference	9

Mohammadali Keramati and Saeid Batooei

Table 2: Paired comparison of measures

Measure	c1	c2	c3	c4	c5	c6	c7
c1	1.00	7.00	9.00	9.00	9.00	9.00	7.00
c2	0.14	1.00	4.00	4.00	4.00	4.00	1.00
c3	0.11	0.25	1.00	2.00	2.00	2.00	0.25
c4	0.11	0.25	0.50	1.00	1.00	1.00	0.25
c5	0.11	0.25	0.50	1.00	1.00	1.00	0.25
c6	0.11	0.25	0.50	1.00	1.00	1.00	0.25
c7	0.14	1.00	4.00	4.00	4.00	4.00	1.00

Table 3: Normal matrix

Measure	c1	c2	c3	c4	c5	c6	c7
c1	0.58	0.70	0.46	0.41	0.41	0.41	0.70
c2	0.08	0.10	0.21	0.18	0.18	0.18	0.10
c3	0.06	0.03	0.05	0.09	0.09	0.09	0.03
c4	0.06	0.03	0.03	0.05	0.05	0.05	0.03
c5	0.06	0.03	0.03	0.05	0.05	0.05	0.03
c6	0.06	0.03	0.03	0.05	0.05	0.05	0.03
c7	0.08	0.10	0.21	0.18	0.18	0.18	0.10

Table 4: Weight of measures

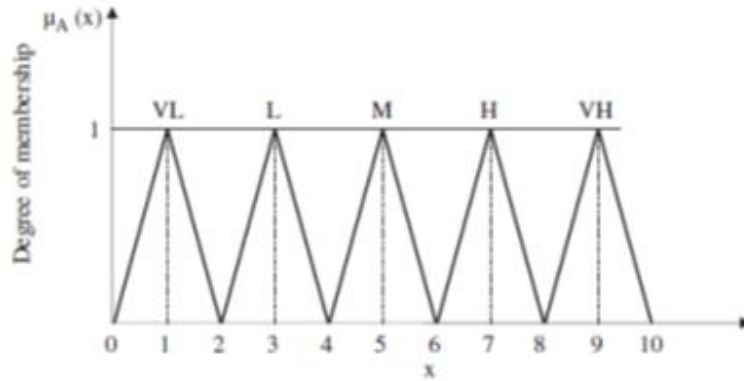| Measure	Weight
c1	63.9%
c2	9.1%
c3	4.5%
c4	4.5%
c5	4.5%
c6	4.5%
c7	9.1%

Mohammadali Keramati and Saeid Batooei

Fig .1 : Linguistic for relative importance [8]

Table 5: Information for qualitative measures

Measures / activities	c3	c4	c5	c6	c7
Civil Works	L	L	VL	L	H
Steel Structure	VL	L	L	L	L
Installation of Fixed Equipment	H	M	M	M	L
Installation of Rotary Equipment	H	H	VH	VH	L
Installation of Furnace & Boiler	M	H	H	H	M
Piping	M	M	M	M	VH
Electrical & Telecommunication	M	M	M	M	L
Instrumentation	M	H	H	VH	M
Insulation	VL	L	VL	VL	L
Painting	VL	L	VL	VL	L

Table 6: data related to quantitative measures

Measures / activities	C1	C2
Civil Works	(1783,1877,2253)	(297,330,396)
Steel Structure	(229,241,289)	(144,160,192)
Installation of Fixed Equipment	(1234,1299,1559)	(135,150,180)
Installation of Rotary Equipment	(415,436,524)	(117,130,156)
Installation of Furnace & Boiler	(395,416,499)	(108,120,144)
Piping	(3120,3284,3941)	(315,350,420)
Electrical & Telecommunication	(457,481,578)	(130.5,145,174)
Instrumentation	(545,574,689)	(135,150,180)
Insulation	(206,217,260)	(90,100,120)
Painting	(183,193,231)	(144,160,192)

Mohammadali Keramati and Saeid Batooei

Table 7: normal matrix

Measure/activity	C1	C2	C3	C4	C5	C6	C7
Civil Works	(0.452,0.476,0.572)	(0.476,0.572,0.707)	(0.572,0.707,0.786)	(0.707,0.786,0.943)	(0.786,0.943,0.25)	(0.943,0.25,0.375)	(0.25,0.375,0.5)
Steel Structure	(0.058,0.061,0.073)	(0.061,0.073,0.343)	(0.073,0.343,0.381)	(0.343,0.381,0.457)	(0.381,0.457,0)	(0.457,0,0.125)	(0,0.125,0.25)
Installation of Fixed Equipment	(0.313,0.33,0.396)	(0.33,0.396,0.321)	(0.396,0.321,0.357)	(0.321,0.357,0.429)	(0.357,0.429,0.75)	(0.429,0.75,0.875)	(0.75,0.875,1)
Installation of Rotary Equipment	(0.105,0.111,0.133)	(0.111,0.133,0.31)	(0.133,0.279,0.31)	(0.279,0.31,0.375)	(0.31,0.371,0.875)	(0.371,0.75,0.875)	(0.75,0.875,1)
Installation of Furnace & Boiler	(0.1,0.106,0.127)	(0.106,0.127,0.257)	(0.127,0.257,0.286)	(0.257,0.286,0.343)	(0.286,0.343,0.5)	(0.343,0.5,0.625)	(0.5,0.625,0.75)
Piping	(0.792,0.833,1)	(0.833,1,0.75)	(1,0.75,0.833)	(0.75,0.833,1)	(0.833,1,0.5)	(1,0.5,0.625)	(0.5,0.625,0.75)
Electrical & Telecommunication	(0.116,0.122,0.147)	(0.122,0.147,0.312)	(0.147,0.312,0.345)	(0.312,0.345,0.414)	(0.345,0.414,0.5)	(0.414,0.5,0.625)	(0.5,0.625,0.75)
Instrumentation	(0.138,0.146,0.175)	(0.146,0.175,0.321)	(0.175,0.321,0.357)	(0.321,0.357,0.429)	(0.357,0.429,0.5)	(0.429,0.5,0.625)	(0.5,0.625,0.75)
Insulation	(0.052,0.055,0.066)	(0.055,0.066,0.214)	(0.066,0.214,0.238)	(0.214,0.238,0.286)	(0.238,0.286,0)	(0.286,0,0.125)	(0,0.125,0.25)
Painting	(0.046,0.049,0.059)	(0.049,0.059,0.343)	(0.059,0.343,0.381)	(0.343,0.381,0.457)	(0.381,0.457,0)	(0.457,0,0.125)	(0,0.125,0.25)

Mohammadali Keramati and Saeid Batooei

Table 8: conditioned matrix

Measure/activity	C1	C2	C3	C4	C5	C6	C7
Civil Works	(0.29,0.3,0.37)	(0.06,0.07,0.09)	(0.01,0.02,0.02)	(0.01,0.02,0.02)	(0,0,0.01)	(0.01,0.01,0.02)	(0.05,0.06,0.07)
Steel Structure	(0.04,0.04,0.05)	(0.04,0.05,0.03)	(0,0.01,0.01)	(0.01,0.02,0.02)	(0.01,0.01,0.02)	(0.01,0.01,0.02)	(0.02,0.03,0.04)
Installation of Fixed Equipment	(0.2,0.21,0.25)	(0.21,0.25,0.03)	(0.03,0.04,0.04)	(0.02,0.03,0.03)	(0.02,0.02,0.03)	(0.02,0.02,0.03)	(0.02,0.03,0.04)
Installation of Rotary Equipment	(0.07,0.07,0.08)	(0.07,0.08,0.03)	(0.03,0.04,0.04)	(0.03,0.04,0.04)	(0.04,0.04,0.04)	(0.03,0.03,0.04)	(0.07,0.08,0.09)
Installation of Furnace & Boiler	(0.06,0.07,0.08)	(0.07,0.08,0.02)	(0.02,0.03,0.03)	(0.03,0.04,0.04)	(0.03,0.03,0.04)	(0.03,0.03,0.04)	(0.04,0.05,0.05)
Piping	(0.51,0.53,0.64)	(0.53,0.64,0.07)	(0.02,0.03,0.03)	(0.02,0.03,0.03)	(0.02,0.02,0.03)	(0.02,0.02,0.03)	(0.02,0.03,0.03)
Electrical & Telecommunication	(0.07,0.08,0.09)	(0.08,0.09,0.03)	(0.02,0.03,0.03)	(0.02,0.03,0.03)	(0.02,0.02,0.03)	(0.02,0.02,0.03)	(0.04,0.05,0.05)
Instrumentation	(0.09,0.09,0.11)	(0.09,0.11,0.03)	(0.02,0.03,0.03)	(0.03,0.04,0.04)	(0.03,0.03,0.04)	(0.04,0.04,0.04)	(0.02,0.03,0.04)
Insulation	(0.03,0.04,0.04)	(0.04,0.04,0.02)	(0,0.01,0.01)	(0.01,0.02,0.02)	(0,0,0.01)	(0,0,0.01)	(0.02,0.03,0.04)
Painting	(0.03,0.03,0.04)	(0.03,0.04,0.03)	(0,0.01,0.01)	(0.01,0.01,0.02)	(0,0,0.01)	(0,0,0.01)	(0.02,0.03,0.04)

Table 9: the obtained scores

Activity	Score
Civil Works	(0.43,0.48,0.6)
Steel Structure	(0.12,0.15,0.2)
Installation of Fixed Equipment	(0.34,0.38,0.46)
Installation of Rotary Equipment	(0.26,0.29,0.31)
Installation of Furnace & Boiler	(0.23,0.28,0.31)
Piping	(0.73,0.79,0.94)
Electrical & Telecommunication	(0.2,0.24,0.29)
Instrumentation	(0.28,0.31,0.35)
Insulation	(0.08,0.12,0.16)
Painting	(0.09,0.12,0.17)

Table 10: Normalized score table (weight range for each activity)

Activity	Score
Civil Works	(0.113,0.152,0.217)
Steel Structure	(0.032,0.047,0.072)
Installation of Fixed Equipment	(0.09,0.12,0.167)
Installation of Rotary Equipment	(0.069,0.092,0.112)
Installation of Furnace & Boiler	(0.061,0.089,0.112)
Piping	(0.193,0.25,0.341)
Electrical & Telecommunication	(0.053,0.076,0.105)
Instrumentation	(0.074,0.098,0.127)
Insulation	(0.021,0.038,0.058)
Painting	(0.024,0.038,0.062)

Table 11: Distance from the option to the positive ideal

Activity	Distance to the positive ideal option
Civil Works	9.894
Steel Structure	10.437
Installation of Fixed Equipment	10.069
Installation of Rotary Equipment	10.243
Installation of Furnace & Boiler	10.256
Piping	9.407
Electrical & Telecommunication	10.302
Instrumentation	10.200
Insulation	10.492
Painting	10.483

Mohammadali Keramati and Saeid Batooei

Table 12: Distance to the negative ideal option

Activity	Distance to the negative ideal option
Civil Works	0.795
Steel Structure	0.261
Installation of Fixed Equipment	0.629
Installation of Rotary Equipment	0.451
Installation of Furnace & Boiler	0.439
Piping	1.299
Electrical & Telecommunication	0.395
Instrumentation	0.496
Insulation	0.211
Painting	0.220

Table 13: Weight of main activities

Activity	Weight
Civil Works	15.303%
Steel Structure	5.031%
Installation of Fixed Equipment	12.109%
Installation of Rotary Equipment	8.688%
Installation of Furnace & Boiler	8.451%
Piping	24.980%
Electrical & Telecommunication	7.599%
Instrumentation	9.541%
Insulation	4.064%
Painting	4.234%

Table 14: weight in Rials

Activity	Weight
Civil Works	20.814%
Steel Structure	2.672%
Installation of Fixed Equipment	14.405%
Installation of Rotary Equipment	4.835%
Installation of Furnace & Boiler	4.613%
Piping	36.416%
Electrical & Telecommunication	5.334%
Instrumentation	6.365%
Insulation	2.406%
Painting	2.140%

RESEARCH ARTICLE

Fakhr-al-Din Iraqi and Unity of Existence

Khadijeh Shahsavari* and Mohammad Diyanati Feyzabady

Department of Literature, Kerman Branch, Islamic Azad University, Kerman, Iran.

*Address for correspondence
Khadijeh Shahsavari
Department of Literature,
Kerman Branch, Islamic Azad University,
Kerman, Iran.

ABSTRACT

In "Unity of Existence" theory, the whole world is the essence of God, throughout universe in is no more than a single world, and all appearances and symbols are expressing a single truth. Truth has an eternal expression; it is the manifestation of divine essence in the forms of possible beings, which is a rational affair without objectivity.

A short glance at the ideas and beliefs of Muslim mystics, especially gnostic poets, about unity of existence reveals that most of the poets who agree on the unity of existence express some particular sort of vitality, joy and spiritual movements in the explanation of their ideas. In other words, auras are seen clearly throughout their intellectual and spiritual existence. In mystic poets agreeing the unity of existence, Sanai, Attar, Rumi, Kamal al-Din Abdul Razzaq, Fakhr-al-Din Iraqi, Hafiz and Jami are prominent figures. In Fakhr-al-Din Iraqi's unity of existence, love, lover, and beloved are the same. He looks at himself through his own eyes.

Iraqi finds that unique existence with burning love; he wants to describe it for readers. Mysticism of existential unity would be uncovered as much as one defines subjects like simile and transcendence, attributes and the names of God, abiding essence, God's relationship to the universe and so forth in his mysticism; all these terms describes an aspect of the unity of existence. This article tries to mull over the roots of the unity existential unity thinking in Iraqi's poems and writings.

Keywords: Unity of existence, Ibn Arabi, Fakhr-al-Din Iraqi, unity of existence in Fakhr al-Din Iraqi's poem.

Khadijeh Shahsavari and Mohammad Diyanati Feyzabady

INTRODUCTION

Fakhr al-dīn Ibrahīm 'Irāqī, known as Iraqi or Araqi, was born in n the village of Kamjan near the city of Hamadan in Persia in 1213. He had learned the literature and science of his age in Hamadan and taught at schools in his young days. Seeing some pilgrims, his mood was changed. He left lessons and teaching and followed them. He explored the Persian Iraq, traveled to India, attended in the classes of Baha-ud-din Zakariya, and came in the ring of his disciples (Derakhshan, 1995: 73).

There is not an agreement among biographers about the name and ancestry of Iraqi. According to Hadullah Mostofi, his name was Ibrahim, his title was Fakhr al-din, and his father's name was Bozarjmehr ibn Abdulqafar al-Javaleqi. According t a research conducted by, he was born in Komeijan, near Hamadan, in 610 Hijri. He died in eighth Dhi Al-Qaeda 688 Hijri (ibid: 74).

According to Iraqi's book of poems and the author of its introduction, "That person who was beauty burned, joining thirsty, that healthy unique and sign of blame arrow was born in the village "Komeijan", a region of Hamadan. His ancestors were really and scholar and intellectual" (Iraqi, 1994: 48).

He had a strong memory, memorized Quran in early childhood, and had good voice and penetrating expression. At the young age when he was 17 or 18 years old, Iraqi, left Hamadan looking for a romantic appeal, went to Baghdad and Damascus, then moved to India and settled in Multan in the abbey of Baha-ud-din Zakariya, the founder of the Multan Suhrawardîya dynasty descent. Iraqi accompanied Zakariya for 17 years, lived in Multan and married Zakariya's daughter. He had a son called Kabi al-Din from Zakariya's daughter. Shaikh Fakhr-al-Din Iraqi did not stay in Multan, and continued his travel in search of his inner love; he moved to Asia Minor, or present Turkey. Arriving turkey at the late 666 or 667 Hijri, he was 56 or 57 years old. While he was involved in the idea of unity of existence, he met Sadr al-Din al-Qunawi, who was Shaikh al-Islam, influential and powerful. In this regard, he took the advantages of his accompaniment as the best disciple and interpreter of Ibn Arabi; he uses the lessons of great figures like Moein Duleh Parvaneh as well (Derakhshan, 1995: 75).

Finally, Iraqi moved to Egypt and Damascus from Rome in 683 Hijri; he ran due to animosity of rulers in his age. He selected Egypt foe some reasons. First, he wanted to keep his distance with Mongols. Second, he wanted to save Moein Duleh Parvaneh's son who was imprisoned. After a period of residence in Egypt, Iraq tried to travel to Damascus, and took up residence in Damascus. In any case, he was sick in Damascus in 688 Hijri, and died there; this was the last pilgrimage of a pilgrim and a love wanderer (ibid: 96).

Fakhr-al-Din Iraqi's Works and Stylistic Features of his Poetry

Sheikh's works are divided into two categories:

Poems: The collection of his poems contains about five thousands lines of Qasida, Tarkibiat, Tarjiyat, lyrics, and robaee. Undoubtedly, he is one of the great Persian poets in sensational love sonnets and his expressions are fresh and mirth inspiring that place him among the great Persian composers (Derakhshan, 1995: 41). For instance, his masnavi titled "Lovers' Letters" has ten chapter describing love and the states of lovers in thousand lines in eloquent and elegant fashion (Brown, 1993: 176).

Prose: His book Lomaat contains seven to eight thousands lines. It is an eloquent and elegant prose with sensational expressions (Akhtar Chimeh, 1976: 348). Said Nafisi believes that 'Sufi Terminology Treatise' is written by Sheikh. According to Abdoh Hossein Zarrinkoub, there are some Sufi texts in Persian literature that can be regarded as prose poems, Khaje Abdollah Ansari's hymns, Ahmad ghazali's Savaneh, Einolghozat Hamadani's Tanhidat, and Iraqi's

Khadijeh Shahsavari and Mohammad Diyanati Feyzabady

Lomaat that are mystical poems in prose forms (Zarrinkoub, 1990: 159). Moreover, there are some copies of his handwritten treaties and books available in some libraries around the world. For instance, Fi al-Hamdolah WA Ma'naha fi al-asavof (No. 1042) and Latifa fi al-zoqiat (No. 1180) are in Cairo Library.

In terms of the characteristics of his poetry, Iraqi was a romantic lover narrating his inner pains, enthusiasm, and perfection of the soul by his poems. He has simple, stable and masterly words. There is a unique enthusiasm in his Tarkibiat and Tarjiyat expressing his inner desires. He describes the state of pilgrims through innovative and original phrases. His masnavi and qasida are written in an investigative approach, which naturally have not the state and elegance of his lyrics.

Good thought, or true belief, toward some great figures like Sheikh Ahmad Qazali, Sheikh Ohad Kermani, and Sheikh Fakhr al-din Iraqi who were engaged in contemplation on the formal beauty of instances implies that they witness the absolute beauty of God while they were not committed emotionally. If some other great figures have rejected them, they have decided not make any ideal figure by them, and do not compare themselves with the mystics and place themselves immortal at perigee betrayal position (Zarrinkoub, 1964: 220).

In terms of Iraqi's poetic style, note that Iraqi is smoother, engaging and more enthusiastic in his lyrics rather than in Lomaat. The number of his poems in The Collection of Poems, especially lyrics, is more than his proses in Lomaat (Barati, 2008: 32).

> Love motivated us,
> Put our soul in test container
> (Iraqi, 1994: 110)

As seen, Iraqi composes his lyrics with simplicity and reaches a abstention easy approach with few manipulation in sentence pillars. In addtion, imagery of Iraqi is not far-fetched and it is enriched with emotion and sensations expressing genuine mystical concepts.

The Unity of Existence

The unity of existence is basically one of the pivotal doctrines, and maybe the most important one, in mysticism; it determines and influences the path for other mystical concepts. That is to say, the main objective of mysticism is sometimes achieving unity in the creation of God (Wakili & Tajik, 2010: 134). Ibn Arabi is regarded as the editor and organizer of this theory in the historic course of ideas among Muslim mystics. Ibn Arabi is the first maystic laying the unity of existence as the base of his mysticism; then, he describes it to the extent that he is known as the pioneer of believers in the unity of existence (Jahangiri, 1996: 262-64).

Definition of the Unity of Existence

It is a known concept for mystics because they believe that unity is equal to existence; like existence, one cannot define it unless it is essential to define an object due to its own presence (Allameh Tababaee, 1994: 138). Describing types of unity or unit, mystics argue that unit is real or unreal. Real unit refers to objects with natural unity in attribute; it has connection without steps and links like a single person. Unreal unit has not unity as an attribute, but it is connected to unity through links and medium, like human beings and paradise that have uniy in animality (ibid: 11).

It seems that the key factor in clarification of existence unity is found in manifestation idea. Manifestation is a pivotal issue in mysticism ant it is available in all mystical debates. With true understanding of manifestation, the truth of mysticism is comprehended and other mystical issues are regarded as its consequences (Rahimian, 1997: 14).

Khadijeh Shahsavari and Mohammad Diyanati Feyzabady

Ibn Arabi' Unity of Existence

The subject of mystical ontology is the unity of existence and existing. In other words, existence is one and it is the Sacred Essence of God. If existence means a unit who recognizes unity of existence, existing will not be multiple and it is only one single entity; therefore, it can be called unity of existence and existing. In this regard, mystical poem says:

> There is one, and he is the only one
> The only alone is God
> (Hatef isfahani, 1994)

In the mystical insight, plurality and multiple objects are the appearances and manifestations of God's nature; therefore, Muslim mystics accept the unity of existence and they argue that they have witnessed this fact. Ibn Arabi explains this multiplicity of manifestations of reality:

"As a man sees hs picture in a mirror, he claims that he has seen his face so that he cannot deny it. When he knows that the image in the mirror is not his real face and there is nobody between him and the mirror, now if he says that he has both seen and not seen his face, he will be both true and wrong. In this case, what are the face and its picture? Where are they while they are both rejected and accepted, both existing and nonexisting, and both known and unknown? This fact has been uncovered for human beings by God as an example of recognizing that while he is a part of the material world, he is unable and incapable of understanding the truth. Thus, he is more incapable and unable of understanding his Creator." (Hasan Zadeh Amoli, 2000: 48)

With respect to the difference of manifestations for mystics to the displacement in being as an existence and being as a lower level (but manifesting in the existence of manifestations), the above extract means that every being is a manifestation of God.

Mulla Sadra's Unity of Existence

The history of philosophy reveals tha philosophers have different, and maybe opposite, opinions in recognizing existence. Some believe that existence is contrary to pleasures: the realities of existences differ (Asadi Garmaroodi, 2013: 29). Peripatetics propose the divergence of necessary and possible existence and the Western philosophers accept the divergence of creatures due to their belief in the priority of essence (Rahimian, 2008: 22).

Some philosophers consider the subscription of existence in creatures as spiritual subscription and know reality of existence as single. Peripatetic school agrees them. They are divided in two groups:

The unity of existence and multiplicity of existing: this group believes that the only existence is God. This theory is known as "tasting of theosophy." Allameh Davani is a pioneer in this respect (Sabzevari, 1422: 22-25). They argue that the priority of existence belongs to God and the priority of essence belongs to creatures; there is only one existence in the universe, and it is God. Nonetheless, existing is multiple in the world. Existence does not depend on the essences and it is not also independent of them. Calling this unique reality (God) as existing means it is the soul of existence, and referring to the essences means that they are attributed to the existence (Hasan Zadeh Amoli, 1990: 115).

The unity of existence and its graded multiplicity: this theory asserts that there is one type of existence; existences in the necessary being and the possible being have the same meanings, but it has different degrees with different intensities. Therefore, it s called graded multiplicity (Tabatabaee, 1994: 14). Mulla Sadra argues tha if existence is prior in existings, then it cannot be considered as a mere general concept or an abstract characteristic and external

symptom like actuality and causality, unity and recognition. In this manner, one should go further and regard the essence of beings full of the truth of existence. That is to say, they have the same common beings in terms of essence; thus, these two pints should be included in this type of subscriptions and unity (Sadr al-Din Shirazi, 2004: 141).

Mystics' Unity of Existence

The theory of unity of existence and existing is indeed an interpretation of Tawhid (the oneness or monotheism) by mystics because monotheism for them means not only rejection of any partner in God's essence and denying any equivalent in attributes, and denying any helper in action but also rejection of any type of existence rather than God's existence. Mystics seek to prove by different expressions that creatures are the same as creator, are not separated (Malmir, 2007: 98). In fact, there is only one reality; it is the source of the single truth. All beings (existings) are leakage of origin of the oneness having been issued through manifestation, flooding and emission (Qani, 2007: 102).

Most of the mystics agree on the certainty of existence. They believe that the concept of existence is obvious, or every body has clear idea about it. Even this is obvious that the concept of existence is certain. There is no debate around axioms, and remembrance is enough (Mutahari, 1981: 20). Proving the existence of multiplicity needs no reason for mystics, but proving the oneness of God requires reasoning even though we have firm faith on it (Malmir, 2007: 98).

With these words, it is clear that the first theory assumes the unity of both existence and existing, but the second theory assumes the unity of God and multiplicity of creatures.

Principles of mysticism and unity in Fakhr-al-Din Iraqi's poetry

The Origin of Mysticism

In his book titled "The genesis and progression of Sufism", Reynolds Alan Nicholson compares ideas of Dionysius and Dhul-Nun al-Misri (d. 245); he says about Dhul-Nun that he knows primary sciences like Jabir ibn Hayan (Zarrinkoub, 2006: 50).

Researchers who refer the intellectual roots of mysticism to Greece argue that many practical concepts in mysticism have Greek origins. Meanings and concepts such as considering body as the prison of soul, impossibility of recognizing supreme truth through rational thinking and the necessity of illumination, self-knowledge, microcosm of man, the promise to perfection, and collective diffusion are entered in Islamic philosophy from Greek philosophy (Qani, 2007: 111). Birooni's theory about the root of the term Sufi is regarded in this list because Abo Reihan Birooni argues that the term Sui is derived from a Greek term meaning wisdom.

Some researchers, e.g. Muslim scholars (especially, great Sufi figures), believe that Sufism is born from Islam and Quran teachings. Louis Massignon (1883 - 1963), the French East and Islamic Studies scholar is an example in this regard. Louis Massignon agrees that Sufism is a phenomena arised as the result of Islam and it is the sequence of evolutionary ascetic tendencies process of the first century of Islam leadership. Ilia Pavlovic Petrochevskie, Russian Orientalist (1898) asserts that Sufism has appeared as the result of Islam and due to the evolution of Islam in feudal society and non-Islamic mysticism is not the cause of Islamic Sufism, but it has few impacts on its next course (Petrochevskie, 1984: 334).

However, some scholars regard the root of mysticism and Islamic Sufism in old ages, even divine and non-divine religions before Islam. Zarrinkoub says:

Khadijeh Shahsavari and Mohammad Diyanati Feyzabady

"This path of wisdom has long been considered by some thinkers so that some people believe that it is more useful that reasoning in understanding truth. Even som simpler and earlier versions of this path are available in ancient and primitive religions. There are some types of mysticism in totem's religious worships and worshipers of spirits' ritual. One can see this issue in old religions of Hindus, Persians, Greeks, Jews and Christians as well." (Zarrinkoub, 2006: 50)

Jalal al-Din Homaie believes that Islamic Mysticism began from the advent of Islam under the teachings of the Quran, the Prophet, and his Companions, especially Imam Ali ibn Abi Talib (pbuh) who is the Saints' leader and the dynasty of all the tribes of Sofia (Homaie, 1993: 17).

The Relation between Islamic Sufism and Mysticism

It may be said that mysticism is an approach of spiritual pilgrim in Islam. Defining Sufism, many ideas have been proposed, but its principle is based on a path making possible understanding the creator of the world, discovering the realities of creation and the relationship between human beings and truth by means of mystical inward journey, not through partial intellectual reasoning. The subject is denying self and joining the creator through correction and self-control, leaving the worldly interests, austerity and restraint. Apparently, the term Sufi was common in some Islamic lands, especially in Mesopotamia in second century. In the second century, Sufi was a person without any specific social organization, school of thought and a certain mystical system. In other words, monastery related organization, the relationship between disciples and masters, particular Sufi customs as well as system of thought and belief forming the theoretical aspects of Sufism in the second century and in the first quarter of the third century (Safa, 1989: 177).

Islamic Sufism has a wider arena, it is integrated with mystical approaches, and they are considered both same perception and different perception. These terms are used as synonyms in lexical terms. Since the truth of Islamic Sufism includes mysticism, the general, scientific, and verbal concepts can be regarded under the tile of Islamic Sufism. Sufism is mention as a famous path in Islam. Some thinkers, like Morteza Mutahari, introduce two connotations from this concept. He argues that mysticism is the practical aspect and Sufism is its social and pretending dimension (Mutahari, 1978: 83).

Mystical Position of Fakhr-al-Din Iraqi

Iraqi uses the lessons of Baha-ud-din Zakariya. After the death of of Baha-ud-din, Iraqi did not stay in India, and went to Hajj through the Oman. Then he moved to Anatolia and settled in Konya at the service of Sadriddin Qonawi. Amir Moein al-Din Parvaneh buit a convent in Tokat (present Turkey). He went to Egypt after the imprisonment of Amir Moein al-Din and then moved to Damascus. He died there at the age of 78, or 82, and he was buried in Mount Al-Salehe. The collection of his poems contains Qasida, Tarkibiat, Tarjiyat, lyrics, and robaee (Tabibian, 1995: 180).

He edited Lomaat corresponded to Qazali's Sawāni al-ʿuššāq in describing degrees of love. It is known that Iraqi wrote his book Lomaat as the result of his revelation in a lesson presented by Sadriddin Qonawi about the ideas of Ibn Arabi; it is one of the best sources in describing Ibn Arabi in Persian language (Nasr, 1992: 143).

In his literary book, Edward Brown wrote about Iraqi that when Iraqi was 17 years old, a group of mystics was passing Hamadan. A pretty boy was among them. When they left, Iraqi could not bear to stay away from him and moved toward India after him. In Multan, he met Sheikh of Baha-ud-din Zakariya. Sheikh ordered him forty days of commitment; he had to stay at retreat and follow his care and thought. In the tenth day, other Sufis called sheikh and said that Iraqi had composed a poem instead of silence and contemplation. After a few days, most of the singers learned the song and sang it in all pubs. The sonnet is:

Khadijeh Shahsavari and Mohammad Diyanati Feyzabady

As they pour the first wine in the cup,
They borrow from the drunken butler's eye.
He continues:
While they uncovered their own secret,
Why did they defame Iraqi?
(Tabibian, 1995: 183)

Selections of Iraqi's Poems about the Unity of Existence

Destructed drunk will find in a pub,
A treasure that cannot be find in worships by worshipers,
If you want to find an easy path to the treasure,
Try to purify yourself every daydawn in the pub,
If you were successful,
You can met hundred thousand Suns,
If the picture in the cup looks at you,
You will be informed by yourself, neither cup nor sun rays,
In unconsciousness and drunken state, you reach a place,
Where worships mingle and implications lost their ways,
You cannot find the treasure, unless lost yourself,
It is happier than the meeting of lost person and his goal.
(Iraqi, 1993: 200).

Fakhr-al-Din Iraqi envied the tavern-man state because he is unaware of himself. He cannot justify the state of a person who stays at mosques and monasteries of egoism following his own desires. He regards the non-understanding the only existence with all his borrowed heart obscene; thus, he takes refuge in the drunken state to express his feelings.

Love plays the instrument,
Where is a lover to listen him?
Every moment he sings a new song,
Every moment he uncovers a new pain,
All universes are the sound of his song,
Who has heard this long voice?
He uncovers his secret in the world,
A singer cannot maintain secrets,
From the tongue of each particle,
Listen to the voice that I am not a propagator.
(Iraqi, 2011: 390-448)

Every moment, he says the secret to himself in any language, every time he hears his voice by his own ears, every moment that a vision reveals its beauty, every glance, it presents its existence to witnesses; listen to me for his attributes.

Implications of the Unity of Existence in Iraqi's Poems

While the absolute truth of beauty is in God and God's beauty does not reduce, Iraqi's burning love starts. Iraqi has discovered the only existence and true beloved and he wants to describe it for the reader. This point has been describes delightfully in most of his romantic sonnets:

Khadijeh Shahsavari and Mohammad Diyanati Feyzabady

> In the beauty of all beautiful persons, I see just Him,
> In the eyes of every beautiful person, I see just his beauty,
> In the eyes of every lover, he deserves the position,
> In the eyes of wameq, I see all things Azra,
> Sweetheart of lovers, compassionate of all beloveds,
> Helper of helpless, I see hin everywhere,
> As the aim of a confused heart, I found only him,
> The intention of the painful man, He is the only object,
> I look at ahead and back, he is the only friend,
> All is he, just, I see only him
> (Iraqi, 1993: 195)

Nevertheless, it is not easy to find this truth and to achieve union with this beloved. As siad earlier, it is available in "the desert of separation". An inner-spiritual journey is necessary for passing this dangerous distance. This journey will be continued to eliminate the rebellion soul, break the selfishness, and fight in the Great War. The love of the unique leader is required for achieving the unity. Love is a light guiding seeker to walk in the path of human dignity and sublimity.

Reality of Existence for Sheikh Fakhr-al-Din Iraqi

Reality and love is considered the same as the self-truth of existence by Iraqi. In terms of love's origin, he believes that it is an elusive, inconceivable, and unnamed essence that is the absolute secret. Thus, love is the absolute reality of existence, which is not fitted in descriptions and is not defined. For him, love is place in it pure position. In the world of existings, there is only one absolute love that is the absolute truth. It is the hidden treasure in Ibn Arabi's school. Here, how this love transformed from images stage to an uninterpretable love?

According to Iraqi, when king of love decided to set up a tent in the desert, he opened the Treasury and the treasure opened to the world.

> Take the tent and pull out the flag,
> To disturb existence and nonexistence,
> Restlessness of the exciting love,
> Has excited the world

Otherwise, it has always been relax in the backyard of intuition where there was only God and no one accompanied Him (كان الله و لم یکن معه شیء).

> When there was no trace of universe,
> There was no impact of strangers on the plaque of existence,
> Beloved, love, and we, all were on unity,
> In the corner was not a land.

Suddenly, love pushed away all veils to express its perfection; it manifested by his beloved face to the entire world:

> When the light of his beauty revealed,
> The universe appeared,
> A short look at his beautiful face,
> Saw his face and fell in love,
> They borrow sugar from his lips,

Khadijeh Shahsavari and Mohammad Diyanati Feyzabady

When its taste was found, it flourished
(Ibid: 198)

When Iraqi claims that love is connected to existence, he means that every existing has a determined dignity that is possible and it has a real dignity that is mere existence. Love is connected to that existential reality.

In Iraqi's understanding of the unity of existence, love, beloved, and lover are the same and himself who looks at his own beauty with his own eyes.

> Who knows about the instrument of love's joy?
> Those nine heavens are excited by its song,
> With a song, all universe are dancing,
> It is the soul and the world is the sound of song,
> Nobody knows that universe is which curtain of the sound,
> This path is which part of the curtain, what secret is in the curtain?
> This is love changing its color every moment,
> Somewhere it is cute, somewhere needs,
> In the face of lover in is pain,
> In the position of beloved, it is instrument
> (Iraqi, 2007: 78)

Thus, all the secrets of love are obvious for creatures. Some points are behind the scene, which are known only by God, and only He knows them. For Iraqi, the cause of love is beauty and goodness and the absolute beauty is God; there is no partner in his beauty and goodness:

> All I look, I see your face,
> I say: you are superior to all good entities.
> (Ibid: 79)

It was introduced by Ibn Arabi in Futūḥāt al-makkīyah when he asserted that the cause of love is goodness and beauty, beauty is an attribute of God, and goodness is lovely due to the requirement of its essence. Allah is beauty and loves beauty (Ibn Arabi, 2002: 320). Ibn Arabi loves the source of goodness and love:

> How can I describe a moon-like?
> The purpose of ringlet and my face is you,
> Whether I spell your name, or not,
> The purpose of my speech is you.
> (Iraqi, 2007: 88)

CONCLUSION

The unity of existence is one of the most important philosophical concepts. There is no a certain agreement about assuming that the entire world with inanimate objects, plants, animals, mines, abstract ideas, and heavens is only one existence confessing the existence of God in different levels with a variety of intensities, and other beings vary in terms of closeness to God. The unity of existence is both philosophical and mystic concept regarding all beings with a same existence, or God, and all beyond god have been assigned as graduation such as wave, bubble, whirlpool, drops and dew that are all water, but they are manifested in different forms.

Khadijeh Shahsavari and Mohammad Diyanati Feyzabady

Ibn Arabi believed God has an eternal manifestation (Feiz Aqdas); it is the manifestation of God's essence in the form of all possible beings, which is a rational affair without objectivity (abiding essence). According to Ibn Arabi, abiding essence is manifested in the absence from the rational world to the world of tangibles when it is necessary. This manifestation is called "sacred manifestation" by him. In this manner, existence is a ingle reality with different manifestations, which is called "creation". When this single existence is measured in terms of essence and reality, all multiplications are seen as a unity and the unity is called "the mere truth".

While there are some traces of "the unity of existence" in the intellectual currents before the seventh century including both Islamic and non-Islamic currents, the doctrine of existence unity have not been organized and well-formed before Ibn Arabi; he is the first muslim mystic and Sufi who established the theory with his true faith and his

Islamic excitement. In this manner, he creates a new systematic mysticism due to his lovely feelings, enriched taste, and vast knowledge. Futūāt al-makkīyah and Fusus al-Hikam are firm document and decisive argument that he believes in the unity of existence.

Note that the mystical discussion of Ibn Arabi about the unity of existence is understandable to the extent that subjects like simile and transcendence, attributes and the names of God, abiding essence, God's relationship to the universe and so forth are defined as the explanations of the principle of unity. Ibn Arabi has faith that the reality of existence is a principle and source of all effects.

The mystical theory has influenced many philosophers and poets. The mystical current of Persian classic poetry should begin by Sanaei. With his ascetic poems, he influenced the poets of next generations. Then, Attar composed his poems with firm mystical romantic themes. Persian poetry reached its peak by Rumi.

In seventh century, Fakhr-al-Din Iraqi as well as Jami is very famous due to the influence of Ibn Arabi on him. Fakhr-al-Din Iraqi could describe Ibn Arabi's mystical system of existence unity in his poems. Indeed, Iraqi was an eloquent poet and competent commentator who have expressed sublime mystical concepts deliberately in his prose beyond his exciting poems. Apart from expressing IbnArabi's deep mystical ideas, Iraqi's Lomaat presents poetic and fascinating prose. It results from the perfection of Persian prose in seventh century. Like poetry, this prose found the opportunity to contain sublime mystical themes.

REFERECES

1. Ibn Arabi, uhammad ibn Ali (2002). Futūāt al-makkīyah. Trans. Muhammad Khajavi, Tehran, Mula publication.

2. Asadi Garmaroodi, Muhammad (2013). A critical view of mystical unity of existence in divine sources. The teachings of Islamic philosophy, fall and winter of 1392, No. 13, pp. 27-50.

3. Akhtar Chimeh, Muhammad (1976). A short introduction to biography and works of Fakhr-al-Din Iraqi. Literary essays, summer 1976, No. 46, pp. 344-62.

4. Barati, Mahmood (2008). Fakhr-al-Din Iraqi's style in Lomaat. Researches of mystical literature, summer 2008, No. 6, pp. 29-52.

5. Brown, Edward (1994). From Sa'doi to Jami. Trans. Asghar hekmat, Tehran: Tehran University Press.

6. Petrochevskie, Ilia Pavlovic (1984). Islam in Iran. Trans. Karim Keshavarz. Seventh edition, Tehran: Pyam Publication.

7. Jahangiri, Muhsen (1976). Musi al-Din bn Arabi: Great figuer of Islamic mysticism. Fourteenth Edition, Tehran: Tehran University.

8.　Hasan Zadeh Amoli (1984). Eleven Persian treatises (philosophical, logical, mystical), first edition, Tehran: Institute for Cultural Studies.

9.　---. Quran, Mysticism, and reasoning are not separate. Tehran: Qiam.

10.　---. A description of Al-Manzomeh. Vol. II, Tehran: Nab Publication.

11.　Derakhshan, Mahdi (1995). Great poems and writers of Hamadan: After the emergence of Islam to the Qajar dynasty. Vol. I, first edition, Tehran: Etelaat.

12.　Rahimian, Muhammad Hasan (1997). Manifestation. First edition, Qom: Publications Bureau.

13.　Rahimian Said (2008). Creation from the viewpoint of mysticism. Qom: Book Garden.

14.　Zarrinkoub, AbdolHossein (1964). With Hella Caravan. First edition, Tehran: scientific publications.

15.　--- (1990). legacy of Sufism. Tehran: Amir Kabir.

16.　--- (2006). Search on Sufism in Iran, Tehran: Amir Kabir.

17.　Sabzevari, Mulla Hadi (1422 Hijri). A description of Al-Manzoomeh. Edited by Hasan Hasanzadeh Amoli. Tehran: Nab.

18.　Safa, Dhabihollah (1989). History of Persian literature. Volume III, sixth edition, Tehran: Ferdous.

19.　Tabatabaee, Mohammad Hasan (1994). The end of wisdom. Translation and commentary of Ali Shirvani, seventh edition, Qom: Book Garden.

20.　Tabibian, Seyed Hamid (1995). Iraqi's writings. First edition, Tehran: Rowzaneh publications.

21.　Iraqi, Fakhr-al-Din (1993). The collection of poems: with an introduction by Said Nafisi. Seventh edition, Tehran Sanaei publication.

22.　---. Books of poems. Fourth edition. Tehran: Negah Press.

23.　---. (2007). An Overview of Iraqi's poems. Edited by Nasim Mohtasham Pour. Third edition, Tehran, Zawar publication.

24.　Qani, Qasem (2007). The history of Sufism in Islam. Tenth edition, Tehran: Zawar publication.

25.　Malmir, Teimour (2007). Explaining the paradoxical unity and plurality of Attar, College of Basic Sciences, Tabriz, spring and summer, 50 (Series 201), 97-118.

26.　Mutahari, Morteza (1978). The general Islamic knowledge: mysticism. Vol II, Tehran: Sadra.

27.　--- (1981). A description of Manzoumeh. Volume I, first edition, Tehran: Wisdom Publications.

28.　--- (1998). A collection of Mutahari's works. Vol. 9, 14, 23, Tehran: Sadra.

29.　Nasr, Hossein (1992). Three Muslim Philosophers. Trans. Ahmad Aram. Fifth edition, Tehran: Pocket Books Company.

30.　Wakili, Hadi & Abolfazl Tajik (2010). Review some of the basics of unity of existence, mysticism Bulletin, autumn and winter, No. 3, pp. 133-148.

31.　Homaei, Jalal al-Din (1994). An introduction to Misbah al-Hidaya WA Miftah al-Kifaya. Tehran: Homa publication.

RESEARCH ARTICLE

Design of a Digital Core in Embedded System of a Radio Tag for Wireless Communication with RFID Compatible Devices

Mohammad Amin Ahmadiieh[1*] and Reza Berangi[2]

[1]Department of computer Engineering, Iran University of Science and Technology, Tehran, Iran
[2]Assistant Professor, Department of Computer Engineering, Iran University of Science and Technology, Tehran, Iran.

*Address for correspondence
Mohammad Amin Ahmadiieh
Department of computer Engineering,
Iran University of Science and Technology,
Tehran, Iran.

ABSTRACT

RFID is a wireless detection system able to exchange data by establishing communication between a tag attached to a commodity, an object, a card and a reader. RFID systems use electronic and electromagnetic signals to read and write data without contact. The project designs a digital core in an embedded system of a tag to communicate wirelessly with RFID compatible devices. The advantage of this system is to increase security and reduce the cost of mass production. According to the structure of the electronic tags, the core consists of two main parts from a top-down look: communication block and a control block which is composed of receiver and transmitter blocks. The main part of the work is related to the modeling of embedded systems. This paper used a FSM approach relative to the surface of each element of the system. By complete design of project by this modeling approach, the system was implemented. Finally, digital core blocks were accurately simulated, and the results were reported.

Keywords: digital core, embedded systems, modeling, tag reader, wireless detection system

INTRODUCTION

For automatic detection of people and things, in many cases, the Radio Frequency Identification, or RFID technology is used. Using radio frequency-based communications, RFID allows automatic identification, tracking and management of objects, humans and animals (Klus, F. (2010)). The function of RFID depends on tag and reader which use radio waves to communicate with each another. RFID technology has the potential to replace barcode and it provides a considerable improvement in tracking and identification of goods. Comparing to barcode, RFID transmits data at a high speed, it has a higher capacity storage and supports automatic recovery of data without

Mohammad Amin Ahmadiieh and Reza Berangi

physical contact (Sandip, L. (2005), Li, Y. (2010)). It is noteworthy that successful application of RFID is challenged by price of tags, operating costs and development procedures which must be considered. Some advantages of RFID technology include hided tags, no need for direct contact, no depreciation and fatigue, no manipulated serial code stored in the tags, reduced costs, reduced errors, security, integration and so on (Bill, G. (2006)).

RFID History

The emergence of this phenomenon dates back to 1946, when Léon Theremin invented an instrument for Soviet government; the device was able to transmit radio frequencies and waves generated by various events to the desired location. By moving a diaphragm attached to a vibrating device, the sound waves translated the reflection of radio waves into the understandable language. Although the device did not have many features, it was named as the first device with RFID technology. According to some sources, the emergence of RFID in the world started in 1920 and completed in 1960. Thereby, an American researcher, Harry Stockman (1948) published a paper on RFID as a communication by reflection and predicted that radio waves can be used to identify objects and various means, even humans(Klus, F. (2010), Sandip, L. (2005))

Design and Modelling

Initial modeling approach is to start designing a state machine in which the design level is considered. The used state machines are all Mealy in which the next state of machine is determined by the current state and input. From a top-down perspective, entire digital core was first modelled to a state machine considering the working units required in the core. The machine was called the main machine. In the next level of design, each state of the main machine would have its main state machine; in the lower level, each state would be modelled to another state machine or using the flowchart model.

Digital Core Design

The main task of digital core design is to exchange information between the chip and tag readers and to control and manage the commands to the chip (Karthaus, U., Fischer, M. (2003)). Figure 1 shows the block diagram of a radio tag. As seen in the figure, digital chip is composed of three main parts including frame decoder, data packet control and frame encoder.

Control Module

The control module is the main unit of a digital core. This unit controls the function of decoder for data packets. The first step to design a control unit is to create a state machine composed of four states: idle, compare, transmission, and wait. Upon receiving the first data packet from the tag reader, decoder begins to work and decodes the data packets. At this time, an end of frame (EOF) signal is sent from the decoder to the control module. Upon receiving the control signal, the control module starts the compare state. In another situation, if the control module receives error control signal from the decoder, the current data packet will be ignored and idle waiting for new data packet from the tag reader. In the first situation, the command code is extracted from the newly received data packet and it will be recognized whether it is the reading or writing command. After this process, the control module goes into transmission state. In this case, the response packet is sent by the encoder; upon sending to tag reader, the controller goes to wait state. Upon the full transmission of response packet to the tag reader, EOF signal is generated by the encoder. This signal causes the shift to idle; again, decoder and encoder reset to the initial state (Yeager, D. (2010)).

Mohammad Amin Ahmadiieh and Reza Berangi

Decoder Block

This unit decodes the received data packet and extracts data. In fact, it receives a data signal as input and produces a stream of data as output (Kaiser, U. (1995)). If the command is a reading command, the packet will consist of five parts including 40-bit data such as command code, flag bits and cyclic redundancy check (CRC), in addition to start of frame (SOF) and EOF signal separators. The only difference is that writing command has additional 32 bit of data.

The decoding process of a data packet can be expressed by its state machine. This process will be shown by two state machines running at the same time. Here, two processes were designed, clock (CLK) and modulation (ASK), as shown in the figure. The change in state of these two machines is completely interdependent. The ASK machine was used to change the state of CLK machine considering states of ASK machine. On the other hand, if the CLK machine goes to error state, the ASK machine will be idle. It is noteworthy that the CLK machine plays a key role in operation of the decoder unit and saves the final data in the considered stability for transmission to the control module. In encoding method, each of the four-bit data is extracted from a period of $75.56\mu s$. This period is composed of four equal time intervals. A pulse in each interval represents that bit data. Using a counter, the calculation is done. ASK machine works always on the falling edge of the input data signal. CLK machine runs on the rising edge of the main CLK (with a frequency of 13.56 MHz).

The states used in these two machines include idle, SOF1, SOF2, bit1, bit2, bit3 and bit4, enter, byte, halt, EOF and error.

1) The following figure shows SOF signal of a data packet. The ASK machine steps into SOF1 state in the first falling edge of this signal. Immediately, the CLK machine steps into SOF1 state by the rising edge of the main CLK. In this state consistent with ASK machine, the 11-bit counter starts counting. Next, ASK machine will step into SOF2 state, when it is in 512 counts. As the ASK machine steps into SOF2, the CLK machine will steps into BIT0. Considering the fact that the marginal error is 32, the BIT5 to BIT10 are investigated to determine the new state to which the machine steps.

2) The CLK machine uses BIT0, BIT1, BIT2, and BIT3, each of which detects bit; eventually, 1 byte will be detected. To determine the next byte, the machine restarts from BIT0. Therefore, the machine can repeatedly goes into BIT0 considering the number of bytes. The next figure shows how to identify bit in BIT0. According to the 1 out of 4 coding used, the pulse intervals detecting the value of bit are a certain value. Finding the different states of these pulse intervals, the value of bit will be specified. Therefore, it is essential to determine the certain values using the top 6 bits of the counter counting input data signal between two consecutive falling edges. For example, consider the bit00 after the SOF signal; in this case, counter value is equal to 384. Accordingly, the value of counter will be a certain number if the bit01 or, 10 or 11 are considered.

3) The next figure shows how to detect bit2 of the new byte in BIT1. This figure assumes that the value of bit1 was 00. As the previous two parts, when CLK machine steps into BIT1, ASK machine goes into BIT1 just one CLK before. The counter starts to count from the falling edge to the next falling edge of the input signal. The counter value will be a certain number; by various examinations, the value of the next bit is determined. For example, if bit2 indicates the value 01, the counter should have the number 1152. Similarly, this is true for BIT00, 10 and 11.

This trend is true for BIT2, BIT3 to decode the value of bit in these states. By detecting a full byte, we go back to BIT0 to determine the next byte. When all the data is detected, their value will be stored in the output data register to refer to the controller unit. In this case, when the CLK machine goes to EOF signal, the ASK machine goes to idle in the falling edge of the input signal and the CLK machine goes to idle on the rising edge of the next CLK.

In this case, both machines go into idle state and become ready to receive new data packet from the tag reader.

Mohammad Amin Ahmadiieh and Reza Berangi

Encoder Block

The main task of encoder is to respond to the tag reader by encrypting response data bit flow and resend to the tag reader (Qiuting H. et al (1998), Pillai, V. et al (2007).

The communication mechanism starts by the tag-reader. By receiving data packets from the tag reader, the radio tag must decode by frame decoder and send the bit flows to the control module. By detecting the command, the control module requires the encoder to send the response relative to the command in at least t1 (311.5μs). The response frames to reading and writing commands are shown in the figures below.

Encoder uses a designed state machine for response packets. As in response packets, SOF, flags, data, CRC and EOF are produced to be sent in the form of response packets. In order to produce any portion of response packet, separate modules are designed which are enabled by control signals generated by other modules. Consecutive function of these modules and their interrelationship finally lead to a response packet associated with proper coding and modulation. Block structure designed for encoder block of data packets is shown in Figure 10. The first step in generating a response frame is to produce a minimum initial delay time t1 (311.5μs). By complete generation of a proper delay, the control signal delay_done is enabled which is responsible to launch the clock pulse module. This module generates three types of clock pulses, each of which is used in different modules. These clock pulses are produced based on the main clock (13.56 kHz), which is the input in encoder block. The three clock pulses generated in this module include clock pulse with 512-frequency division (clk_512), the clock pulse with 256-frequency division (clk_256) and the clock pulse with 32-frequency division (clk_32). The clk_512 (26.484 kHz) is used to generate CRC, flag bits and data generator block. The clk_256 (52.968 kHz) is used to generate SOF and EOF signals. The clk_32 (423.75 kHz) is used for modulation. In a general classification, the response packets consist of SOF, EOF and data signals. These modules are shown by a done signal. In some cases, the multiplexer is disabled to save the energy.

ISO 15693 standard uses Manchester coding for signals received by the tag reader and then modulation by a carrier signal with a frequency equal to one-thirty second frequency of main clock pulse. For this purpose, a Manchester module is used, which is responsible to convert the data signals to the Manchester coding before sending to 4:1 multiplexer. This module is also responsible to encode data and CRC. In order to choose between these two parts, a 2:1 multiplexer is used. The multiplexer takes its two inputs from CRC module and data module. The control signal data_module_done is responsible to choose between these two inputs. When data is generated and CRC module starts to work, output of 2:1 multiplexer will change. CRC module will generate this code in parallel, if Manchester coding module receives data normally. To do so requires a module (PISO) which receives parallel data as input and generates serial data as output. This module receives 16-bit CRC generated by the module itself as input and sends the 16-bits to the output in a serial form to insert as the second input into the 2:1 multiplexer. By enabling the control signal data_module_done sent by completion of data module, the multiplexer shifts from sending data to sending PISO-generated data. In generating the final signal, first 4:1 multiplexer appears SOF in the output; then, the data containing 16-bit CRC and 40-bit data will appear on the output of 4:1 multiplexer by the Manchester coding module. Finally, SOF signal appears on the output to build a full data packet. The control signal piso_module_done causes a shift from data bits to EOF signal which is generated by EOF module. By generating the signal, the control signal eof_done is enabled. This signal makes both its module and all encoder blocks, enabling by a control signal start_tx, idle to save the energy.

SOF Module

This signal is composed of three parts. The first part is without modulation for 56.64μs. Then, it continues for 24 pulse of frequency 423.75 kHz. It ends by a one-value logic signal.

Mohammad Amin Ahmadiieh and Reza Berangi

There are many ways to generate this signal. The method used here is to use the clock pulse clk_256 and simple shift register which generates the word "00011101". In this process, the signal is easily generated.

The signal pulse clk_256 is used because the period of this signal is 68.88μs, which is a multiple of 56.64. Therefore, the considered signal can be generated by shifting the word in the rising edge of the clock pulse. By generating this signal, modulation is done by the carrier signal clk_32, as shown below.

By the end of this generator block, a control signal sof_done is enabled. This stops the generator block to save the energy and enables other modules.

EOF Module

Similar to SOF signal, EOF is composed of three parts. The first part is the same zero-value logic signal which continues by 24 pulses of 423.75 kHz. Finally, it ends by a 56.64μs interval which has not been modulated.

Similar to SOF block, EOF signal can be generated in different ways. The simplest method is to use a shift register with input clock pulse of clk_256 signal. The shifter receives its CLK input from one output of clock pulse generator and shifts the word "10111000" by rising edge of its CLK; in this case, the generated signal will exactly match to the SOF signal.

Data Module

The basic idea to create this module is to load a 40-bit data including 32-bit data and 8-bit flag of the control module within a shift register prior to sending data and then remove serially to send data. These two operate by two control signals. The 40-bit loading is evaluated within the register by ENABLE control signal. When the LOAD signal reaches its high level, 40 bits of data are stored in the register; when the LOAD signal reaches its low level and ENABLE signal reaches a high level, data is serially removed at the rising edge of clk_512 signal. Given that the data are sent from bits with a lower value, this data is sent to two places; first, to CRC module to generate this 16-bit code and second, to 2:1 multiplexer which delivers data to a Manchester coding module for final send. Upon removal of all 40 bits, including flag bits and data bits, from data blocks, two control signals called as done and done_to_piso are created. The control signal, done, is considered to control CRC module, as a selection signal for 2:1 multiplexer, while the done_to_piso control signal is designed to launch a PISO module. Activation of these two control signals disables the CRC module and multiplexer will transfer the input of PISO block to the output.

CRC Module

In this method, the division is used. In this example, a character is used as SOF signal and the other character is used as EOF signal. In this case, data must be recovered before sending and after receiving in order to send any information in a single frame. Techniques used to change data are called data interpolation, because they insert a number of bits with additional byte in the data stream. In an example of byte interpolation, one reserved character is replaced by two other characters.

The other discussion is the incidence of electromagnetic interference on electronic equipment and pathways, which can change or remove the transmitted data over a network. Furthermore, interference can lead a receiver to receive disturbances as valid data. Computer networks have several mechanisms to identify these transmission errors (Gerrish, P. et al (2005))

Mohammad Amin Ahmadiieh and Reza Berangi

One of these mechanisms requires a transmitter to calculate and send a series of additional data and a receiver to control the accuracy of the received data (Rankl, W., Effing, W. (1996)). Three redundancy check mechanisms were studied: parity bits, CRC and checksum. Parity bit is sent by each character, while checksum and CRC are sent by one frame.

No redundancy check scheme will entirely ensure, because the incidence of transmission error can change the additional information as data. CRC technique, which is slightly more difficult than the other two methods, detects more errors than others do. Although the CRC theory is relatively complicated, it can be implemented by a simple and inexpensive hardware. In the following, input-output structure of this section is described in hardware.

Serial_in signal contains a set of bits produced by data generator block, which exit the block serially and enter the CRC generator as input. On the other hand, enable control signal is responsible to set up the block.

There is a 16-bit D-type flip-flop shift register used in the internal structure of this block. The register is responsible to insert the serial bits of serial_in signal. The three XOR gates generate a 16-bit CRC. The output is shown by crc_out signal in the figure.

CONCLUSION

This study presented the internal structure of digital core of a radio tag. There are three blocks in this structure, including decoder, control and encoder. The control block is the main block of digital core. The main task of control block is to control the function of encoder. The main task of encoder is to send a response to the command of tag reader by encrypting response data bits and resends to the tag reader. Decoder block decodes the received data packet and extract the desired data. In fact, it receives a data signal as input and produces as output of a stream of data. The blocks were described in details. In particular, the encoder block has a more complex structure. Encoder has eight modules, which were described in detail and modelled by various methods such as state machine flowchart and block structure. Finally, the results from implementation of various sections were examined. ISE software was used for simulation. The simulations verify the accuracy of results.

REFERENCES

1. Klus, F. (2010). RFID Handbook, Fundamentals and Applications in Contactless Smart Cards, Radio Frequency Identification and Near-Field Communication, 3rd Edition.
2. Li, Y. (2010). "Battery-free RFID-enabled wireless sensors" , Microwave Symposium Digest, IEEE MTT-S International.
3. Sandip, L. (2005). RFID Sourcebook ,2rd Edition: Prentice Hall PTR ,
4. Bill, G. (2006). RFID Essentials , 3rd Edition: O'Reilly.
5. Karthaus, U., Fischer, M. (2003), "Fully integrated passive UHF RFID transponder IC with 16.7-μW minimum RF input power," Solid-State Circuits, IEEE, 10: 1602- 1608.
6. Yeager, D., Fan, Z., Zarrasvand, A., George, N.T., Daniel, T., Otis, B.P. (2010). "A 9 mu A, Addressable Gen2 Sensor Tag for Biosignal Acquisition," Solid-State Circuits, IEEE, 45: 2198-2209.

7. Kaiser, U. Steinhagen, W. (1995) "A low-power transponder IC for high-performance identification systems," Solid-State Circuits, IEEE, 3: 306-310.
8. Qiuting H. Oberle, M. (1998). "A 0.5-mW passive telemetry IC for biomedical applications," Solid-State Circuits, IEEE, 7: 937-946.

Mohammad Amin Ahmadiieh and Reza Berangi

9.   Pillai, V.; Heinrich, H.; Dieska, D.; Nikitin, P.V.; Martinez, R.; Rao, K.V.S. (2007); , "An Ultra-Low-Power Long Range Battery/Passive RFID Tag for UHF and Microwave Bands With a Current Consumption of 700 nA at 1.5 V," Circuits and systems I: Regular Papers, IEEE Transactions on , 7: 1500-1512.

10. Gerrish, P., Herrmann, E., Tyler, L., Walsh, K. (2005). "Challenges and constraints in designing implantable medical ICs," Device and Materials Reliability, IEEE Transactions on, 3: 435-444.

11. Rankl, W., Effing, W. (1996) Handbuch der Chipkarten, 2nd edn, Carl Hanser Verlag, Munich.
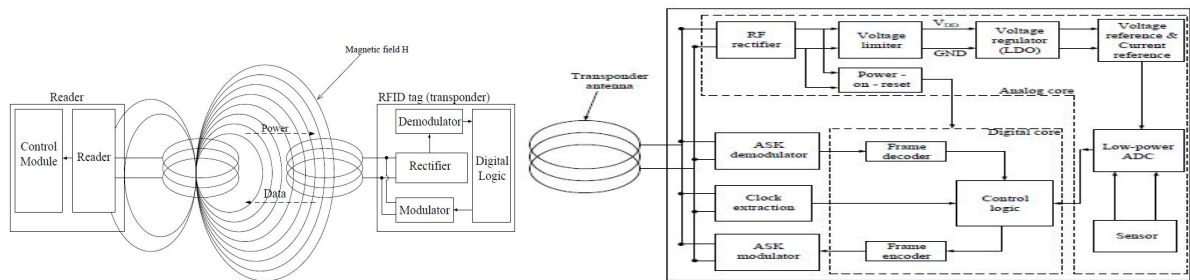
Figure 2: Overview of the internal structure of a radio tag
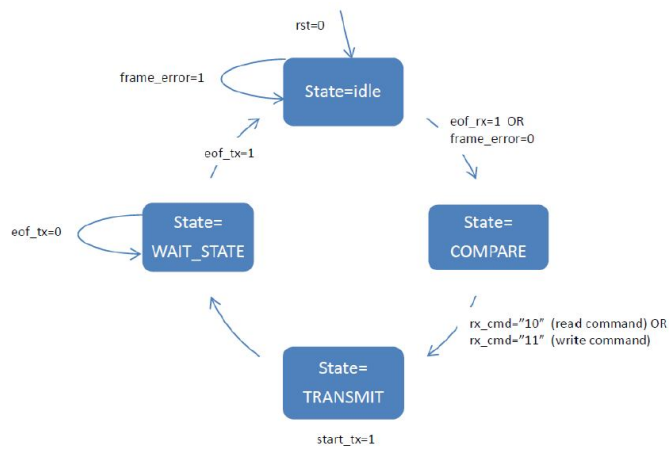
Figure 3: state machine of control module in the digital core

Mohammad Amin Ahmadiieh and Reza Berangi
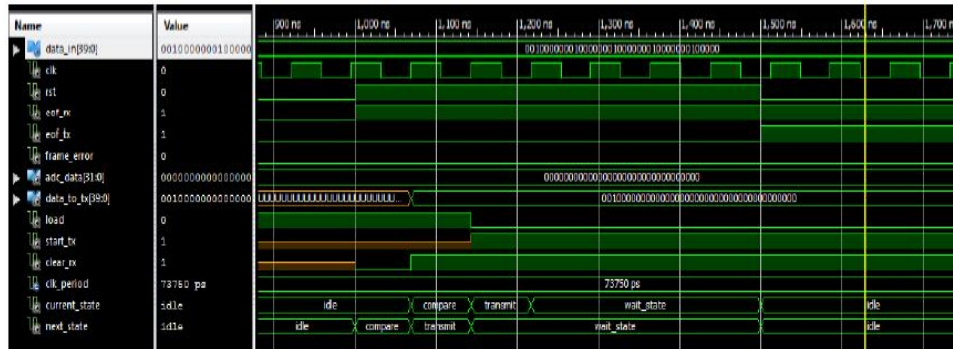
Figure 4: Simulation of control module in the digital core
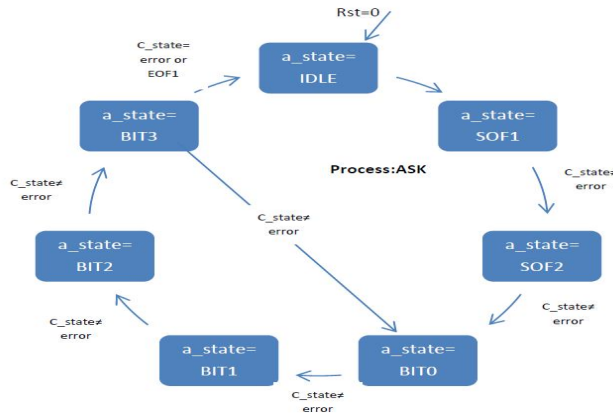
Figure 5: ASK state machine
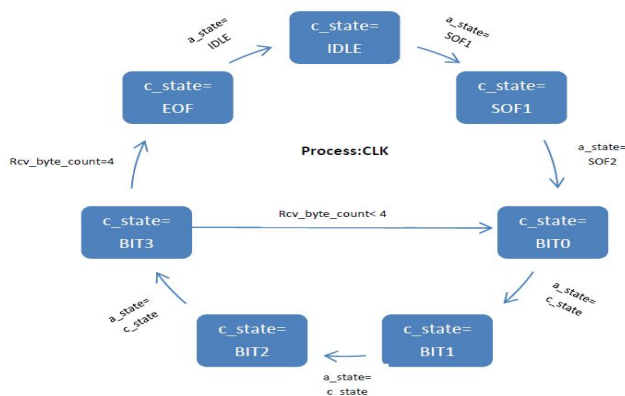
Figure 6: CLK state machine

Mohammad Amin Ahmadiieh and Reza Berangi
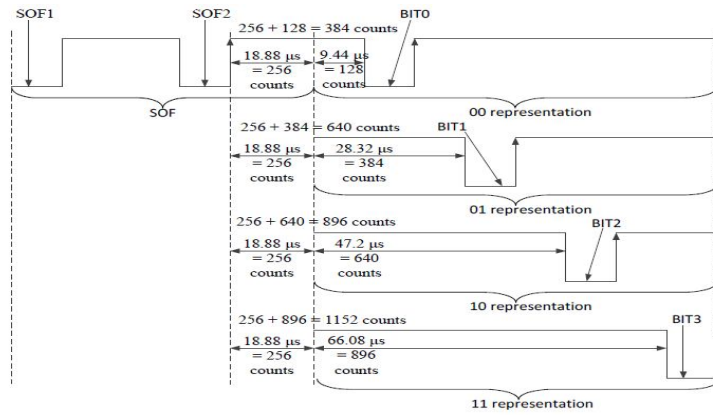
Figure 7: bit1 detection
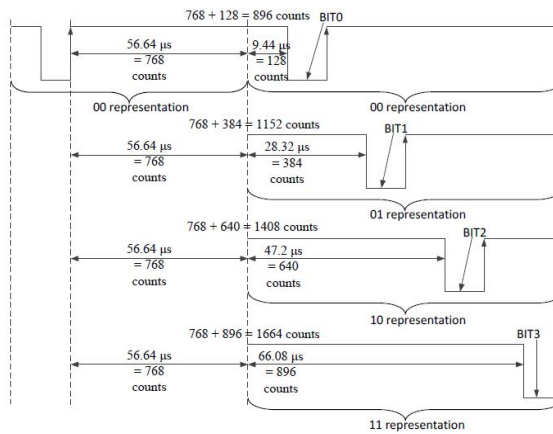
Figure 8: detection of bit1 of the frame after 00
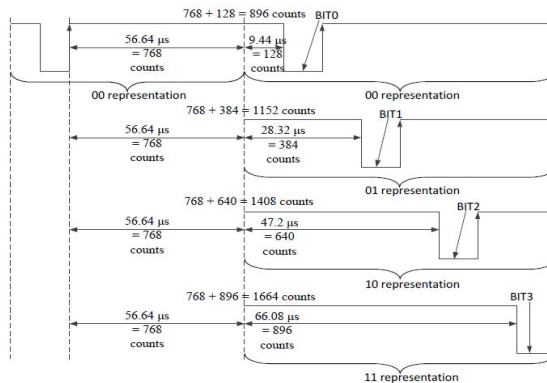
Figure 9: detection of bit2 after 01

Mohammad Amin Ahmadiieh and Reza Berangi
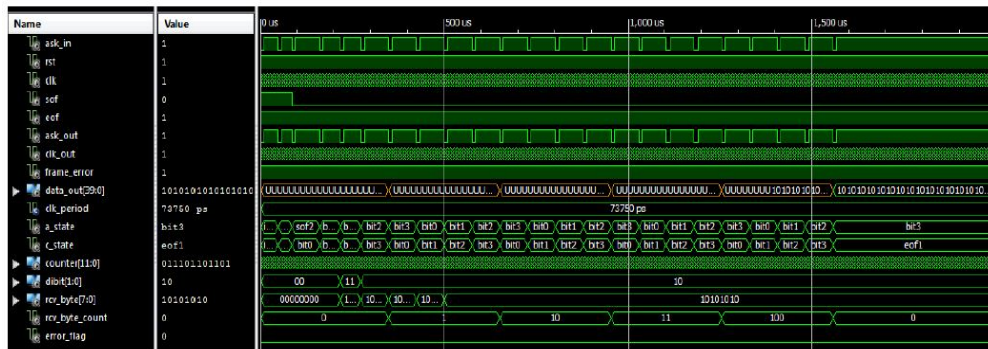
Figure 10: Simulation of decoder in digital core

Response SOF	Response Flags	Data	CRC 16	Response EOF
	8 bits	32 bits	16 bits	

Figure 11: the general form of reading command

Response SOF	Response Flags	CRC 16	Response EOF
	8 bits	16 bits	

Figure 12: the general form of writing command
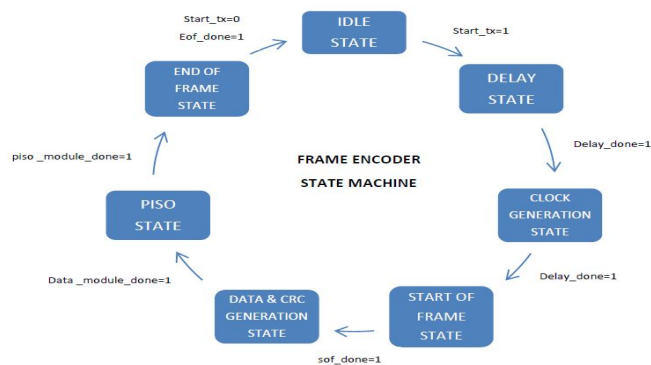
Figure 13: frame encoder state machine

Mohammad Amin Ahmadiieh and Reza Berangi
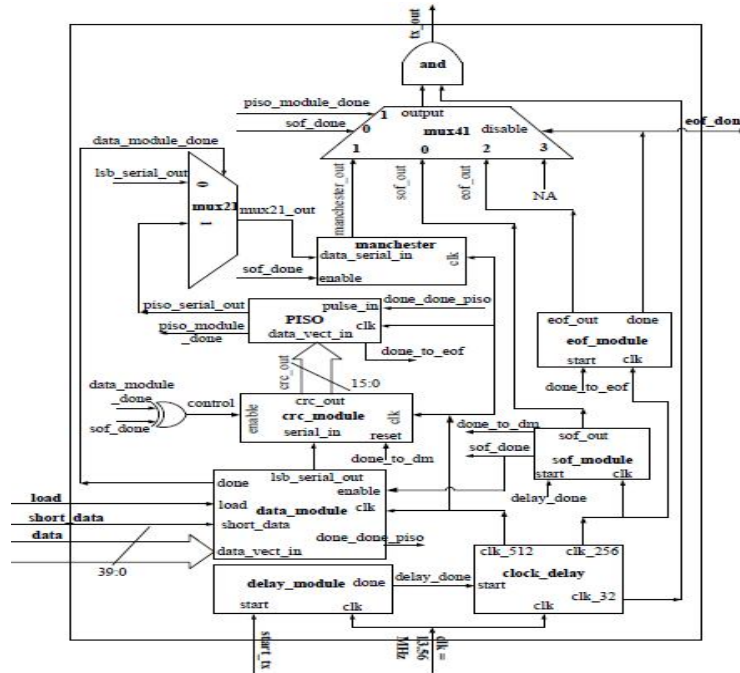
Figure 14: the single structure of data packets
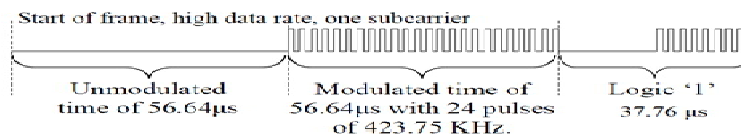
Figure 15: SOF signal of the response packet
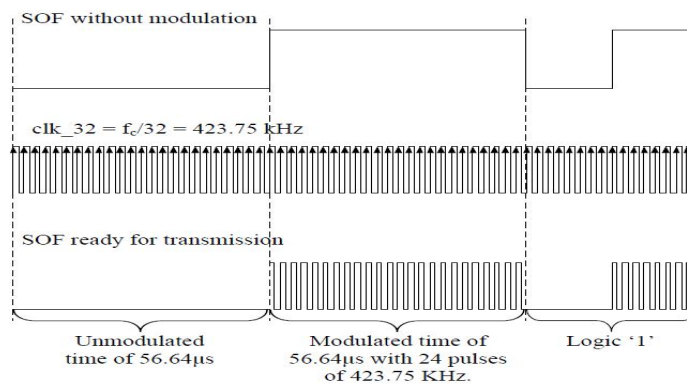
Figure 16: SOF signal after modulation by signal clk_32
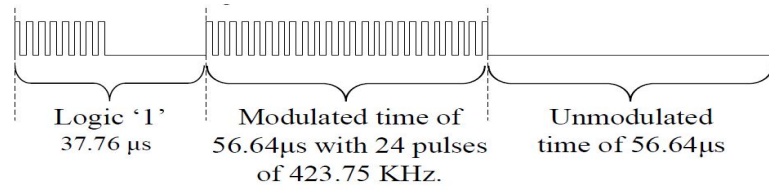
Mohammad Amin Ahmadiieh and Reza Berangi

Figure 17: EOF signal in response packet

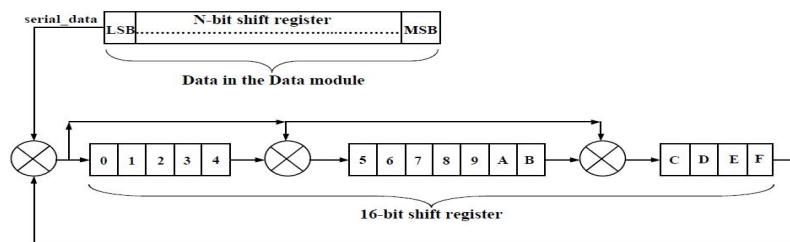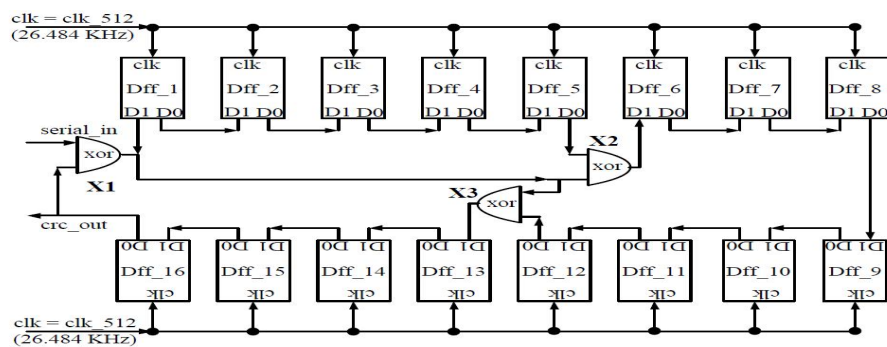| CRC type	Length	Polynomial	Direction	Preset	Residue
ISO13239	16 bits	$x^{16} + x^{12} + x^5 + 1$	Backward	'FFFF'	'F0B8'

Figure 18: CRC code

Figure 19: The CRC code function

Figure 20: The hardware scheme of CR generator
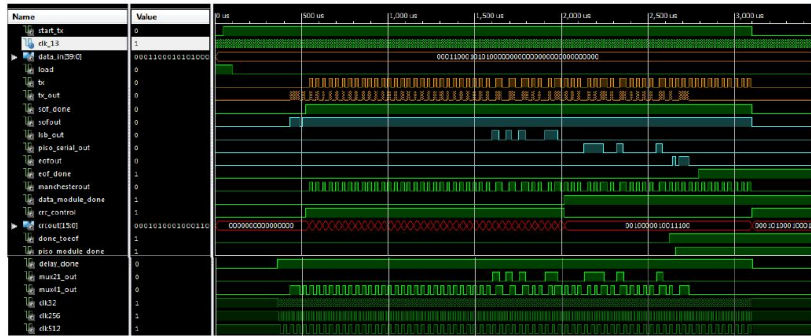
Mohammad Amin Ahmadiieh and Reza Berangi

Figure 21: Simulation of digital core encoder

RESEARCH ARTICLE

Effect of Organizational Foresight on Organizational Ambidexterity in Pishgaman Kavir Yazd Co

Hadi Aminoroayaei[1,2] and Hamideh Shekari[3]*

[1]Department of Management, Yazd science and Research Branch, Islamic Azad University, Yazd, Iran.
[2]Department of Management, Yazd Branch, Islamic Azad University, Yazd, Iran.
[3]Department of Public Administration, Payame Noor University, Tehran, I. R. of Iran.

*Address for correspondence
Hamideh Shekari
Department of Public Administration,
Payame Noor University,
Tehran, I. R. of Iran.

ABSTRACT

Current paper aims at investigating effect of organizational foresight on organizational ambidexterity in Pishgaman Kavir Yazd Co. It is an applied research in terms of purpose of study and it is descriptive survey study in terms of methodology. Research statistical population includes all employees of Pishgaman Kavir Yazd Co. including 240 ones. Sample size was estimated as 148 using Cochran formula. Following determination and approval of indexes related to main problem variables, the questionnaire was prepared and distributed in the statistical population. Collected data were analyzed using AMOS software. Research findings showed organizational foresight has positive significant effect on organizational ambidexterity. In addition, findings suggest environmental scanning capabilities have positive significant effect on exploratory innovation and exploitative innovation. Strategic selection capabilities have positive significant effect on exploratory innovation and exploitative innovation, and integration capabilities have positive significant effects on exploratory innovation and exploitative innovation, and all hypotheses were supported.

Key words: environmental scanning capability, integrating capabilities, Organizational ambidexterity, strategic selection capability.

Hadi Aminoroayaei and Hamideh Shekari

INTRODUCTION

Competition of organizations in the modern business world has become very difficult. Survival of organizations is always facing threats and challenges. Meanwhile, enhancing organizational support, which creates alignment and compatibility capacity for the organization, seems necessary. The issue discussed in most organizational texts is that successful organizations have ambidexterity in dynamic environment, that is, they have capability of managing their business and at the same time they are able to match to changes in their surroundings (Duncan, 1976; Tushman, 1996). In this way, organizational ambidexterity is considered as a source of competitive superiority (Simsek, 2009). On the other hand, foresight issues are a must, because success of organizations depends on rapid understanding of environmental variables and predicting threats and opportunities and acquiring necessary preparations (Sarpong, 2010; Roubelat, 2006). In recent years, many experts have conducted various case studies and experimental studies have attempted to show that how insight practices such as strategic thinking growth may lead to innovation (Amsteus, 2011; Van der Duin, 2006). Recently the world has speeded up so that even scientists may lag in providing new theories in many cases. The society, business, economy and many other aspects of human life have had serious changes so that avoiding surprise is the main characteristics of the organizations in today world. The world is accompanied by the rapid and severe changes. Most changes are not controllable by the organizations and they are imposed from the outside environment, thus their effects require foresight (Khanloo and Nazemi, 2014). Also, rapid change in novel technologies, has made prediction and rapid reaction according to needs of customer as difficult so that active companies in this competitive environment should act for profitable changes in existing products, services and process according to the changes (utilization) and provide new products, services and process considering internal and external environment situation and they should seek for basic changes and creation (exploration) (Im and Rai, 2008). Pishgaman Kavir Yazd Co. is regarded as one of the main companies in the country and Yazd province which is no exception in this regards. Considering extent and variety of activities and entry of recognized new competitors, it should act according to new changes in information technology area and needs of the customers. Considering different theories and definitions about organizational ambidexterity and foresight as well as importance of this issue in the organizations, current paper attempts to investigate effect of organizational foresight on organizational ambidexterity in Pishgaman Kavir Yazd Co. so that solutions can be recommended for promoting organizational ambidexterity in Pishgaman Kavir Yazd Co. and promoting foresight culture in top management. Current paper aims at answering this question: does organizational foresight have positive effect on organizational ambidexterity in Pishgaman Kavir Yazd Co.?

Theoretical Foundations

In the current era, speed of changes in organizations is so high that organizations seek for ways to rapidly change themselves quickly. One of the issues raised in recent years for coping with such rapid changes is ambidexterity in organizations. Ambidexterity in organizations is highly important in today dynamic environment. Organizations with ambidexterity are those which can find their existing abilities and at the same time seek for new opportunities.

This term initially was used by Duncan (1976) and then the most silent research work was done on organizational ambidexterity by March (1991). The term of ambidexterity in terminology means human ability for using skills of both hands equally. If this definition is considered as a metaphor for organizations, considering view of authors who divide ambidexterity to explorative innovation and exploitative innovation, it can be stated that organizations are competent in exploration and exploitation equally.

Various definitions have been provided for organizational ambidexterity some of which include: ambidexterity means that the organization manages relationship between contradictory demands by creating double structures so that business unit groups focus on alignment (exploitation) and other units focus on compatibility (exploration) (Duncan, 1976). Ambidexterity includes explorative and exploitative aspects, which are two different learning activities and organizations divide their attention and resource between them and organizations should

Hadi Aminoroayaei and Hamideh Shekari

simultaneously be aligned with exploration and exploitation (Marchs, 1991). Ambidexterity can be defined as organizational ability in consistent and efficiency in responding market demands and compatibility to changes in the environment (Gibson and Birkinshaw, 2004). Organization with is one which is able to focus on current responsibilities and future opportunities simultaneously as a key for competition and competitive advantage of the company for innovation, entrepreneurship and competition (Ramos et al., 2012). Considering aspects of organizational ambidexterity referred previously, these aspects are summarized in the following.

Explorative innovation: exploration is defined as risk taking and discovery and search and it is applied on the innovations which are designed for meeting needs of purchasers and existing markets (Danneels, 2004). Exploration uses existing systems, opens new connections toward markets and users, suggests new ideas and expands new distribution methods. Thus, exploration utilizes existing knowledge. According to Marchs (1991), exploration and investigation of new knowledge provides opportunities for development of new competencies, but it confines area of correction and purification of existing capabilities and maximum use of their potential (March, 1991).

Learning through exploration requires absorbing new knowledge from the environment. The organization can recognize, perceive and use new knowledge better in the environment in which it has experience compared to the environment in which it has no experience. Cohen and Levinthal call this capability as absorptive capacity and consider it as including capabilities of diagnosis of new information value, its absorption in their knowledge body and using it for business goals (Cohen and Levinthal, 1990). Exploration requires absorptive capacity and it is result of experiences and knowledge basis related to new knowledge area (Wiklund and Shepard, 2003).

Exploitative innovation: exploitation is defined by terms of correction, utilization, selection and implementation and it is applied in innovations which are designed for meeting needs of the purchasers and existing markets (Jansen, 2005).

Exploitation includes changes which use existing capabilities and it is focused on progress of existing plans, providing corrections toward the existing goods and services and increasing efficiency of existing distribution methods. Exploitative innovation is necessary for crating short term outcomes and due to more certain outcomes; it is main focus in many companies. However, companies need to find new options for developing readiness in future changes in surrounding environment and ensuring their long term survival. According to March (1991), excessive exploitation of existing capabilities may lead to creating limitation versus discovery of new options with better potential (March, 1991).

Learning through exploitation requires finding new applications via combination and recombination of current knowledge of the organization. Since knowledge exists in people or groups of the organization as distributed manner, it needs sharing through social interactions (Kogut and Zander, 1992). Exploitation of existing knowledge requires combined capabilities which originate from the organization's ability to create a strengthening social environment for knowledge sharing (Wiklund and Shepard, 2003). Also, in the current era, technological changes and change in other daily life aspects, mutual dependence of nations, decentralization of communities and existing institutions have increased due to expansion of technology and information. Thus, increasing tendency for globalization as well as preservation of national and ethnical and cultural features and many other factors necessitate better understanding about the future changes for the governments, businesses, organizations and people. The future is something which people can shape it with their purposeful measures. Speed of changes is wonderful and it cannot be copped in traditional way. If we are not aligned with the changes we would be crushed under great wheels of it. Since human can influence his future destiny, thus the knowledge is shaped which attempts to control changes and prepare the society for the changes by foresightedness and predicting future and its affecting factors, and at the same time, foresightedness and future-research is shaped (Russel, 2002).

Hadi Aminoroayaei and Hamideh Shekari

The first attempts for formation of foresightedness were done by Japanese at national level. What was experienced by Japanese in 1970 – 1971 was organized aiming at prediction (especially technology prediction) and it was introduced under title of Delphi 1970. This experience was called as "foresightedness" later since it achieved a collection of goals other than prediction. Emergence of foresightedness paradigm can be investigated from two views. In the first view, invention of Delphi method by authors of Rend Institute in 1960s, which led to emergence of scientific and efficient method for prediction of scientific and technological progress. In late 1960s and early 1970s, Japanese people used Delphi method more extensively for prediction of science and technology situation until 2000 using experience of experts of this institute. In the other view, changes in areas of strategic planning, future studies and politics development led to emergence of foresightedness. The term of foresightedness in dictionary means process of predicting something which is not too far and it can be practically controlled. In the other definition, foresightedness is defined as "systematic, participatory process collecting future perceptions, which provides mid to long term outlook aiming at adopting updated decisions and mobilization of common actions". This definition of foresightedness is used as the basis in plan of "regional development network of EU future research" which is known as FOREN in summary. Role of foresightedness is providing ways for seeing the future in different eyes and perfect understanding of possible effects of social and technological paths for business executives and governmental policy makers. However, according to studies there are three roles for foresightedness (Rohrbeck et al., 2011):

Foresightedness play leading role which inspire and create new ideas through achievement to introspection toward the future growth and development of the environment. Thus, with having new information regarding changes obtained in the growth and development of existing markets and purchasers, foresightedness process may cause creation of new ideas regarding exploratory capabilities or gradual introduction of innovations in stock and bonds of existing products or business performances.

Foresightedness with implementation of strategic role allows companies to explore and plan aiming at developing new areas of business, which helps challenge and evaluation of existing research works, innovative projects or current business activities with presence of competitors.

Concept-orientation of competency based in organizational foresight expresses the third role. While yet studies on organization foresight are in hand aiming at understanding and identifying successful methods and processes, according to the performed studies, integrated methods which are followed in organizational foresight as competencies are not exclusive in methods, processes and capabilities. Competency is a collection of powerful, wise, patterned and frequent behaviors which every organization can obtain toward the competitive area in which it lives. Competent model tends toward evaluation of organizational features instead of human features. Thus, this model is more suitable in drawing future outlook of the organization compared to behavior-oriented models. Thus, organizational foresight as called as the ability including structural and cultural capabilities. Hence, organizational foresight is defined as the ability which enables the organization to identify early discreet changes, interpret organizational results, and regulate effective reactions. While, it brings continuous and practical foresightedness simultaneously.

Aspects of organizational foresightedness can be called as environmental scanning, strategic selection, and integrating capabilities, which are described in following (Paliokaite et al., 2014).

Environmental scanning: generally it is applied on the learning events and methods in the market which helps understanding and identifying technology opportunities (Middelbeek, 2011). The companies need environmental scanning capability in order to understand valuable sources of external knowledge. Also, it is ability for understanding opportunities, continuous follow up and supervision of markets and technologies (Teece, 1997).

Strategic selection: it applies on the organizational activities which are optimal for creating organizational changes following identification and determination of optimal solutions (Zatt, 2003). When new opportunities emerge for the

Hadi Aminoroayaei and Hamideh Shekari

first time, the companies require collection and purification of technical, market and competitive information so that they can perceive concepts of every action. They require investigation and analyzing external knowledge and attempt for performing strategic selection processes (Capron et al., 2009). Thus, strategic selection capability proceeds by analytical systematic and planning processes (Amsteus, 2011).

Integrating capabilities: they are based on organizational strategy, climate governing the organization and infrastructures in integrating resources in order to create and adopt values from the obtained opportunities. Integrating capability plays significant role in dissemination, repetition and holding the knowledge in organization (Rohrbeck et al., 2011).

Considering importance of organizational ambidexterity and organizational foresight, current research aims at investigating effect of organizational foresight in different aspects on organizational ambidexterity in Pishgaman Kavir Yazd Co.

REVIEW OF LITERATURE

Bandarian (2013) in his work entitled "simultaneous ambidexterity as suitable pattern for organizing exploration and exploitation activities in research and technology organizations" showed research and technology organizations could respond current and future challenges of the industry through exploitation, and they could succeed in exploration of current and future challenges of the company and new technological opportunities. They distinguish their exploration units from exploitation units and they allowed independent action. Jansen et al. (2009) studied effective leadership behavior for obtaining aspects of organizational ambidexterity in 89 branches of financial service companies and 305 members of top management team and executive managers, and they found environmental dynamicity is needed for perfect understanding of the effectiveness of strategic leaders and there is distinction between exploratory and exploitative innovation and leadership styles (Jansen et al., 2009). Simsek et al. (2009) theoretically argued that effect of ambidexterity has stronger effect on performance in dynamic environments compared to less dynamic environments (Simsek et al., 2009). Geerts et al. (2010) designed a longitudinal study and studied 532 companies during a four-year period. They showed ambidexterity has positive effect on company growth (Geerts et al., 2010). Wulf et al. (2010) considered origin of ambidexterity in learning literature. They stated ambidexterity has application in various areas including technology and innovation management, design and organizational behavior and studies support ambidexterity strong positive effect (Wulf et al., 2010). Yang and Li (2011) studied 298 Chinese companies and found from organizational ambidexterity, exploration and performance of new product aspects through environmental dynamicity have negative adjustment, but exploitation and new product performance have positive adjustment to environmental dynamicity (Yang and Li, 2011). Oh et al. (2012) studied integration of retailing channels and its effect on the performance in 125 retailing companies in Singapore and found in dynamic environments, exploitation does not have weak effect on the performance, while exploration has strong effect on performance in dynamic environments (Oh et al., 2012). Goosen et al. (2012) studied a large sample of companies during a one year period and found that companies with higher technological capability take more advantage of ambidexterity (Goosen et al., 2012). O'Reilly and Tushman (2013) in a meta-analysis stated organizational ambidexterity is useful for companies with high technology and competition in new markets under uncertainty conditions and environmental dynamicity and have positive effect on their performance. They consider effect of organizational ambidexterity on performance of non-manufacturing industries with high technology level as effective (O'Reilly and Tushman, 2013). Junni et al. (2013) in their meta-analysis showed when organizational growth is measured; organizational ambidexterity has positive relationship with the performance (Junni et al., 2013). Paliokaite and Pacesa (2014) studied relationship between organizational foresight and organizational ambidexterity in 230 companies in Litanies and found organizational foresight has positive effect on occurrence of organizational ambidexterity especially exploratory innovation (Paliokaite and Pacesa, 2014).

Hadi Aminoroayaei and Hamideh Shekari

Research Methodology

Current research is an applied research in terms of purpose and considering way of data collection it is a descriptive survey.

Research Conceptual Model

Considering research conceptual model, research hypothesis are divided into minor and major hypothesis.

Research major hypothesis: Organizational foresight has positive effect on organizational ambidexterity in Pishgaman Kavir Yazd Co. and minor research hypotheses include as follows:

Environmental scanning capability has positive effect on exploratory innovation aspect of organizational ambidexterity in Pishgaman Kavir Yazd Co.

Strategic selection capability has positive effect on exploratory innovation aspect of organizational ambidexterity in Pishgaman Kavir Yazd Co.

Integrating capability has positive effect on exploratory innovation aspect of organizational ambidexterity in Pishgaman Kavir Yazd Co.

Environmental scanning capability has positive effect on exploitative innovation aspect of organizational ambidexterity in Pishgaman Kavir Yazd Co.

Strategic selection capability has positive effect on exploitative innovation aspect of organizational ambidexterity in Pishgaman Kavir Yazd Co.

Integrating capability has positive effect on exploitative innovation aspect of organizational ambidexterity in Pishgaman Kavir Yazd Co.

METHODOLOGY

In the current research, combination of library and field studies were used for collection information and data needed in the research. In library studies and using websites, theoretical concepts regarding organizational ambidexterity and organizational foresight were formulated. Then, research questionnaire was formulated and distributed among the population under study so that research data are collated. Statistical population in this research include all employees working in Pishgaman Kavir Yazd Co. (n = 240). Research sample was calculated using simple random sampling through Cochran formula and it was calculated as 148. The mean measurement tool in this work is two questionnaires. In order to collected data for organizational ambidexterity, the questionnaire proposed by Jansen et al. (2009) including 8 items was used. It covers explorative and exploitative innovation. In order to collect data for organizational foresight, questionnaire proposed by Paliokaite and Pacesa (2014) was used which includes 37 items and covers components of environmental scanning capability, strategic selection capability and integrating capabilities.

In analysis and description of research model, structural equations are used for testing hypothesis. To this end, confirmatory factor analysis is used for structural equation modeling and fitting measurement model using AMOS 22 software. Maximum likelihood estimation (ML) is used for estimating model parameters. Model fit indexes including chi-square, RMR, GFI, AGFI, etc. are calculated for determining fit of organizational foresight measurement model. Results showed that following elimination of items with factor loads lower than 0.5, factor load of most of them is above 0.5 and they are significant at confidence level 99 percent. It suggests that items describe conceptual variables well and questionnaire items have acceptable factor validity. Critical ratio (CR) is larger than 1.96 which supports significance of the calculated coefficient. For determining reliability of research constructs, Cronbach alpha was calculated as 0.7 denoting acceptable reliability of constructs.

FINDINGS

Descriptive Indexes of Research Variables

Results for investigation of descriptive indexes of research variables are given in Table 1 which includes indexes of mean and SD.

Results for Major Research Hypothesis

Following assuring suitable fit of structural mode, effect of variables can be studied according to factor lads and regression coefficients. Table 2 gives regression coefficients and significance level of the research structural model.

Results on Table 2 indicates effect of organizational foresight on organizational ambidexterity   is significant with path coefficient as 0.61 at confidence level 99 percent (Critical ratio (CR) is larger than 1.96 which supports significance of the calculated coefficient). Considering it is appositive relationship, organizational foresight has positive effect on organizational ambidexterity. Hence, Main hypothesis is supported.

Results for Minor Research Hypotheses

In order to investigate minor research hypotheses, following structural model was used. Structural model of minor hypothesis drawn in AMOS software is given in Fig 2.

In order to determine fit of structural model of minor research hypotheses, fit indexes are given in Table 3.

Results for indexes of Table 3 indicates structural model of the minor research hypotheses have good fit. Thus, according to obtained regression coefficients it is possible to investigate effect of the variables. Table 4 gives regression coefficients and significance level of the structural models.

Results of the minor hypotheses are as follows:

Results in Table 4 indicates environmental scanning capability has significant effect on exploratory innovation with path coefficient as 0.49 at confidence level 99 percent (critical ratio values are all larger than 1.96 which supports significance of the calculated coefficients). Considering it is a positive relationship, environmental scanning capability has positive effect on exploratory innovation. Hence, first minor hypothesis is supported.

Results in Table 4 indicate strategic selection capability has significant effect on exploratory innovation with path coefficient as 0.55 at confidence level 99 percent. Considering it is a positive relationship, strategic selection capability has positive effect on exploratory innovation. Hence, second minor hypothesis is supported.

Results in Table 4 indicate integrating capability has significant effect on exploratory innovation with path coefficient as 0.22 at confidence level 99 percent. Considering it is a positive relationship, integrating capability has positive effect on exploratory innovation. Hence, third minor hypothesis is supported.

Results in Table 4 indicate environmental scanning capability has significant effect on exploitative innovation with path coefficient as 0.73 at confidence level 99 percent. Considering it is a positive relationship, environmental scanning capability has positive effect on exploitative innovation. Hence, fourth minor hypothesis is supported.

Results in Table 4 indicate strategic selection capability has significant effect on exploitative innovation with path coefficient as 0.30 at confidence level 99 percent. Considering it is a positive relationship, strategic selection capability has positive effect on exploitative innovation. Hence, fifth minor hypothesis is supported.

Results in Table 4 indicate integrating capability has significant effect on exploitative innovation with path coefficient as 0.19 at confidence level 99 percent. Considering it is a positive relationship, integrating capability has positive effect on exploitative innovation. Hence, sixth minor hypothesis is supported.

DISCUSSION AND CONCLUSION

Importance and considerable role of organizational ambidexterity in business world encouraged to author to conduct this research. Current research attempted ot investigate effect of organizational foresight on organizational ambidexterity in Pishgaman Kavir Yazd Co. which was accomplished through investigation of different angles of the conceptual model. Using achievements of research it is possible to move toward promotion of foresight culture and ambidexterity in Pishgaman Kavir Yazd Co. Results obtained from data analysis support main and minor research hypotheses. In fact, results indicate that organizational foresight has positive effect on organizational ambidexterity. Also, it can be said that:

Environmental scanning capability has positive effect on organizational ambidexterity in exploratory innovation aspect in Pishgaman Kavir Yazd Co.
Strategic selection capability has positive effect on organizational ambidexterity in exploratory innovation aspect in Pishgaman Kavir Yazd Co.
Integrating capability has positive effect on organizational ambidexterity in exploratory innovation aspect in Pishgaman Kavir Yazd Co.
Environmental scanning capability has positive effect on organizational ambidexterity in exploitative innovation aspect in Pishgaman Kavir Yazd Co.
Strategic selection capability has positive effect on organizational ambidexterity in exploitative innovation aspect in Pishgaman Kavir Yazd Co.
Integrating capability has positive effect on organizational ambidexterity in exploitative innovation aspect in Pishgaman Kavir Yazd Co.
According to obtained results from the research, following recommendations are given:
Research findings show there is positive significant relationship between organizational foresight and organizational ambidexterity, thus the company can utilize adequate power in order to pay more attention to nurturing various organizational capabilities toward organizational ambidexterity, and thus it can use changes for achieving creativity.
According to research findings, successful and reliable methods are provided for the company's employees that can promote foresight culture relying on the capabilities and methods.
Results of the research suggest that the company should have more investment on following cases:
Regular scanning of the external environment through weak and strong resources
Investment on educated employees and R & D capabilities which increase opportunities for recognizing new information.
Encouraging employees for creating new ideas regarding organizational ambidexterity
Foresight with focus on futurist methods such as planning and steering, measurement and balanced test systems, active strategic programs. Etc.
Research findings show that updating knowledge of the company's employees through new knowledge obtained in this research can improve exploitative innovation and business efficiency.

Hadi Aminoroayaei and Hamideh Shekari

REFERENCES

1. Amsteus, M. (2011). Managerial foresight and firm performance, Linnaeus university press, Gothenburg.

2. Bandarian, R. (2013). Simultaneous ambidexterity as suitable pattern for organizing exploration and exploitation activities in research and technology organizations, Journal of Industrial Technology Development, 22: 21- 32.

3. Blackman, D.A., Henders,S. (2005). On, Autopoietic limitations of probing the future, in: H. Tsoukas, J.

4. Capron,L.,Mitchell,W.(2009). Selection capability: how capability gaps and internal social frictions affect internal and external strategic renewal, Organ. Sci.294-312.

5. Cohen,W.,Levinthal,D. (1990). Absorptive capacity : a new perspective on learning and innovation, Adm. Sci. Q.128-152.

6. Danneels, E. (2004). Disruptive technology reconsidered: a critique and research agenda , J.Prod . Innov.Manag. 21: 246-258.

7. Duncan, R.B. (1976). The ambidextrous organization: designing dual structures for innovation , in : R.H. Kilmann, L.R. Pondy ,D.P.Slevin , The management of organization design , Strategies and Implementation, 167- 188.

8. Geerts, A., Blindenbach-Driessen, F., Gemmel, P. (2010). Achieving a balance between exploration and exploitation in service firms: A Longitudinal study, paper presented at the annual meetings of the academy of management.

9. Gibson,C.B.,Birkinshaw,J.(2004).The antecedents, consequences, and mediating role of organisational ambidexterity, Academy Man. J. 47 ,209-226.

10. Goosen, Martin C., Bazzazian, N., Phelps, C. (2012). Cconsistently capricious: The performance effects of simultaneous and sequential ambidextetity, Paper presented at the annual meetings of the academy of management.

11. Im, G., Rai, A.(2008). Knowledge Sharing Ambidexterity in Interorganizational Relationships. Management Science. 54: 1281–1296.

12. Jansen, J.J.P., Vera, D., Crossan, M. (2009).Sterategic leadership for exploration ad exploition : The moderating role of environmental dynamism. Leadership Quart. 20: 5-18.

13. Jansen, J.P.(2005). Ambidextrous organisatios: A Multi – level Study of absorptive capacity,Exploratory and Exploitative innovation and performance , Erasmus research institute of management , Rotterdam, Erasmus University Rotterdam.

14. Junni, P., Sarala, R., Taras,V., Tarba, S. (2013). Organizational ambidexterity and performance: A meta-analysis.The Academy of Management Perspectives, amp-2012. Published online before print, 9.

15. Khanloo, N., Nazemi, A. (2014). Prudence and foresight in planning and implementation of personnel plans in government agencies, Management Selection Magazine, 152.

16. Levinthal, D., March, J. (1993). Myopia of learning. Strategic Management Journal, 14: 95-112.

17. Marchs, J.G. (1991). Exploration and exploitation in organization learning, Organizatin science, 2: 71-87.

18. Middelbeek, S. (2011). Organizational ambidexterity: Research into the relation between organizational antecedents and ambidexterity on a department level with transactional and translational leadership style as moderating variables, Open universiteit Nederland .

19. O'Reilly, C., Tushman, M. (2013). Organizational Ambidexterity: Past, Present and Future, Academy of Management Perspectives , 4: 324-338.

20. Oh, L. B., Teo, H. H., Sambamurthy, V. (2012). The effects of retail channel integration through the use of information technologies on firm performance.Journal of Operations Management, 30: 368-381.

21. Paliokaite,A.,Pacesa,N. and sarpog ,D. (2014). Conceptualizing strategic foresight : an integrated framework , Strateg.Chang.Special issue : Strategic Foresight, 23, 3-4.

22. Paliokaite,A.,Pacesa,N.(2014). The relationship between organizational foresight and organizational ambidexterity,Technol.Forecast.Soc.Change.

Hadi Aminoroayaei and Hamideh Shekari

23. Ramos, M., Morales, V., García, J. (2012).Technological distinctive competencies and organizational learning: Effects on organizational innovation to improve firm performance,Journal of Engineering and Technology Management, 29: 331–357.

24. Rohrbeck, R., Gemünden, H.G. (2011). Corporate foresight: its three roles in enhancing the innovation capacity of a firm, Technol. Forecast. Soc. Chang. 78: 231-243.

25. Roubelat, F. (2006). Scenarios to challenge strategic paradigms: Lessons from 2025, futures 38: 519-527.

26. Russel, V. (2002). Ideal design (creation of organizational future), Tr. by M. Soltani

27. Sarpong, D.B. (2010). Scenario thinking in product innovation teams: a practice approach, A Thesis submitted to the Bristol business school, University of the west of England in partial fulfilment for the award of doctor of philosophy degree.

28. Simsek, Z., Heavay, C., Vegia, J.F., Souder, D. (2009). A typology for aligning organizational ambidexteritys conceptualizations ,antecedents, and outcomes.Journal of management studies, 46: 864-894.

29. Tushman ,M.L., O'Reilly (1996). Ambidextrous organizations :managing evolutionary and revolutionary change , Calif. Manage. 4: 8-30.

30. Van der Duin, P. (2006). Qualitative futures research for innovation, Eburon Academic publishers, Delft.

31. Wulf, T., Stubner, S., Blarr, H. (2010). Ambidexterity and the concept of fit in strategic management – Which better predicts success?, A study conducted by the chair of strategic management and organization at HHL – Leipzig graduate school of management, HHL – Arbeitspapier HHL working paper, 89.

32. Yang, T.T., Li, C.R. (2011). Competence exploration and exploitation in new product development: the moderating effects of environmental dynamism and competitiveness , Management Decision, 9: 1444-1470.

33. Zott, C. (2003). Dynamic capabilities and the emergence of intraindustry differential firm performance: insights from a simulation study, Strateg,Manage. 2: 97-125.
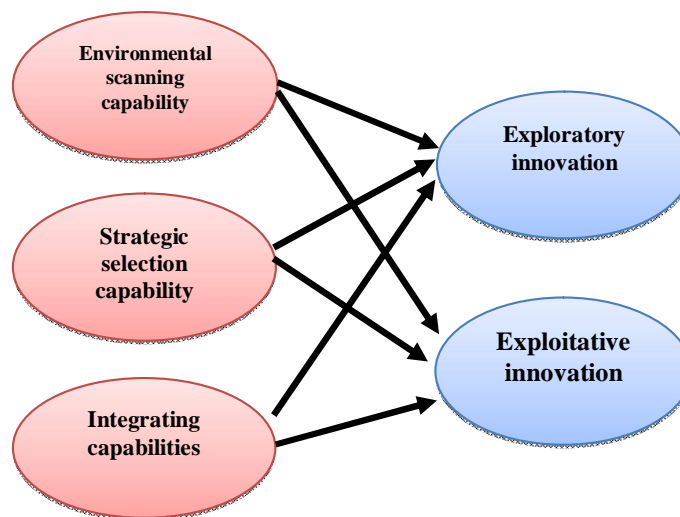
Fig 1. Research Conceptual Model
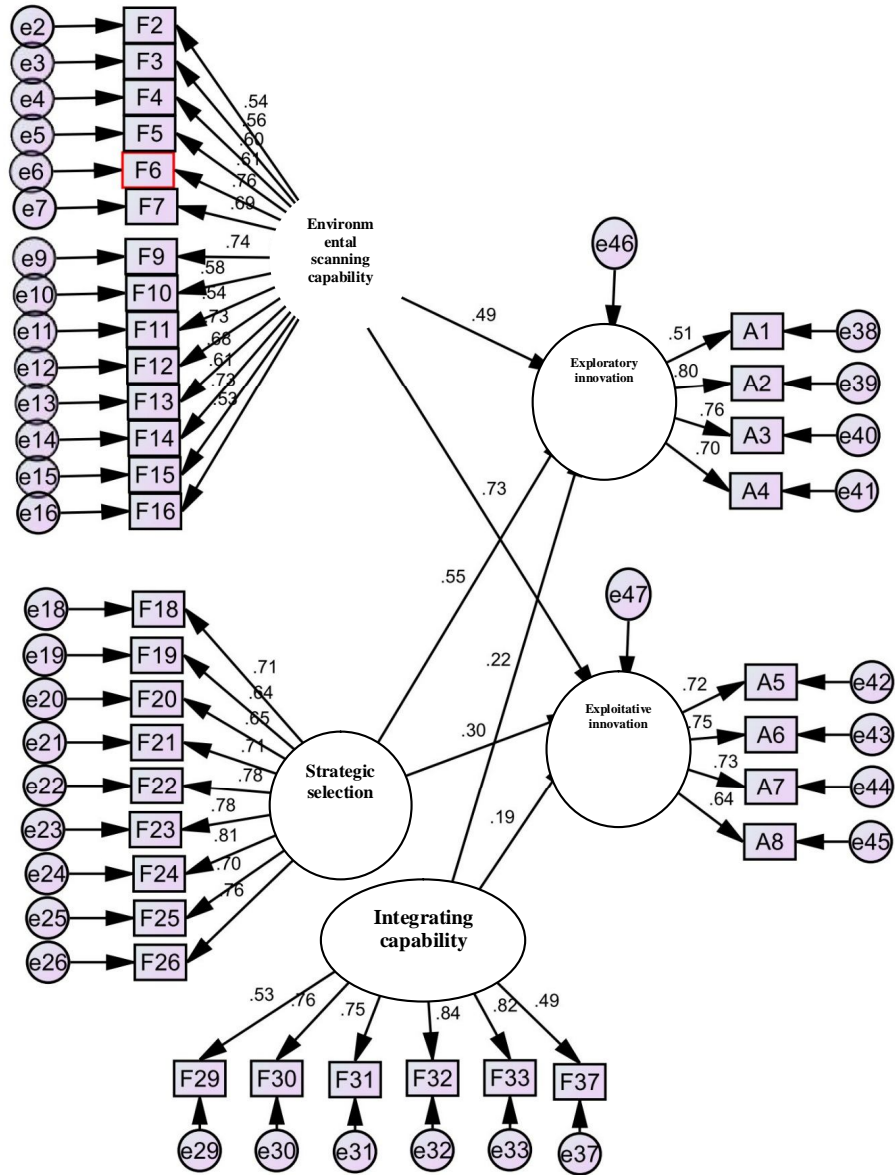
Hadi Aminoroayaei and Hamideh Shekari

Fig 2. Structural model of minor hypotheses (standard estimation)

Hadi Aminoroayaei and Hamideh Shekari

Table 1: Descriptive Indexes of Research Variables

Aspect	Component	Mean	SD	Min.	Max.
Organizational Foresight	Scanning capability	3.436	0.589	1.941	4.706
	Strategic selection capability	3.46	0.636	1.8	4.8
	Integrating capability	3.118	0.584	1.7	4.6
Organizational Ambidexterity	Exploratory innovation	3.296	0.766	1	4.75
	Exploitative innovation	3.613	0.82	1.75	5

Table 2: Regression coefficients and significance level (research structural model)

Relationship	Standard regression coefficient	Critical ratio CR	Sig. level	Result
Organizational foresight → organizational ambidexterity	0.61	6.863	0.000	Effect is significant at level 99 percent. Relationship between two variables is positive

Table 3: structural model fit indexes for minor hypothesis

Index	Optimal level	Reported value
X2/df	3 and smaller	1.707
NFI	0.9 and larger	0.923
IFI	0.9 and larger	0.980
CFI	0.9 and larger	0.977
GFI	0.9 and larger	0.945
TLI	0.9 and larger	0.944
RFI	0.9 and larger	0.982
PCFI	0.5 and larger	0.675
PNFI	0.5 and larger	0.622
PRATIO	0.5 and larger	0.861
AGFI	0.9 and larger	0.953
RMSEA	Smaller than 0.08	0.021
RMR	Close to zero	0.032

Hadi Aminoroayaei and Hamideh Shekari

Table 4: Regression coefficients and significance level (research structural model for minor hypotheses)

Minor Hypothesis	Relationship	Standard regression coefficient	Critical ratio CR	Sig. level	Result
1	Environmental scanning capability → exploratory innovation	0.49	4.497	0.000	Effect is significant at level 99 percent Relationship between two variables is positive
2	Strategic selection capability → exploratory innovation	0.55	5.397	0.000	Effect is significant at level 99 percent Relationship between two variables is positive
3	Integrating capability → exploratory innovation	0.22	2.507	0.003	Effect is significant at level 99 percent Relationship between two variables is positive
4	Environmental scanning capability → exploitative innovation	0.73	6.632	0.000	Effect is significant at level 99 percent Relationship between two variables is positive
5	Strategic selection capability → exploitative innovation	0.30	3.556	0.000	Effect is significant at level 99 percent Relationship between two variables is positive
6	Integrating capability → exploitative innovation	0.19	2.303	0.024	Effect is significant at level 99 percent Relationship between two variables is positive

RESEARCH ARTICLE

Studying the Economic Problems of Women Prisoners after Release

Seyede Marzie Mirmasoomnejad[1]* Afsaneh Yousefalizadeh[2] and Mohammad Farajiha[3]

[1]Department of Law, Lahijan Branch, Islamic Azad University, Lahijan, Iran.
[2]Department of Law, Mashhad Branch, Islamic Azad University, Mashhad, Iran.
[3]Department of criminal low, Tarbiat Modares University, Tehran, Iran.

*Address for correspondence
Seyede Marzie Mirmasoomnejad
Department of Law,
Lahijan Branch, Islamic Azad University,
Lahijan, Iran.

ABSTRACT

Returning to the community and releasing from prison have its own problems for persons. As seen people with a criminal conviction and sentence have many difficulties in finding a job, return to their families and society, their livelihoods, and communication with friends and family. Meanwhile, women are grappling with severe problems due to cultural obstacles because criminal stigma is bolder for them after release and the society acts more stringent foe their readmission. Economic problem after the release of the women is a notable challenge that is the source of many future pests and consequences. This descriptive-analytical study tries to investigate the economic problems of women prisoners after release from Mashhad and Rasht jails by means of depth interviews with 10 released women as well as interviews with the informants, such as prison supervisors, psychologists at triangular hospitals, psychologists of after leaving office and occupational experts and authorities. It seems the main problem for women released from prison is the difficulty of finding a job and earn a living for themselves and their children because financial independence is a condition for the delivery of child given to Social Welfare Organization. Financial independence seems necessary to get away from the damage caused by the dependence of the family finances that results in the prominence of criminal stigma. The 'Care after Release Office' can be useful in meeting the needs of the women and trying to get back healthy and low concern to society.

Keywords: economic difficulties, women in prison, problems after release, the profession.

INTRODUCTION

The biggest problems of women prisoners are their rejection by family and society and label and shame due to their criminal record rejecting them from society. For this reason, a prisoner must find an illegal occupation, criminal profession and earn money through illegitimate actions, which results in a more dangerous recidivism and further incarceration.

Although many of the problems that women face during re-entry into society is similar problems in men (eg. Ex-prisoners face discrimination in employment and training after the release due to reports about their crime or their infamous), their severity and multiplicity of needs after release are very different. Women suffer from discrimination, particularly with regard to social stereotypes in the aftermath of liberty; they may be ostracized by their families or will be deprive of motherhood right in some countries (Bloom.2004).

Problems with Finding Jobs and Housing

Although a constant location was considered positive to reduce crime, 60 percent of women have no specific place to live after release. For instance, Sample 6 lives at her parents' home with her two children after her release from prison. The parents are so rigid with children due to their old age. On the other hand, the parents pointed out to her meaning that she should not separate her addicted husband and she should not be taken to jail. She considers unemployment and lack of ability to supervise children as the biggest problem after release. She has gone to 'Care after Release Office' to get a loan and she believes that she spent his life working without her children. Now she needs finance to build the future of her children who have been victims of parents' substance abuse.

Women who have left violent relationships need to build a new life would perhaps require social, economic and legal difficulties in addition to the challenges in the transition to life outside prison. Performed research articulates some problems after the release from prison as about one of three Britain female prisoners have lost directly or indirectly their house. This has a particular impact on women with children, which the custody of their children is very difficult. If these women were not forced to care their children, they would never give priority to the housing. However, if these women do not have a secure residence, they will not acquire the permission to supervise the children (Atabay, 2009).

In the studied samples, Sample 10 who have kept in Mashhad prison for charges of drug trafficking considers his biggest problem after the release the lack of financial debility and a good job. Social Welfare Organization has suspend the delivery of her child to finding a suitable job and she could only pick up fruit in gardens and earning daily wages.

Economically, the path to stability and self-sufficiency can be an uneven way. Since women's vocational qualifications before being incarcerated tend to poverty, probably, there is not much hope to get lucrative jobs after the sentence (Talvi.2007). Restrictions on receiving favorable welfare and scholarships for people who have been convicted of drug use prevent them to earn resources that may be required as a bridge toward independence. Most of the interviewed women were expressed dissatisfaction with their financial conditions. Most of them referred to the 'Care after Release Office' and criticized the strict and complicated administrative procedures. However, close monitoring of steps of getting loan seems logical. As sample 2 said, there are persons abusing the privilege of taking a loan by released prisoners. They help the released prisoners by providing guarantees for loans; then, they get a major part of the money and a small amount is left for the released prisoner. Monitoring the use of the loans in the jobs that has been introduced and presented by the released prisoner can prevent such abuses.

Moreover, other social barriers such as rare adequate jobs to earn a living, settlement of with payable fees and social prejudice against ex-convicts are also should be considered. Researches show that former convicts with minor problems had persons earn a living lawfully from legal sources; they have marketable skills and strong support systems to return. Poor, unskilled and uneducated women have fewer incomes. Nevertheless, for all the women who were jailed, the path to productive citizenship has some challenges relating to the records of injury, emotional problems and their desire to use drugs at prison. Many women suffer psychological trauma when surrounded by prison walls. In the absence of re-entry into society and economic aid, which is necessary, there is no surprise to see them arresting again sometimes few weeks later (Van Wormer, 2010).

Mental Health Problems and the Costs of Psychoanalysis Sessions

Women are more liable to mental health problems in prison; thus, they need continuous of psychiatric or counseling investigation after release. Many interviewed women take pills after their release from prison. This requires further attempt by social workers and psychologists in 'Care after Release Office' and Social Welfare Organization to hold free regular meetings of psychoanalysis because the payment of psychoanalysis sessions and referrals to psychologists, or psychiatrists, is difficult for person who are unable to afford their basic needs. In this rgard, sample 11 has reached such a financial position to support her children and her sick wife.

Security Problems

In some countries, women would never leave jail unless a male guardian release her; this may lead to the prolongation of their detention after sentencing. Moreover, in some countries, If women have committed a moral crime, they may be at risk of murder by family members, or they may be victims of rape or other sexual abuse. They are also at risk of compulsory return into marriages with violence or compulsory marriages despite her wish. These women need special support; however, protections (such as shelters) are insufficient to meet the needs of these people in most cases (Rasche.2003). The above items can be reduced remarkably if 'Care after Release Offices' help in the financial independence and security of women. For example, we can neutralize the threats of bias families and individuals wishing sexual abuse of women with no income if there are safe houses and production workshops associated with the employment of women (Atabay, 2009).

Specific Problems of Incarcerated Mothers

Return to society can be a dream coming true for many prisoners, especially mothers of young children, but there are many surprising problems for women in this regard. Their husband is usually living with another woman and the children have grown and changed in the absence of their mothers. For example, the parents recognize their children do not respect them while they are involved in heavy addiction to drugs or other illegal activities. Others who have lost the right to supervise their children should cope with feelings of grief and loss. In a comparison with male ex-convicts, women face three strikes: lack of a partner expecting their return, immediate responsible for the care of children and the necessity to overcome the shame of offense by a woman, especially a mother (Alejos, 2005). Sample 10 has fully been ostracized by her family. They are a respectful family in their city and according to the sayings of the prisoner, his family members have never been committed a crime and arrested. Therefore, it is difficult for them to tolerate this event; for her family members, she is an embarrassment.

Since constant contact is a determining factor in compatibility of children with the incarcerated parent before and after her release, prison visits should be strengthened as far as possible. Children who often meet parents under the same conditions as their home (eg. private wagons are predicted at Bedford Hills Correctional place) have less compatibility problems in comparison with prisoners prohibited from being visited in the jail. Unfortunately, as Petrisyliya states, prisoners are often only allowed to call home (if the recipient of the call accepts the cost) with very high cost. Some prisons earn millions of dollars through the repayment of phone calls. Where the procedure is

terminated and calls have been encouraged, family relationships have been strengthened in favor of the prisoner and his family. Sample 11 has a 7 years old daughter. This child is very inconsistent and nervous after her mother's liberation. She is skeptical of all and very aggressive. She did not call her mother mom up to one month after her release and she is now angry of her mother.

Economic Problems Relating to Opiate Withdrawal

Besides, this fact should be remembered that many freed women have major problems in health and addiction records. Hence, referring to health care centers outside the prison, such as health clinics and self-help groups is essential for solving developing problems (Mummert, 2007). In Mashhad Care after Release Office, there is a triangular clinic supporting released prisoners who are faced with the problem of drug abuse. The center gives methadone to released people up to 2 months after release; then, it introduces them to the addiction detoxification centers that are not free. Sample 4 believes that her problem after release was lack of methadone. She argues that two months is not enough for free distribution of methadone by the triangular clinic.

CONCLUSION

Psychologically, prisoners' re-entry into society raises many challenges. This involves a major change in the prisoner's behavior; it is a transition from a condition in which all aspects of life has been controlled and any sign of independence or organizing was punished to the expression of expected quality from an independent and responsible adult. In bold life in the "free world", some sort of innovation that had been suppressed for years seems essential to find a suitable job, stay clean and sober, and resume the responsibilities of care. Depending on the number of years of imprisonment and the degree of institutionalization, the shift from a passive incarcerated prisoner to an adult active member of the community may be associated with a high risk of failure. Therefore, the risk of returning to criminal professions should be diminished with various supports that one of the most important ones is economic support. This article presents the following suggestions for solving the economic problems of women released from prison.

Creating employment workshops and financing the establishment of businesses by, 'Care after Release Office' and Social Welfare Organization.
Financing housing loan and building safe houses for homeless women or women who are at high risk of harm from their families.
Holding group and individual psychoanalysis and counseling sessions and referral to a psychiatrist and medication freely in necessary.
Setting up opiate withdrawal clinics and providing methadone free of charge for a required period.
Facilitating conditions for lending to mothers whose children are living in centers of Social Welfare organization and it the organization suspend the children return to the provision of housing and job.

In sum, it appears attention to the economic needs of female prisoners after release is very important among all their needs in prison and after release because the purpose of return of a healthy person to a community can be achieved if the person has the first needs for a dignified life. Otherwise, returning into the abyss of crime in chaotic conditions, rejection by family, financial problems, lack of housing and jobs and staying away from children does not seem far even after the release.

REFERENCES

1. Atabay, Tomris. Handbook for prison managers and policy makers. Trans. Alireza jamshidi. Deputy of Legal and judicial development of the judiciary, the first edition, summer 2009.

Seyede Marzie Mirmasoomnejad *et al.*

2. Alejos, M, "Babies and small children residing in prisons", Geneva, Switzerland: Quaker United Nations Office, 2005.

3. Bloom, Barbara, "Women offenders and the gendered effects of public policy, Department of Justice, National Institute of Corrections, 2004. Mummert, M, "The war on drugs war on families", Unitarian Universalist, 2007.

4. Rasche, C, "Cross-sex supervision of incarcerated women ", NC: Academic, 2003.

5. Talvi, S, "Women behind bars: The crisis of women in the U.S. prison system", Emeryville, CA: Seal, 2007.

6. Van Wormer, Katherine, "Working with Female Offenders", WILEY, 2010.

Table A: prisoners interviewed by age, charge, education and duration of imprisonment

Row	City	Date of Birth	Education Level	Charge	Jail term	Date of Interview
Sample 1	Mashhad	1345	Illiterate	Drugs	4 months	3.24
Sample 2	Mashhad	1362	Ninth grade	Liaison	9 months	3.24
Sample 3	Rasht	1344	Third grade	Drugs	18 months	3.28
Sample 4	Mashhad	1361	Diploma	Drugs	7 months	3.28
Sample 5	Mashhad	1337	Fifth grade	Drugs	5 year	3.28
Sample 6	Mashhad	1329	Illiterate	Drugs	38 months	4.8
Sample 7	Rasht	1346	Illiterate	Liaison	1 year	4.14
Sample 8	Rasht	1352	Fifth grade / literacy Movement	Liaison	1 year	4.18
Sample 9	Mashhad	1364	Elementary	Keeping guns	6 months	4.26
Sample 10	Mashhad	1359	Sixth grade	Robbery	51 months	6.9

RESEARCH ARTICLE

The Analysis of the Declining Trend of Cotton Production in Gorgan

Mohammadali Ahmadian[1], Razieh Mosadegh[2]*, Hamid jafari[3] and Mahdi jahani[3]

[1] professor of Geography, Mashhad Branch, Islamic Azad University, Mashhad, Iran

[2]The Ph.D student of Geography and Rural Planning, Mashhad Branch, Islamic Azad University, Mashhad, Iran.

[3]Assistant Professor of Geography, Mashhad Branch, Islamic Azad University, Mashhad, Iran.

*Address for correspondence
Razieh Mosadegh
The Ph.D student of Geography and Rural Planning,
Mashhad Branch, Islamic Azad University,
Mashhad, Iran.

ABSTRACT

Nowadays, one of the most important needs of human being is to prepare food and clothing. Since yarn, oil and protein can be extracted from cotton, it can meet some of industrial, food and animal needs of the country. It can also create high employment. The growing population has some demands and needs which must be met through making and executing development programs. However, in recent years, the planting of this product have had a declining trend in Golestan, Iran. In 1992, the cultivated field in Gorgan, was 75000 hectare, which decreased to 885 hectare in 2013. The purpose of this study is to analyze the effective factors in the declining trend of cotton production in Gorgan, Iran. The research method is descriptive-analytical and it is a survey research. Considering the data collection method, the present study is a qualitative and field study. 151 people were determined as the sample size, using the Cuchran formula, in order to analyze the effective factors on the declining trend of cotton production. These samples are selected by the classification and random methods. T test, Kolmogrov and Smirnov tests are used in order to analyze the data. Results show that 61.43 percent of the studied sample considers the competition of highly beneficial products as a highly effective factor on the declining trend of cotton production, 14.49 percent of the sample considers it as a factor with an average effect, 13.9 percent considers it as lowly effective factor and 10.15 percent considers it as ineffective factor.

Key words: Agriculture, C production, Gorgan, Rural development.

Razieh Mosadegh *et al.*

INTRODUCTION

Problem definition

Cotton is one of the few most commonly and efficiency used products that the most large and small developed and developing countries are its producers and consumers in respect their political and social situation (Department of Cotton and Oil Seeds, 2002, 3). The exchange earnings from the export of cotton have been awarded some of the world's developing countries (Asayesh, 1997: 20) .cotton is one of the oldest textile fibers and the most important one in the world (PBO, 1995: 22). more than seventy-major and minor product are extracted from the cotton that are used in various industries such as weaving, food, and chemical industrial including the density and viscosity of ice cream, decoration of salads, toothpaste preparation, production of cellulosic derivatives, etc. (Vatknz, 2000: 6).

In 1960 and 1970 Golestan province by meeting 0.50% of planted area, allocated about 0.65% of the country's cotton production. But in recent decades, the area under cotton plantation has fallen sharply so that from 75,000 hectares in 1981 reached to 885 hectares in 2013. Since the decline of cotton production in this region of the country could have adverse effects on textile industry and oil extraction and other related activities and also the fact that cotton production in the region could diminish our need to import cotton and currency out of the country, the investigation of the reasons of cotton production decrease is required. According to the research, the following questions can be posed:

Research Questions

 Depending on the capabilities of the province about cotton plantation, how much competition of other products has stagnated cotton-growing in the city of Gorgan?

 Government policy To what extent has been effective in reducing the production of cotton?

Research Purposes

- Determination of the role of public policies in the fluctuation of cotton production in the city of Gorgan (promotional support, cotton import tariff rates, etc.).

- Specification of the role of economic factors such as cotton prices, the imbalance between the prices of agricultural products, increasing demand for oil extraction plants.... in cotton cultivation.

- The role of human factors in fluctuation of cotton cultivation in the study area.

 The role of education in order to increase knowledge and experience transfer to farmers to increase cultivation of cotton and its performance.

Literature Survey

On the abovementioned subject, much research has been done. Cotton book written by Kohl and Lewis (1995), has presented many articles about natural condition of cotton cultivation and economic issues related to it.Ghadiri moghadam and Nemati (2011) in their study compared the profitability of organic and conventional cotton crops in Khorasan Razavi. Due to the growing demand for organic agricultural products, being aware of the costs and benefits of organic production can contribute to the planning of agriculture and farmers and in particular to farmers

Razieh Mosadegh *et al.*

to decide to produce it. Aghai and Jalali (2013) examined the effect of irrigation and plant density on yield of two varieties of cotton.

Afshari (2011) in his investigation about the stability of attitudes among cotton farmers found that Cotton is one of the most unstable products among the crops and has the negative effects associated with that leading to a reduction in farmers' income in the long-term and socio-economic systems instability. Ahmadi and Agha alikhani (2012) analyzed the energy consumption in the province to provide a mechanism to increase the efficiency of and the results showed the contribution of different factors in the energy inputs in the production of cotton is different. Majidi et al (2012) set up an examination in Birjand to determine the optimum levels of saline water for irrigation of cotton.

Besharati et al (2013) have studied the ecological conditions of cotton cultivation. Najafi et al (2012) in their research studied the performance and determined the optimal level of irrigation in respect to two cotton cultivars under different salinities of irrigation. Pahlavani (2012) studied the rate of change of use of agricultural inputs in respect to the liberalization prices (cotton production in Iran). Ghaderi also (2011) in his study investigated the effects of tillage systems on cotton yield in Gorgan.

Farzin et al (2012) in a study investigated the role of insurance income on risk management in the city of Darab and showed that agricultural activities are associated with the risks resulting from fluctuations in income. So the management strategies can help to reduce fluctuation. Rahmani (2011) investigated the effects of agricultural inputs subsidies elimination on the production of selected agricultural product in Iran.

Sargazi also (1999) examined the production of cotton and its role in the economic structure in Kalaleh and resulted that the cultivation of cotton has great importance in job creation, both in the production of cotton and textile industry and oil extraction industry. Mishra (1999) investigated the factors affecting the adoption and development of agricultural insurance in the state of Gujarat, India.

Vandeveer Monte (2001) conducted a study in North Vietnam and concluded landscape characteristics of agricultural insurance, personal characteristics, farm income and agricultural, and level of education of farmers are the key drivers of demand for insurance.

Hardaker (2004) also emphasizes people are faced with unpredictable factors in the planning and decision-making relating to agriculture,

The results obtained by Shahzad et al (2013) in the research about the changes in the composition of B gene photochrome in cotton showed that the upper line indicates that the composition QCC11has two genes in homozygous condition, while the final composition observed in QCC10 lines has three copies in heterozygous conditions and these copies can combine in one or some place.Chandrashekhar et al (2013) in their study of the leaf extract against Adsagypty Gossypiumhirsutum Anophelesstephensi larvae found that cotton Bt (G.hirsutum) can be used as a strong alternative to chemical insecticides in integrated pest management.

Canada International Development Agency (2003) has agreed to expand new decision for private sector development, agriculture and rural development, and enhancement of investment in this sector.

Hassan Abdullah (2010) in his study about the analysis of Bt cotton cultivation in Punjab using decision support systems in agriculture (ADSS), concluded that farmers with their small agricultural lands, mainly be attacked by Bt bollworm complex (except spotted bollworm) does not happen in Bt cotton .This issue is not true for sucking pests, especially in emerging mealybug. Drop. Although a growth regulator was found for controlling plant pests and whitefly.

RESEARCH AND DATA COLLECTION METHODS

The research method is descriptive and analytical survey and because in this type of research, researcher describe the real objective and systematic characterization of a situation or issue without any interference or subjective conclusions, this report deals with objective results.

Methods of data collection were the library and field methods. The statistics population includes the entire city of Gorgan that includes 248 persons.

The sample size in this study was calculated using the formula Cochran and calculated carefully 0.05. According to this formula, a sample size was determined 151 was determined.

$$N = \frac{N(t \pm s)2}{Nd2+(\pm s)2}$$

N=248   S=0.05   T=1.96   D=0.05

$$n = \frac{248(1.96 \times 0.05)2}{248(0.05)2+(1.96 \times 0.05)2} = 151$$

Source: Hafez Nia, 140: 2005

In addition to cotton farmers, the comments of 30 experts were collected from the questionnaires. After the data analysis, the research hypotheses were tested. These hypotheses are shown in the following.

1. Competition of profitable crops such as soybeans is one of the most important factors in the decline of cotton production .

2. Lack of government support has caused reduction in cotton production in the studied area.

The study area

Gorgan city is located between 54 ° and 12.9 min to 54 ° and 44.9 min east longitude and 36 ° and 30.6 min to 36 °and 58.8 min north latitude in the central and southern provinces. The city is located almost in the center of the province and is limited from the north to Aqqala, from the south to the mountains of Shahkuh and Damghan in Semnan province and from East to Aliabad and from the West to Torkman port. Earth Slope is from south to north and the earth height increases with the going to the south. City altitude above sea level is about 155 meters to 1,500 meters.

Gorgan city area was 1615.81 km^2 at the end of 2011 (7.91% of the province), i.e. the fourth city in size among the cities of the province. According to the latest divisions, the city has 2 districts, 3 Cities (Gorgan, Sarkhon Kalateh, and Jolleyn), 5 rural districts, 97 inhabited villages and 13 uninhabited urban villages.

Theoretical concepts of research

Development in lexical meaning means widening and in terms means moving forward to achieve better conditions (Council of Scientific and Industrial Research, 2001) .development means trying to improve the lives of human history, but the development in the modern concept is a comparable concept (Jomeh Poor, 2005: 52).

Development aspects can be a cultural, political, economic, human and sustainable development (Paply Ebrahimi, 2006: 38). In the explanation of human development five criteria of: 1) the physical quality of life, 2) access to the means of subsistence 3) freedom of choice 4) The development of self-reliance 5) social and political development is considered (Lakshmanan, 1997: 80). Sustainable development is considered as an integral part of the development terminology that includes economic, social, environmental, spatial concepts (Raymond F., 1997: 151-130). Sustainable development was introduced for the first time in mid-1970 by Barbara (Motiee, 2007: 78).

Sustainable rural development is the comprehensive, harmonious and endogenous process in which the capacities and capabilities of rural communities will grow and progress. (Rezvani, 2011: 2). Sustainable agricultural is a system that in addition to the successful management of the use of resources to meet human nutritional needs, it maintains environmental quality and increases the natural resource reserves (Maknoun, 2004: 25-14). The main obstacles to achieving sustainable agriculture include natural resources and environmental constraints, socio - economic limitations, , technological restrictions, limitations of infrastructure and human limitations (Sedaghati, 1991: 281-279). Since the agricultural is the only rural income is the world, naturally until a suitable replacement was not found for the rural economy, the villagers will live through the creation of this income and whenever the alternative was established, it could be expected the destruction of the rural environment through agricultural was reduced otherwise this project will not succeed practically.

Agricultures the source of production, employment and income in rural origin therefore the agricultural extension and education is necessary for rural development (Nouri, 2010: 6). Cotton plants belong to the genus Gossypium from Malvaceae family. This genus has 40 species (Singh, 1989: 249-237). Usually cotton is planted between latitude 36 degrees south latitude to 47 degrees north latitude (Alishah, 2009: 4). Cotton is grown in a year and it growth duration is 200 days (Tohid far, Kavyani, 2010: 3).The average temperature in the summer months should not be less than 25°C and average annual rainfall should not be less than 500 and not more than 1500 mm. The abundant sunshine and cloudless sky is essential for cotton growth. (Marashi and Vaghefi, 1974: 109). Planting cotton in the world is common in Pakistan around 3000 BC (Nobati, 1998: 3). G.bar badence production is relatively low in Israel [Palestine], Morocco, Colombia, China and Yemen (Kohl, Charles, 1995: 306-307). Cotton cultivation has existed in the Achaemenid period in Iran and in the later periods it was mainly planted in Gorgan, Mazandaran, Khorasan, Fars, and Central Province. Gorgan and Gonbad have the largest area under cotton cultivation (Nobati, 1998: 3). Cotton planting time begins in the first half of April and continues until the last half of this month (Khodabandeh, 2000: 81).

Harvest time begins from the first half of September from homebred Farms and in the second half of September or early October at the irrigated farms(Sar gazi: 1999, 86). Traditional farming methods only works for a family and has lost its efficiency so millions of hungry worldwide should be feed through modern agriculture. To achieve this goal and protect products against pests, large amounts of pesticides and chemical fertilizers used annually in the world that in addition to environmental pollution, it also threaten the health of consumers of agricultural products (Yazdani and Hosseini, 2009, 8-9).

More than seventy major and minor products are extracted from the cotton that are used in various industries such as weaving, chemical and food processing including the density and viscosity of ice cream, decoration of salads, toothpaste preparation, production of cellulosic derivatives, etc. Although cotton was planted in ancient times, its use in a large scale was postponed because the fibers must be separated from the seed and this work was tedious and costly. The situation suddenly changed in 1379 with the invention of the cotton gin by Eli Whitney (Vatknz, 2000:

6). The area under planting was 75,000 hectares in the city of Gorgan in 1981 that this value decreased until 2013 to 885 hectares. Therefore authorities should consider some planning and arrangements in this context.

THE RESULTS OF DESCRIPTIVE RESEARCH

The results of Table 2 shows that in the index of the work with the machines, the use of sowing machines, using machines for seed treatments, the use of machines for spraying, the use of machines for harvesting have taken the first to fourth priority place. In support of the government index, the factories in the region, the distribution of chemical fertilizer, unification of pricing, distribution of high quality seeds, pesticides and pesticide distribution, timely payment of the price of the product, accountable institution, and insurance of agricultural product, agricultural loans and taking incentive awards to farmers have the priority of first to tenth, respectively.

In The education index, supervision and guidance of experts and training of farmers ranked first and second priority, respectively. Also in the planting index, quality of land, water, experienced workforce in and manure have placed in first to fourth ranking, respectively. Also the other product benefits, more profitable products and unification of prices were matched in the first and second priorities and in the lack of government support index, the lack of adequate support and lack of accountability of the government are placed in the first and second place, respectively.

THE RESULTS OF ANALYTICAL RESEARCH

Competition of profitable crops like soybeans is among decreasing factors of production of cotton

Assumption: the data are not normally distributed

Null hypothesis: the data has a normal distribution?

According to achieved significant level in competition of profitable crops variation (P>0.05) and the inadequate government support variable (P>0.05), the null hypothesis is accepted on both variables, and it can be concluded that data distribution is normal.

Hypothesis 1: competition profitable crops variation such as soybeans are among the most important factors of cotton production in the cotton production decline.

Null Hypothesis: competition profitable crops variation such as soybeans are not among the most important factors of cotton production in the cotton production decline.

According to the test (t=19.329) and a significant level (P>0.05), the null hypothesis is rejected. So we can say that at the level 5%, the competition of profitable crops like soybeans are among the decreasing factors of cotton production. Also the results of the test can be generalized with 95% of the significance level of population.

The second hypothesis of the research: the lack of adequate support from the government reduced cotton production in the study area.

Null hypothesis: the lack of adequate support from the government in not among the decreasing factors of cotton production.

According to the test value (t = 1.119) and achieved significant level (P>0.05), the null hypothesis is confirmed. So we can say that the lack of adequate support from the Government doesn't have caused the reduction cotton production in under studied area at the level of 5%.

CONCLUSION

The results of this study indicate that the sufficient support from government in the view point of 39.18% of farmers was very high and high, 23.13 famers evaluated it medium while 18.65 % considered it low and 19.5% farmers knew it effectiveness. Also the use of sowing machinery, fertilizer requirements, matching the price of cotton and factories in the region roles in the increase in cotton cultivation is more than the normal average (3) and shows that government support for farmers in the abovementioned items is appropriate.

The results show the use of pesticides and toxins through the guidance of experts, harvesting machinery, use of agricultural insurance, use of agricultural loans, training in order to raise awareness about the cultivation of cotton, accountable institution, timely payment of the price of the product, incentive awards for farmers are less than the average amount (2). This suggests that government support was inadequate in recent cases in the study area.

In conclusion, the following action should be performed in order to improve cotton plantation: guaranteed purchase directly from the farmer ,the use of high yielding seed, association between farmers and the cotton industry, entrusting the cotton crop to skilled and knowledgeable experts. Mechanical harvesting of cotton, policy of banning imports of cotton, import or manufacturing of small devices for textile industry and their deployment in rural areas,unification of prices, subsiding the purchase of cotton based on production cost , integrating of the lands,updating of the related industries ,Mechanization of planting to reduce the cost are among the solutions that are suggested solutions for the elimination of the crisis that has affected the cotton planting.

REFERENCES

1. Ahmdi, M., Aghaalikhani, S. (2012). "Analysis of Energy Consumption of Cotton planting in Golestan province in order to provide a solution for increasing productivity of resources".The journal of Agricultural Ecology, 2: 151.
2. Department of cotton and oil seeds (2003). "Report of cotton" Gorgan city. " Statistics Department".
3. Afshari, G. (2011). "Examination of the attitudes of job stability among cotton farmers, Iranian Journal of Agricultural Economics and Development" . 3: 431
4. Asayesh, H. (1997). "Rural economy". PNU Press.
5. Aghai, M., Jalali, A.h. (2013). "Effects of irrigation and plant density on yield of two varieties of cotton on agricultural crop." 1: 67-75.
6. Besharati, M. (2013). "Effects of adding monensin and vitamin on degradation properties of cottonseed using plastic bags" .The journal of Animal Science Research, 2: 151.
7. Paply, M., Ibrahimi, M.A. (2006). "Theories of rural development." The Organization for Researching and Composing University Textbooks in the Humanities (SAMT), second edition.
8. Pahlavani, M. (2012). "Determination of the rate of change of use of agricultural inputs in the liberalization of prices of livestock inputs (Case study of cotton production in Iran)." Journal of Agricultural Economics and Development (Agricultural Science and Technology, 4: 228 V234-235.
9. Tohidfar, M., Kavyani, M. (2010). "Cotton Biotechnology and Biosafety aspects of it." Agricultural Biotechnology Research Institute of Iran's Press, first edition.
10. Jomeh pour, M. (2005). "Introduction to Rural Development Planning", The Organization for Researching and Composing University Textbooks in the Humanities (SAMT), First EditionHafez Nia, M.R. (2005), "Introduction

to procedares of research in the humanities," The Organization for Researching and Composing University Textbooks in the Humanities (SAMT), Eleventh Edition.

11. Khdabandeh, N. (1990). "Industrial crops". the center of Sepehr publication.

12. Rahmani, P. (2011). "Effects of subsidies elimination for agricultural inputs in the production of selected crops in Iran." Agricultural Economics, 5: 55.

13. Rastar, H. (1967). "Increased income from cotton cultivation." Publications of the Ministry of Islamic Guidance.

14. Rezavani, M.R. (2011). "Planning rural development in Iran." Ghomes Publishing, Fourth Edition, Tehran.

15. Reymond, F.M. (1997). "Economical and the Environmental Development, comparison between traditional economy and sustainable development." Translated by Arbab M.R, Published by Program and Budget Organization.

16. Sargazy, M. (1999). "Cotton production and its role in the economic structure in Kalaleh." MS Thesis, University of Mashhad.

17. Sedaghati, M. (1991). "Sustainable agricultural system and its role in the protection and exploitation of natural resources." Sixth Conference of the Agricultural Extension, Mashhad.

18. Alyshah, S. (2009). "Introduction to the definitions and terminology of cotton." agricultural research, education and extension organization, Deputy promotion and dissemination of agricultural education, The Organization for Researching and Composing University Textbooks in the Humanities (SAMT), first edition.

19. Farzin, M. (2012). "The role of cotton farmers' income on insurance risk management in Darab city." Research of Agricultural Economics, 4: 143.

20. Ghaderi, F. (2011). "Effects of tillage systems on cotton yield in Gorgan." Iranian Journal of Field Crops Research, 3: 416.

21. Ghadiri moghadam, A., Nemati, A. (2011). "The comparison of the profitability of organic and conventional crops (cotton case study in Khorasan)," Journal of Agricultural Ecology, 2: 5.

22. Ghanbari, A., Barfi, H. (2008). "Challenges in sustainable development of agriculture." Yas Strategy Magazine, No. XVI, Economics (Scientific -promotional).

23. Kahl, R.J, Lewis, Ch. (1995). "Cotton". Translated by Fereshteh Naseri, First edition, Publishing Institute of Astan Quds Razavi.

24. Lakshman, T.R. (1997). "Emerging models of rural development." Rural Development Quarterly,1.

25. Majidi, N. (2012). "Determination of the optimal economic use of saline water for irrigation of cotton in plain Case Study: Birjand ", Journal of Irrigation and Drainage, 2: 139.

26. Marashi, M.R, Vaghefi, H. (1974). "Cotton farmers and traders." Cotton cultivation and trade publications, Second Edition.

27. Motiee, H. (2007). "Rural Planning with an emphasis on Iran." Jihad Mashhad University Press, third edition.

28. Maknoun, R. (2004). "Sustainable Development Strategy". Environment and Sustainable Development Seminar of the Association of Environmental Professionals. Tehran University.

29. Najafi mode, M. (2012). "Examination of the performance evaluation and determination the optimal depth irrigation of two cotton cultivars under different salinity of irrigation water." Journal of Water and Soil Science (Agriculture and Industries, 4: 996.

30. Nobati, .A.M. (1998). "Effect of surface mulch on soil crust formation and water infiltration into the soil and crop emergence in cotton plant under sprinkler irrigation in agriculture research station of Hashem abad , Gorgan."

31. Nouri, M. (2010). "The establishment of a green economy in the world." Journal of Development Strategy, 16.

32. Vatikanz, J.M. (2000). "Cotton diseases." Translated by Abazar Rajabi, Tehran University Publication Center, First edition.

33. Yazdani, A., Hosseini, Sh. (2009). " pesticides and the risks arising from indiscriminate use of them." Tanian publisher, First Edition, Tehran.

Razieh Mosadegh *et al.*

34. Ahsan Abdullah, (2010), An Analysis of Bt Cotton Cultivation in Punjab, Pakistan Using the Agriculture Decision Support System (ADSS),Ag. Bio. Forum, Foundation University Islamabad, Pakistan, 13(3): 274-287.

35. A.Q. Rao1◉, K. Shahzad Bajwa1, A. Nugroho Puspito1, M. Azmat Ullah Khan1, M. Adil Abbas1, Mahmood ur Rehman1, A. Bakhsh1, A. A.Shahid1, I.Ahmad Nasir1, and T Husnain (2013)Variation in Expression of Phytochrome B Gene in Cotton J (Gossypium hirsutum L.)west canal bank ,thokar niaz baig Lahore,pakistan Agr. Sci. Tech.15: 1033-1042

36. Canada International Development Agency. (2003). Promoting Sustainable rural development Through Agricultural. Canada Making a Difference in the World.

37. Hardaker, B., Huirne, M., Anderson, J.R. (2004). Coping with risk in agriculture. CAB Ternational, NewYork: 1.

38. Chandrashekhar D. Patil 1,Hemant P. Borase 1, Rahul B. Salunkhe 1, Rahul K. Suryawanshi 1, Chandrakant P. Narkhade 1, Bipinchandra K. Salunke., Satish V. Patil. (2014). Mosquito Larvicidal Potential of Gossypium hirsutum (Bt cotton) Leaves Extracts against Aedes aegypti and Anopheles stephensi larvae University, Maharashtra,India. J Arthropod-Borne Dis 8(1): 91–101.

39. Singh, M. (1989). Often cross-pollinatdcrops:cotton.

40. Vandeveer Monte, L.A. (2001). Demand for Area Crop Insurance Among Litchi Producers in Northern Vietnam. Journal of Agricultural Economics. 26(2): 23-35.

41. Mishra, P.K. (1999). Planning for the Development and Operation of Agricultural Insurance Schemes, Development and Operation of Agricultural Insurance Schemes in Asia. Report of the APO Seminar on Agricultural Insurance Held in Manila Philippines, 27-40.
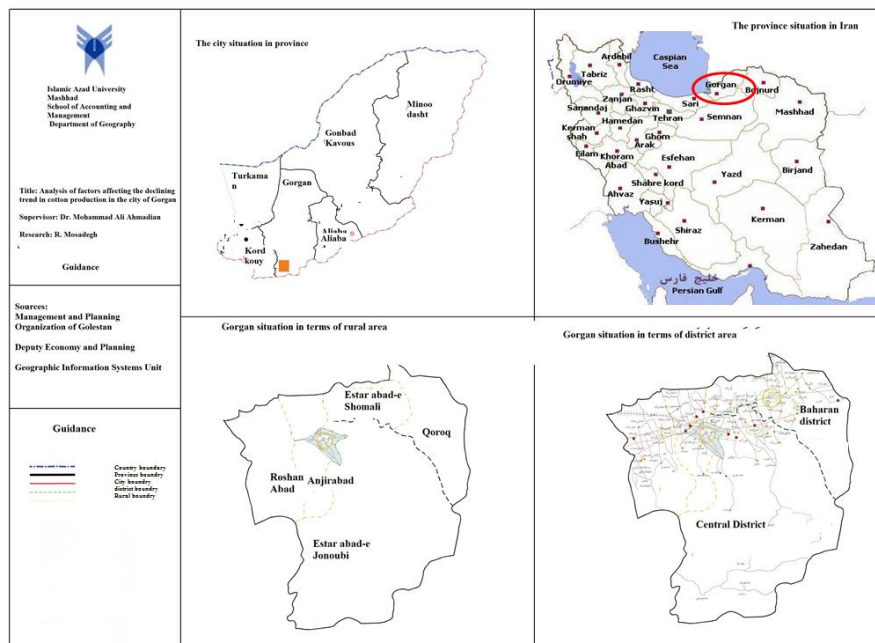
Figure 1: The geographical situation of Golestan province, Gorgan city and its rural area
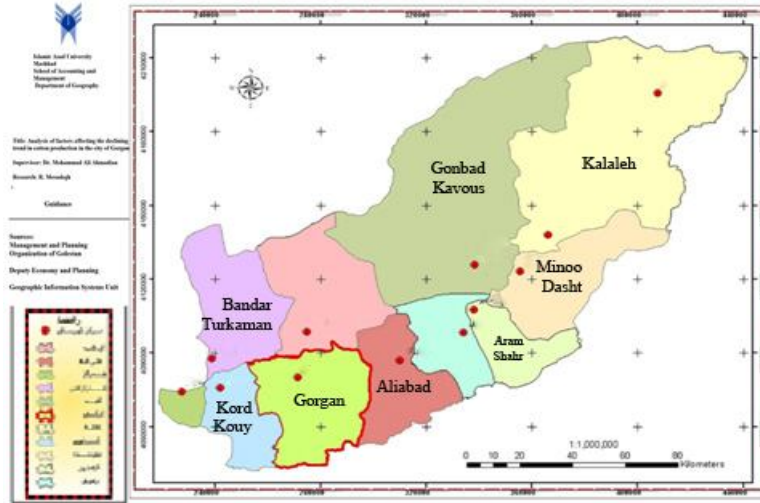
Figure 2. The situation of Gorgan city in Golestan province

Table 1. Political divisions of the city of Gorgan in 2011

District	District Capital	Rural District	Rural population	Villages
Central	Gorgan	Estarabad-e Jonubi	22864	22
		Roshan abad	25840	24
		Anjirabad	27955	16
Baharan	Sarkhon Kalateh	Estarabad-e shomali	17680	17
		Qoroq	24139	18

Table 2. The distribution of frequency and the relative mean and the rank of each component index.

Index	Variable	Type	None	low	medium	high	Very high	Sum of the scores	Relative mean	Ranking
Work with	Using machines	frequency	1	4	12	37	97	151	3.49	1

Razieh Mosadegh *et al.*

the machines	for seed treatments	score	-	4	24	111	388	527		
	The use of sowing machines	frequency	-	-	2	45	104	151	3.68	2
		score	-	-	4	135	416	555		
	For pesticide spraying	frequency	-	2	11	40	98	151	3.55	3
		score	-	2	22	120	392	536		
	For harvesting	frequency	-	16	13	15	7	151	0.76	4
		score	-	16	26	45	28	115		
support of the government	Distribution of high quality seeds	frequency	8	23	85	32	3	151	1.99	3
		score	0	23	170	96	12	301		
	Pesticides and pesticide distribution	frequency	9	38	82	18	4	151	1.80	4
		score	0	38	164	54	16	272		
	The distribution of chemical fertilizer	frequency	1	12	26	89	23	151	2.8	2
		score	0	12	52	268	92	423		
	Insurance of agricultural product	frequency	55	41	43	3	9	151	1.14	6
		score	0	41	86	9	36	172		
	Agricultural loans	frequency	63	21	62	4	1	151	1.07	7
		score	0	21	124	12	4	161		
	Timely payment of the price of the product	frequency	22	42	69	17	1	151	1.56	5
		score	0	42	138	51	4	235		
	Taking incentive awards to farmers	frequency	130	20	0	1	0	151	0.15	8
		score	0	20	0	3	0	23		
	The factories in the region	frequency	3	13	32	71	32	151	2.72	1
		score	0	13	64	213	128	418		
education	Using Supervision and guidance of experts	frequency	35	73	28	10	5	151	1.19	1
		score	0	73	56	30	20	179		
	Training of farmers	frequency	33	82	22	13	1	151	1.12	2
		score	0	82	44	39	4	169		
Special case of the planting index	Quality of land	frequency	-	.	50	46	52	151	2.97	1
		score	-	3	100	138	208	449		
	Water	frequency	-	33	18	63	37	151	2.69	2
		score	-	33	36	189	148	406		

	Experienced workforce	frequency	14	58	50	24	5	151	1.66	3
		score	0	58	100	72	20	250		
	Manure	frequency	22	73	38	13	5	151	1.38	4
		score	-	73	76	39	20	208		
other product benefits	More profitable products	frequency	1	-	3	48	99	151	3.62	1
		score	-	-	6	144	396	546		
	Unification of prices	frequency	3	17	66	43	22	151	2.42	2
		score	0	17	132	129	88	366		
the lack of government support	The lack of adequate support	frequency	0	0	1	39	111	151	3.73	1
		score	0	0	2	117	444	563		
	Lack of accountability of the government	Frequency	25	75	40	9	2	151	1.26	2
		Score	0	75	80	27	8	190		

Table 3. The results of the analysis of data normality by Kolmogorov Simonov test

Variable	Value	Significance level
The competition of profitable products	1.261	0.178
The lack of government support	1.151	0.141

Table 4 - Results of t-test in the competition of profitable products variable

Variable	Frequency	Mean	alue	Degree of freedoms	Significance level (0.05)
The competition of profitable products	151	2.64	9.329	150	0.000

Table 5 - Results of t-tests of the lack of government support variable

Variable	Frequency	Mean	Value	Degree of freedoms	Significance level (0.05)
The lack of government support	151	2.02	1.119	150	0.265

RESEARCH ARTICLE

Investigation of the Effect of Planting Density on Qualitative and Quantitative Yield and Yield Components in Six Soybean Varieties in Dashtenaz Region

Hamideh Semnaninejad* and Mohammad Javad Mirhadi

Department of Agronomy, Science and Research Branch, Islamic Azad University, Tehran, Iran.

*Address for correspondence
Hamideh Semnaninejad
Department of Agronomy,
Science and Research Branch,
Islamic Azad University,
Tehran, Iran.

ABSTRACT

In order toInvestigation of the effect of planting density on qualitative and quantitative yield and yield components in six soybean varieties, an experiment was laid out in split-plot based on randomized complete block design with four replications at Dashtenaz region of Mazandaran province, Iran in 2013. Main plot was seed rates including 55, 70 and 85 kg.ha^{-1} and sub plots were six soybean cultivars including Sari (JK), Telar (BP), Caspian (033), Nekador(032), Katul(DPX) and Sahar(Pershing). Results showed that seed rates had significant effects on all the traits except seeds per pod. The varieties were different for all the traits. Non-significant interaction effects of seed rates and cultivars for most of the traits indicating that variations of the traits of each cultivar had similar trend in different seed rates. The varieties including Sari and Nekador with high mean values of seed number had high mean values of seed yield. Average seed yield of the genotypes for 55, 70 and 85 kg.ha^{-1} were 2999, 3246 and 2700 kg.ha^{-1},respectively.Among the genotypes, the cultivar of Nekador performs a better the highest seed yield due to its seed yield components. The seed yield amount of this value in three seed levels in 55, 70, and 85 kg/ha are respectively 3766, 3643, and 3496 kg/ha which its value was in the same class for 55 and 70 kg/ha seed rates.The effect of soybean cultivars on oil content (%) was not significant.

Keywords: oil content, seed yield and seed rates, soybean, yield components.

Hamideh Semnaninejad and Mohammad Javad Mirhadi

INTRODUCTION

Oil as a primary source of protein and energy, has an important role in human's nutrition so that today oilseed crops are considered as the second most important source of energy supply(Delka et al., 2005; Khalili, 2005; Sedaghati, 2003).Also vegetable oils are of a better quality compared to animal fats, because of the low amount of saturated fatty acids(Beaver and Johnson, 1981). Oilseeds, are considered as the essential food for human that with different products not only provide a part of the human food needs, but also have industrial and pharmaceutical uses and that is why they are considered as important agricultural products(Bergland, 2002). Past researches indicate that only about 9% of the country's oil needs are domestically produced and the rest that is 91.7 percent should be imported from abroad, and to amend the severe shortage, the researchers found that a lot of work is needed to increase oil production in the country, which is possible to achieve both through an increase in area under cultivation and the increased yield per unit area, among which the second option seems more logical (Zaman and Malik, 2002). From the habit of growth, soybean is divided into three varieties of indeterminate growth, determinate growth, and semi-determinate growth. Indeterminate varieties begin to flower when they have only half the main stem nodes, therefore, development of vegetative and reproductive organs of plants mostly starts with its life cycle .In this varieties, pod and seed formation starts from the lower part of plant, and simultaneously continues upward with the formation of new nodes. But this varieties as well as the other varieties of all beans grows at the same time. In the determinate growth, flowering starts once the end node of the main stem is formed or begins to be formed (Ablett et al., 1991).Soybean cultivation has some advantages. Including symbiotic nitrogen-fixing bacteria in the roots of soybean that fixes the nitrogen in the air, and as a result the plant will require less nitrogen during growth stages. Also some of the fixed nitrogen by symbiotic bacteria remains in the soil and the subsequent crops will require less nitrogen. Soybean cultivation has led to reduced incidence of pests and diseases and weeds in the field (Bharati et al., 1986). Deep planting of seed cultivars that genetically, have a shorter hypocotyl are also not recommended. Deep cultivation of soybean seeds in some cases even increased the risk of soil diseases is the greening seedlings (Jason and Emerson, 2005). Many factors, including weather conditions, planting design, seeding rate, management of farm operations and food can cause a variety of performance and other characteristics of soybean(Dekeeijer et al., 2003). yield is affected by changes in plant population and row spacing (Akond et al., 2013). With increasing density, light intensity on vegetation was reduced and it reduced the number of tributaries and biomass. His research showed that absorbing photo-synthetically active radiation to achieve maximum performance was influenced by morphological and physiological characteristics (Wells, 1993). Biological yield has been confirmed as one of the best indicators of selection in many studies (Blum,2011). The researchers concluded that soy density per unit area can reduce the yield per unit area due to increased competition for water and nutrients (Khalili, 2005).Optimum plant density of soybean cultivars changes according to varieties and geographic location (Goli and Olsen, 1983). In studying the physiological response of soybean varieties to plant densities it was found that in all studied varieties yield of product was higher in high density compared to low density. There is a relationship between the reduction in seed yield at low density and reduced number of pods or seed per unit area (Gan et al., 2002). Yield is the result of increase in the number of pods and seed. Although higher seed rate, provides more functionality, low seed rate causes increase in plant yield. This increase is due to new varieties and higher abilities of cultivars to head higher in low seeding situations, while heading is highly reduced in comparison to seeding rates. New cultivars can better compensate lower plant population through producing more seed on the branches than older cultivars(Shure and Davis, 2008).The soybean planting in 40cm rows and observed that significant yield increase in contrast to 75cm rows(Walker et al.,2009).In studying the yield and yield components of Soybean, Goli and Olsen have shown that increase in density causes the decrease in the seed yield in minor branches, pod numbers, and seed yield in a plant (Goli and Olsen,1983). density increment can decrease the amount of oil and increase the seed's protean. In this connection, many researchers have reported existence of reverse relationship between protean amount and seed oil as the relation is negative among them (Cober and Voldeng, 2000).The lodging increases as density increases but harvesting soybean with combine harvester has not created much casualty in high densities (Johnson and Major, 1999).Changes in node's numbers in main stem are different as a consequence of density increment proportional to growth mode. In Fykobi varieties (limited Growth), node's rate was not under the influence of density but in varieties 903-52 (semi-limited growth),

Hamideh Semnaninejad and Mohammad Javad Mirhadi

node decreases as density increases. As density increase, the first pod's height increases from the earth surface consequently. In unlimited varieties, as height increases in high density, the main stem's diameter decreases and causes the increase in lodging. In limited growth, high density does not face lodging(De Bruin and Pederson, 2008). Researchers have said that extra density increase causes decrease in yield; and factors such as varieties, lodging, prematurity, and bad environmental conditions have influence on yield (Wright et al., 1984). In this study, we investigated the effects of different cultivars on agronomic characteristics and yield of soybean cultivars and also by determining the appropriate values for the cultivars in Mazandaran climate, we determined the effect of seeding rate on yield components, seed and oil yieldsand specified the correlation rate of traits and the most effective rates on the yield of desired seed cultivars.

Experimental section

This scheme was done in the crop year of 2013 in a region with 36 degrees longitude, 42 minutes east and with 53 degrees latitude, 13 minutes North and a height of 16 meters above sea level, with warm summers and cold and humid winters and the annual rainfall of 560 mm.

Soil properties of the testing site

To determine the soil characteristics (texture and chemical characteristics of the soil) sampling was done prior to testing, for this project the site was sampled at several points at the depth of 0-30 cm. Table 1 shows the results of soil samples prior to the plant.

Treatments of the test and the statistical characteristics of the design

The experiment is established through designs of in split plots in the form of randomized complete block design with four replications which contains two factors of density (consumed seed rates) and soybean cultivars. The amounts of seeds are 55, 70, 85 kg/ha are considered as the main factor and the soybean cultivars as the sub factor in Sari (JK), Telar (BP), Caspian (033), Nekador (032), Katul (D.P.X), and Sahar (Pershing).

Characteristics of soybean cultivars

1 - Sari (JK): semi-limited growth mode (Semi-determinate), 2 - Telar (BP): Semi-limited growth mode (Semi-determinate), 3 - Caspian (033): semi-limited growth mode (Semi-determinate), 4- Nekador (032): semi-limited growth mode (Semi-determinate), 5 - Sahar (Pershing): semi-limited growth mode (Semi-determinate), 6 - Katul (DPX): semi-limited growth mode (Semi-determinate).

Research Stages

The field was planted for wheat in the last year. The used herbicide is Trifluralin before planting 2.5 liter per hectare. The disc is used for mixing the poison to the soil. According to soil testing, used fertilizers are 120 kg/ha phosphate triple, 150 kg/ha sulfate potassium, 50 kg/ha urea, 50 kg/ha manganese sulfate, and 20 kg/ha sulfate. The experiment map is implemented after fertilizing and mixing them with soil. When planting, Rhizobium japonicum (a bacterium) is used to inseminate the seed. The planting operations are, according to treatments of consumed seed rates, with four replications in plots. Each replication contains 18 plots; each plot includes 6 rows with 5m longitude at a distance of 40cm. Distances of plants on row planting are different according to seed rates and 1000-seed weight, i.e. about 4cm to 8cm.

Hamideh Semnaninejad and Mohammad Javad Mirhadi

Sampling methods for the studied traits.

Number of seeds per pod: in 10 randomly selected plants, the numbers of seeds per pod on main stem were counted and the average was calculated for each pod.

1000-seed weight: Five hundred seeds from each plot was weighed and then doubled, so the weight of 1000 seeds was measured in grams.

Harvest Index: The harvest index for each plot is obtained through obtaining economic yield and biological yield and through the following equation.

$$HI = \frac{Agricultural\ yield}{Plant\ total\ dry\ matter} \times 100$$

Seed yield: The marginal effect was calculated on a kg scale with respect to weighing the seed of each plot in 4.8 square meters after correction with 12% moisture per kg and then was extended to kilograms per hectare.

Oil Content: By soxhlet was measured by the oil content. In this context the mill to 5 grams of the samples, solvent extraction using petroleum ether with a boiling range of 40 to 60 ° C was performed. After extraction, solvent oil was isolated by vacuum evaporation. After measuring the sample weight and oil content was calculated.

Oil Yield: Multiplying the oil content and seed yield for each treatment was calculated as kilograms per hectare.

Statistical analysis

Data obtained was analyzed by SAS and MSTAT-C statistical software were compared through the comparisons of Duncan's multi-domain mean. In each group of comparing the mean, the means that have at least one letter in common are not statistically significant.

RESULTS AND DISCUSSION

The effects of planting density on quantitative yield and yield components of soybean varieties

mean comparison of number of seeds per pod characteristic shows that (Table 2) with increasing the used seed amount number of seeds per pod does not follow a specific process and amount of this for all 3 levels of seed in places in one statistical group, and indicates that number of seeds per pod was influenced by genetic factors and environmental factors do not have a significant impact on it. The correlation of this characteristic is positive with seed yield (Table 4), thus increasing this characteristic as one of the important seed components can also lead to seed yield. (Fig 1) indicates that with increasing the used seeding rate, 1000-seed weight decreased, which indicates increasing plant density and increasing competition between plants, eventually lead to the reduction of seed weight. Among the studied cultivars the amount of this adjective was different from 159.2 to 202 g, respectively for Sahar and Katul cultivars, which shows that 1000-seed weight is a genetic characteristic but also is affected by environmental situation. The correlation of this characteristic with phenological characteristics such as the number of days to start of flowering, days to end of flowering and days to maturity indicates that late maturity cultivars often have higher 1000-seed weight (Table 4). With increasing planting density in most varieties, harvest index has decreased (Fig 2).

Hamideh Semnaninejad and Mohammad Javad Mirhadi

The effects ofplanting density on qualitative yield of soybean varieties

The results of mean comparison shows that (Table 2), with increasing the amount of used seed, the seed yield has increased and then decreased that obtained yield for 55 and 70 kg seed per hectare is placed in one statistical group. The significant mean squares of this characteristic for the studied cultivars in one percent probability level is indicating the genetic differences between cultivars under study from the seed yield view (Table 3). The significant and positive correlation indicates of this characteristic with harvest index indicates that increasing seed yield has an effective role in increasing the harvest index (Table 4) Also positive and significant correlation with 1000-seed weight suggests that in studied cultivars these characteristics have more effective role in increasing the seed yield. Significant mean squares of seed rates for oil content characteristic, indicates the significant effect of used seed level on this characteristic (Table 2) it seems that with increasing plant density and lower light penetration into the canopy of vegetation leads to lower oil content and amount of this characteristic in studied cultivars has not been significant which shows that there is not a significant difference between the studied cultivars from the view of oil content. The correlation of this characteristic with 1000-seed weight and seed yield is positive (Table 4), therefore, the cultivars with potential yield and high yield components have higher oil yield in this study. Oil yield was significantly affected by the amount of the consumed seed which is resulted from the genetic difference of the seed yield of the consumed cultivars (Table 2).The significant and positive correlation of this characteristic with the seed yield and oil yield indicates that this characteristic is significantly influenced by both of the main components (Table 4).

The results of the analysis based on the split-plot design indicated that the effect of the seed rates was significant in all characteristics. The cultivars have had significant difference regarding all the studied characteristics except for the oil content which indicates genetic differences in all the studied cultivars (Table2). Insignificance of the interaction between the seed rates and cultivar for the studied characteristics indicated that changes in the characteristics in the studied cultivars at all seed rates have a similar trend(Table3).

CONCLUSION

Generally, this study contains the following conclusions:

Significance of the mean squares of seed rates shows that phenological characteristic, yield components, and seed and oil yield except seeds per pod are under the influence of significance of seed rates.

In this regard, characteristics follow an increment progress such as shrub's height, distance of Pod's Height from surface and pod's number in main stem as the seed rate increases. Therefore, pod's number in shrub and 1000-seed weight fall in reduction.

The mean squares are significant for all traits except oil content which in turn shows the difference of genetic varieties except oil percentage.

The maximum seed yield is obtained from seed rate in 70 kg/ha field. Among investigated varieties, the Nekador varieties represents the high seed yield because of its seed yield components. In investigating mutual interaction, Nekador varieties high yield is registered in 50 kg/ha seed rate.

Correlation is positive between seed yield with traits of pod's number in shrub and 1000-seed weight which shows that these two yield components have an important role in seed yield.

Hamideh Semnaninejad and Mohammad Javad Mirhadi

REFERENCES

1. Akond, A., Ragin, BA., Willshenua,I., Stella, K. (2013). Row spaces can effect Agronomic traits in Soybean(Glycine max L.). Journal Crop Management.55(1):28-32.

2. Ablett, GR., Beversdorf, WD., Dirks, VA. (1991). Row width and seeding rate performance of indeterminate, semi-determinate, and determinate soybean. J. Prod. Agric. 4:391–395.

3. Beaver, JS., Johnson, RR. (1981). Response of determinate and indeterminate soybeans to varying cultural practices in the northern U.S.A. Agron. J. 73:833-838.

4. Bergland, DR. (2002). Soybean production field guide for North Dakota and Northwestern Minnesota. Published in cooperative and with support from the North Dakota soybean council. 136Pp.

5. Bharati, MP., Whigham, DK., Voss, RD. (1986). Soybean response to tillage and nitrogen, phosphorus, and potassium fertilization. Agron. J. 78:947–950.

6. Blum,A.(2011). Breeding crop varieties for stress environments. CRC Critical Reviews in Plant Sciences. 2:199-237.

7. Cober, ER.,Voldeng, HD. (2000). Developing high protein, high- yield soybean populations and lines. Crop Sci. 70: 39-42.

8. De Bruin, JL., Pederson, P.,(2008). Effect of spacing and seeding rate on soybean yield. Agron.J. 100:704-710.

9. DekeeijerTJ,.Debuck AJ, Wossink GAA, Onema J, Renkema JA, Struik PC. (2003). Annual variation in weather: its implication for sustainability in the case of optimizing nitrogen input in sugar beet. Evroup. Agron.J. 19:251.

10. Delka, E., Oplinger, S., Eynor, TMT., Utman, DHP., OII, JDD., Kling, KA., Durgan,BR., Notzel, DM. (2005). Safflower. University of Wisconsin-Extension pub. Cooperative Plant and Animal Products and the Minnesota Extension Service. 300Pp.

11. Gan, Y., Stulen, H., Keulen,H., Ckuiper, PJ. (2002). Physiological response of soybean varieties to plant density. Field Crops Research, 378: 231-241.

12. Goli A, Olsen F. (1983). Response of three soybean cultivars to different seed rates. Trans. I11. State Acad. Sci. 76: 195-202.

13. Jason, KN.,Emerson, RS. (2005). Effect of row spacing and soybean genovarieties on main stem and branch yield. Agron. J. 97:919-923.

14. Johnson, DR., Major, DJ. (1999). Harvest index of soybean as effected by planthing date and maturity rating. Agron.J.71:538-540.

15. Khalili A. 2005. Position of oilseeds in the national economy vegetative oil. Industry Magazine.30-31,28-30p.(In Farsi).

16. Sedaghati H. 2003. Development of oilseeds cultivation. Vegetative Oil Industry Magazine. 8:6-7.

17. Shure J, Davis VM. 2008. Genetic gain * Management interaction in soybean: seeding rate effect. Crop Sci. Available on line al: http//Handle.net/2142/42401/ (accessed 27 November).

18. Walker ER, Mengistu A, Bellaloui N, Koger CH, Roberts RK,Larson JA. 2009. Plant population and Row- Spacing Effects on Maturity Group III Soybean. Journal Crop Management. 102(3): 827-828.

19. Wells R. 1993. Dynamics of soybean growth in variable planting pattern. Agron. J.85:44-48.

20. Wright DL, Shokes FM, Sprenkel PK. 1984. Planting method and population influence on soybean. Agron. J. 76: 921-924.

21. Zaman QU, Malik MA. 2002. Rice bean Productivity under various maize-rice bean intercropping system. Agriculture and Biology. 3: 255-257.

Hamideh Semnaninejad and Mohammad Javad Mirhadi

Table 1 - Physical and chemical properties of the soil of the testing place before planting

Type of the texture	Soil texture			Potassium of the soil (P.P.M)	Soil Phosphor (P.P.M)	Organic carbon (O.C) percentage	Organic material (O.M) percentage	Neutral materials %T.N.V	Electrical Conduction EC×10³	Saturation percentage (S.P)	Soil pH	The depth of the soil (Cm)
	clay	Silica	sand									
Loamy	20	30	50	180	13.6	1.2	2.2	30	0.68	50	7.6	0-30

Table2-Mean comparison of the effect of planting density , soybean cultivars and their interaction effects on qualitative and quantitative yield and yield components

Main Factor	Traits					
	Seeds per pod	1000-seed Weight (gr)	Seed Yield(Kg. ha)	HI (%)	Oil content (%)	Oil Yield (Kg.ha)
55 kg.ha	2.22a	196.1a	2999ab	43.4a	23.08	694.7a
70 kg.ha	2.27a	187.2b	3246a	36.9b	21.5b	698.2a
85 kg.ha	2.19a	177.0c	2700b	32.2c	19.36c	532.4b
Sub Factor						
Sari(JK)	1.62d	185.8bc	3024bc	40.4b	21.52b	658.9b
Telar(BP)	2.86a	178.3c	2855bcd	43.4a	21.79b	621.2bc
Caspian(033)	2.41b	196.0ab	3141b	36.7c	20.63b	648.7b
Nekador(032)	2.42b	199.3a	3626a	39.0bc	22.68a	822.6a
Katul(DPX)	2.13c	202.0a	2690cd	31.7d	20.79b	564.9bc
Sahar(Pershing)	1.93c	159.2d	2536d	33.8d	20.03b	534.5c

In each group of average comparison, those averages that have at least one trait in common do not have significant difference.

Hamideh Semnaninejad and Mohammad Javad Mirhadi

Table 3-Analysis of variance for Yield components,qualitative and quantitative yield in Soybean Cultivars.

Source of Vraiance	df	Mean of Squares(MS)					
		Seeds per pod	1000-Seed weight	Seed Yield	HI(%)	Oil Content (%)	Oil Yield
Replications	3	0.06	31.5	537071*	9.5	0.9	1845
Seed Rates(a)	2	o.o4	2183.9**	1795455**	764.6**	71.7**	215416**
Error	6	0.04	23.5	103865	6.5	1.7	6605
Cultivar (b)	5	2.28**	3142.5**	1786088**	221.4**	6.7	122092**
a×b	10	0.03	31.8	114311	5.7	0.1	4827
Error	45	0.06	107.4	108370	4.6	4.2	9201
C.V (%)	-	11.2	5.5	11.1	5.7	9.5	14.9

*, ** Significant at p=0.05 and 0.01, respectively

Table 4- Correlation coefficient of the traits in soybean cultivars in different planting densities.

Traits	1	2	3	4	5	6	7	8
1-Day to maturity	1							
2-Pod's Number in shrub	0.53*	1						
3- seeds per pod	-0.29	-0.08	1					
4-1000 Seed weight	0.81**	0.27	0.23	1				
5- seed yield	0.33	0.40	0.21	0.56*	1			
6-HI	0.04	0.65**	0.26	0.31	0.50*	1		
7-Oil percentage	0.20	0.47*	0.14	0.46*	0.54*	0.84**	1	
8-Oil yield	0.34	0.54**	0.20	0.61**	0.94**	0.60**	0.76**	1

*, ** Significant at p=0.05 and 0.01, respective

Hamideh Semnaninejad and Mohammad Javad Mirhadi
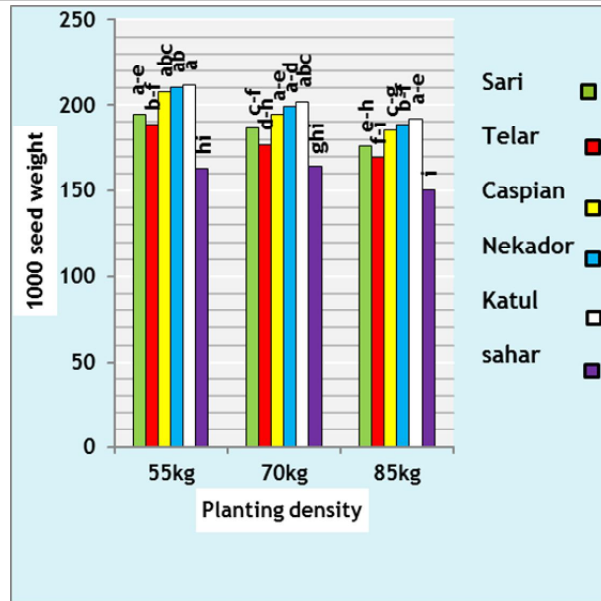
Fig 1. The effect of seed rates, soybean cultivars and their interaction effects on 1000 seed weight.
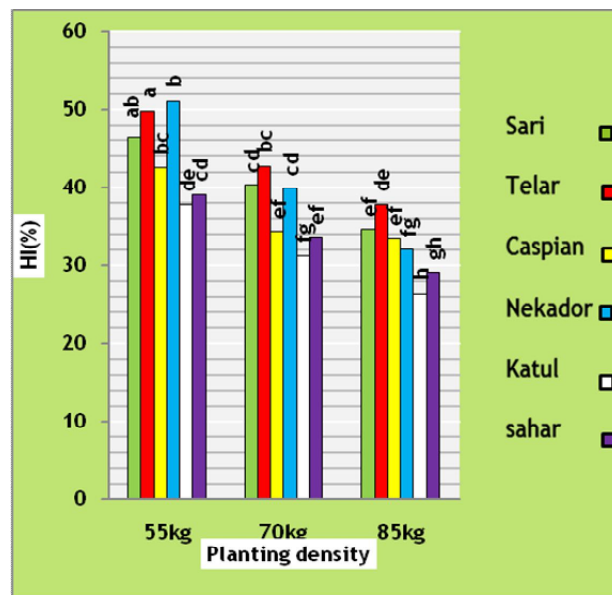
Fig 2. The effect of seed rates, soybean cultivars and their interaction effects on harvest index.

RESEARCH ARTICLE

Women Park Design with Environmental Perception Approach (Case Study: Ardabil City)

Elham Khanghahi Bala

Sama Technical and Vocatinal Training College, Ardabil Branch, Islamic Azad University, Ardabil, Iran.

*Address for correspondence
Elham Khanghahi Bala
Sama Technical and Vocatinal Training College,
Ardabil Branch, Islamic Azad University,
Ardabil, Iran.

ABSTRACT

Women constitute half of the population in every society and planning for their free times and recreations should be considered by the experts within the norms and religion of the country. Since women are the most influential class on the health and their health and recreations directly affect the whole society's health, it is necessary to construct locations for women sports and recreations. Environmental perception means understanding the environment and comprehending it by the citizens and its scientific dimension is as resulting behaviors. Hence, designing women's park with environmental perception approach based on studying behaviors, environment, and needs of women from the park enhance life quality of women. In the current research, document method (search in internet, attending in reliable libraries, and using respective resources and theses) and field studies (gaining ideas of professors and distributing questionnaire and face-to-face interview with women) as well as observation (attending in parks and familiarity to women needs and the way of their use of the space) were used. Then, considering above facts and experiences and obtained data, a site in Ardabil was selected and designed as women's park. Research findings showed men and women in Ardabil have positive attitude toward designing women's park. Most women at any age with any educational degree agreed construction of women's park.

Key words: Women, women's park, environmental perception, Ardabil

Elham Khanghahi Bala

INTRODUCTION

When designing environment and perspective and building is talked, the main point which should be considered is for whom the environment and perspective and building is to be designed, and they use them in what purposes. Thus, environmental perception and individuals' perception about their environment and surroundings should be considered. In the past, designers designed based on their tendencies and information and people used the spaces without expressing their ideas in designing and construction process. But, today the designing is done based on user's tendencies and needs and considering what they perceive as beautiful, convenient, and safe, and the designer is bound to coordinate design with user's demands.

Environments specific for women in our country and other countries exist as girls' dormitories, boarding schools, sports, cultural, artistic centers, and women's parks. Due to allocating these spaces to users who are totally girls and women, observing special principles and regulations in designing these places leads to increased satisfaction of users [1].

In designing any type of park, firstly it is necessary to be familiar to general principles and regulations of park construction and its details so that they can be used well in designing special parks including women's parks. Overall, considering environmental perception of women and given their needs and demands, creating physical and mental security is the main factor which should be considered [2]. In the next places, differences between men and women in terms of aesthetics criteria and their aestheticprinciples should be taken into account [3]. Also, use of color and material and texture in designing for women would be based on their tastes and capacities [4]. General view should be considered that women always pay more attention to details than men and they firstly consider constituents then they see the totality. This view can play considerable role in designing nature for women. Identification of the space is also an important factor which should be taken into account in designing [5].

The environment which is designed for the women should represent special characteristics where one feels she is in an environment with female characteristics. Considering women's preferences in selection of plants and perspective making by environmentalelements such as water, trees, birds, and flowers not only gives identity to the space, but also provides more peace and pleasure for the users. Use of visual elements such as dots, lines, surface, volume, form is a powerful tool in creating feeling of the location and giving spirit to women if it is smartly used and if it is utilized according to women psychological and aesthetic ideas [6]. In the current research, it is attempted to summarize all design steps and details related to the park and classify them so that it helps future research works.

Research Objectives

Offering a suitable design for women's park with environmentalperception approach in Ardabil
Reviewing and identifyingeffective environmental perception factors to improve environmental quality in the park
Investigating psychological structure of women with an approach to park's architecture
Studying sociological structure of women with an approach to park's architecture
Creating places with sport and recreational use.
Designing gathering places which create cultural and social uses for park.
Designing places for research and artistic activities with scientificapplication.
Establishing business centers and entrepreneurship markets for women in the park

Creating recreational spaces for children.

Elham Khanghahi Bala

METHODOLOGY

Data Collection Tool

Data collection was done through questionnaire. Research statistical population included various classes of women in Ardabil with ages above 15 years. Personal estimation method was used for specifying sample volume and 200 cases were selected randomly based on a percent of mean of referents to the Ardabil Beach Park. Also, for data collection purpose, some women referring to the Beach Park were interviewed.

Data Analysis

Data were analyzed using comparison method and causal analysis. In comparison method, theoretical foundations of several parks were reviewed and compared and finally principles and patterns for designing park were obtained. In causal analysis, cause and effects of phenomena and their results were reviewed and patterns for designing park were obtained.

Methods

Descriptive analytical research method was applied and following methods were considered for collecting data:
Document: search in internet, attending in libraries and using related resources and theses, etc.
Field studies: taking ideas of professors and distributing questionnaire and face-to-face interview with women referring to the case study park (Beach Park)
Observation: attending in the Beach Park and familiarization with women's needs and the way they use the space.

Ardabil is situated in a cold region of cold in Northwest of Iran plateau with an area of 17952.5 km^2 which accounts for one percent of the country's total area. This province is part of triangular shaped plateau of Iran in East Azerbaijan plateau and approximately 2/3 of it has mountainous texture with high height difference and the remaining are flat areas. The highest point in the province is Sabalan mountaintop with an altitude of approximately 4811. Climate of Ardabil province generally is dependent on four factors including Altitude, latitude, water and immigrant air masses. Other factors such as vegetation, agricultural, industrial and mining activities also affect climate in small-scale or are affected.

Plan Site

Respective site in Ardabil is shown in Fig 1 which is located beside Shourabil Lake.

In order to formulate principles and regulations for designing environments special to women and constructing such environments it is necessary that the designer is familiar to the people who are to use the space. In Urban Space, Design, Management and Implementation book, it is read: analysis of needs is done through direct interview with users. Such analysis can be done in three axes:

Understanding the space
Importance of movement and its types
Expectations and demands of users
These studies should be done for a collection of people as representatives of different classes of the society (Pierre Maurer, J).

3723

Elham Khanghahi Bala

Considering women's park design, case study of the thesis was selected in Ardabil and statistical population of the research included residents in Ardabil who attended in Ardabil Beach Park. 200 forms were given to citizens randomly during one week in Ardabil Beach Park. Respondents were asked to write down if they have any new ideas along with the closed items. Thus, in addition to closed items and data limited to the options, some open data were also collected.

REVIEW AND ANALYSIS OF QUESTIONS

Q1: Gender: aim of taking ideas of men was merely familiarity to their attitude toward women's park issue. Because it is assumed that the way of men's thinking in agreement or disagreement with this use directly influences use of their girls and women of the park. Results of this question are given in Fig 2. Out of 195 respondents, 150 were females and 45 were males.

Q2: Age: out of 195 respondents, mean age of women was 33 years and mean age of men was 42 years. Answers of respondents to this question are given in Fig 3.

Q3: Marital status: 55 respondents were married and 95 were single. Among men, 32 ones were married and 13 were single. Results for this question are shown in Fig 4.

Q4: Educational level: This question was designed for famility to type of educational classes which can be included in the park as well as for familiarity to educational level of the residents to emulate social actions. 52 percent were women with higher education degrees and 48 percent had high school diploma or below. Among male respondents, 23 percent had higher education degree and 77 percent had high school diploma or below. Answers to this question are given in Fig 5.

Q5: What is your opinion about construction of women's park? Aim of designing this question is finding if women would use the park or not, because construction of such parks incurs considerable costs. 74 percent of respondents agreed and 18 percent disagreed and 8 percent had no idea in this regards. Results for this question are given in Fig 6.

Q6: Will construction of women's park have positive effect on happiness of women? Impact of park on the happiness of the society can be good justification for implementing park and appropriate budget for it. Also, if it is approved, spiritual aids by women and mental health rights organizations can be achieved. Almost 91 percent of respondents provided positive answer to this question, results of which are given in Fig 7.

Q7: Does establishment of women's park causes strengthening recreational, cultural, and sports facilities for women in each city and region? Almost 91 percent of respondents provided positive answer to this question, results of which are given in Fig 8.

Q8: Will construction of women's park lead to promotion of unhealthy relations such as imitation and a place for delinquent women? Since women's park is the first public place which provides freerecreations for women, would certainly have some risks. In the society where yet there are social problems and cultural poverty and presence of some disorders cannot be denied, hearing name of women's park reminds some security problems. Security problems in terms of entry of delinquent women or escaping girls to park or video recording and such issues may occur or presence of such people in the park may significantly affect the way of park use. It also depends on the park design and management as well as people attitude toward these parks. Almost 60 percent of respondents disagreed promotion of unhealthy relations. Results for this question are shown in Fig 9.

Elham Khanghahi Bala

Q9: Overall, Are advantages of women's park more than its disadvantages for the society? Certainly every project has some advantages and disadvantages for the society, and what specifies its realization or not realization is weight of advantages and disadvantages. Answers to this question are shown in Fig 10.

Q10: If selection of clothing is free in park environment, what types of clothing would you choose? Aim of this question is internal coverage of the park and helping park management in establishing order and security. Results for this question are given in Fig 11.

Q11: What facilities and places should be considered in the park so that satisfaction is achieved? Aim of this question is placement of facilities according to demands of the residents and visitors, which is given in Fig 12.

Designing Women's Park in Ardabil

Following investigation of opinions and using obtained opinions, women's park is designed in Ardabil (current project).

In order to realize mentioned objectives, general principles in design and coordination between plan elements should be considered. To this end, the designers consider specific methods and principles including use of water, plants, light, color, etc. in addition, perspective plan change is a function of different day hours and changing seasons during the year. This unique property makes park construction more difficult. Some principles of this project include as follows:

Water and Plant Presence

Centrality of water and plant in designing Iranian perspective and garden making is considered as a principle. Presence of Iranian garden making concepts is in new form, rather than imposing Old Iranian garden making patterns. Water as the main element of freshness is considered as natural and inert and implicit and explicit in the site.

Inert Water

Inert water can be observed beside the restaurant and in the complex, which reflects image of the existing elements in daylight and reflects moon and stars and park lights at night time.

FlowingWater

Presence of water flows in the site in central section which originates from architecture of Iranian gardens such as Mahan Prince Garden, use of various fountains and spools in the site all seems scatter water in the site. In this park, cleanliness, transparency, freshness and happiness is instilled in the whole complex by water [7].

Plants

Greenness and freshness of the plans instill deepest impact on the viewer, since human being is familiar to the nature based on his disposition and he feels peace and comfort by seeing the nature. Plants in this complex are implanted aiming at creating shadow, beauty, and impression in different seasons. In order to protect against cold and warmth, plants are used in safe place. Plants not only create protection, but also direct the vision (Torabifard) [8].

Light

Elham Khanghahi Bala

The main connection channel between human being and his surrounding environment is created through his five-senses. Meanwhile, visual sense is crucially importance. The way of light presence in the environmental psychologically play significant role in our actions and reactions. Following points should be considered in lightening for parks:

Excessive darkness in abundance of trees causes fear.
Monotonous lighting in all points of the park is boring.
Comfortable and cozy spaces can be created using topical lighting.
Colorful lighting and combination of lights can be used.
Artificial light sources can be represented in natural and beautiful manner.

Site Arrangement Pattern

Respecting to the soli, protection of existing nature and site design considering land shape, and understanding rules governing the nature help designer in coping with it and being inspired by the nature.

Observing Boundaries

The main feature in this project which distinguishes it from other projects is specialized use of women from the complex. Considering religious rules and respecting for religious beliefs in the country necessitates preserving religious rules regarding women in designing such space. The first measure in the site is use of green space and fences around the site covered with dense trees. In addition, limitations for access to the park also help protecting this matter. Outdoor recreational lands can be protected using the same system. On the other hand, investigation of women's characteristics and spirits and recognizing the fact that women are in higher levels in terms of sensual perceptions lead to reviewing five senses of women, and direct the plan toward manifestation of these senses using natural elements and landscape which represents these senses, results of which is designing a garden with reflecting five human senses in the site, that is, color garden, mother garden, fruit garden, etc. [9].

Cultivation Plan

Cultivation plan of women's park is different from other parks and the plants considered in this park should be plants interested by women and compatible to their spirits. The plants used in this park should have soft texture.

Climbing plants: The use of climbing plants such as ivy on the colonnades represents image of the mother as a fulcrum. Meanwhile, mother is considered as a support, to whom the climbing plant or child relies and initiates and continues his life by her help.

Covering plants: they give soft tissue surfaces to the environment. Grass and surface covering plants can be used for achieving female fineness concept in the whole site. For example, using grasses gives formatted special color to the environment.

Aromatic plants: wallflower or flowers with special aromas such as jasmine give certain elegance to the park and keeppleasant aroma of mother alive in the dreams [11].

Functional and Physical Planning of Complex

Since purpose of the project is designing a complex for women and necessity for presence of such complex was justified in the previous sections, now land uses and spaces for this complex should be specified. To achieve answer

for this question, physiological and social studies were referred and experts and authorities in sectors related to women affairs were talked. In addition, a questionnaire was distributed among women living in Ardabil in order to get information about their tendencies and interests. Related decisions were made using results obtained from these reviews. It should be noted that ideas of the thesis author, as a member of designer community and contemporary women with women problems preoccupation, were also involved in the decision making process.

Sports Facilities

Considering reviews, the first and main space needed in this complex is sports spaces. Considerable figures in the press regarding sports complications for women are realities which necessitates existence of sports facilities in a complex specific for the women. The type of sports facilities in the complex was specified considering medical and psychological recommendations as well as lists of ideas of respondents. For example, psychologists recommended inclusion of non-competitive sports facilities in the complex. Idea lists showed high tendency of women to such sports as swimming, volleyball, and tennis. Necessity of women sports is not merely in terms of physical health preservation and promotion, but also sports is regarded as one of the most basic elements of women mental health, because due to various responsibilities of women in the home and family and inhibitory views in some classes of the society, women enjoy fewer opportunities than men for attending in the society and doing their personal interests and tendencies, and they view sports as a recreation rather than a necessity [7].

Wellbeing and Relaxation Spaces

Today in most places of the world there are some spaces known as spa which includes various activities, aiming at distancing the worries of everyday life and pollution and providing quiet and pleasant hours in a pleasant environment and refining users' body and soul. Water areas (hot water, steam, water pressure, water sports, etc.), different types of massage (especially eastern massage), health service centers (such as cleaning and hydrating lower layers of skin with an emphasis on the use of plant material) and other non-pharmacological treatments such as use of the therapeutic properties of colors (drowning in colorful lights), therapeutic properties of rocks, aromatherapy, music therapy, etc. as well as spaces for yoga and meditation are main constituent spaces in these institutions. These institutions are usually closely related to nature and natural factors and utilize mental impacts of the nature on human being. Such spaces have not yet become common in our country, but there are some examples in the traditional spaces with similar functions. For example, public traditional baths can be mentioned. In addition to spaces related to washing, they also provided other functions such as massage, barber and serving drinks. Natural hot water bath are also examples of water treatment that aims at ensuring the safety and comfort of the users [12]. Such spaces should also be considered in this complex [12].

Cultural, Artistic, and Social Spaces and Side Spaces Services

Besides these basic activities, the complex also includes cultural, artistic and social section including library, lecture hall, diagnosis and counseling services for the treatment of certain diseases and educational classes (costumes, music, sculpture, painting, journalism, legal awareness, free discussion, etc.). Selection of the educational class types was also done based on ideas and opinions of the experts in women affairs. They emphasized on necessity for increasing awareness of women on legal issues related to women and problems which are created due to unawareness. Attendance of women in journalism and learning related skills such as writing and photography are ways for their effective presence in the society and enjoying views of women on different issues. Free discussion classes were included in line with psychotherapy and group therapy programs in the complex.

Central spaces of the complex have capability for performing seasonal activities such as holding various matches and fairs and etc. on the other hand, considering reviews and studies regarding women health, breast cancer and osteoporosis are the diseases commonly known as deadly and silent diseases and their early diagnosis considerably

Elham Khanghahi Bala

helps in improving treatment. Since diagnosis of both diseases only requires radiography devices and there is no need for special facilities for hospitalization and hospital equipment, mammography and bone densitometry sections were also added to the complex alongside some of the health services such as reproductive health and mental health services, and nutrition specialist class which constitute medical space of the complex.

Children Park and club is the other main services of this complex. This section is allocated for temporary keeping of children when their mothers are using the complex facilities.

Other services such as market centers, beauty salons and cafes and restaurants are included in this section [7].

Design Options

First Proposed Option

Formation of a central core and various uses in different directions and in its surrounding. The functions can be formed in such a way that they constitute internal borders of the core. In this organization, design boundary is very limited and concentrated versus the site. Center of this spatial area is selected in the site center.

Advantages of this proposal are enjoyment of the best landscape to the surrounding environment. The main reason for this locating is its beautiful landscape toward the surrounding.

Its disadvantages include interference of different functions predicted for the complex due to concentration of the spaces as well as failure in meeting to needs and demands of the users and thus irregular and uncontrolled use of the complex.

Second Proposed Option

In this proposal, functions and spaces are scattered in the whole site. In this organization, perfect distinction of the uses is recommended. Due to broad scope of the site, various uses in suitable places are established considering the site conditions, and all of them are connected through multiple pedestrians and roadway axes.

Advantages of this proposal include high facilities which are provided for placement of the functions such as good landscape, good view for radiation, suitable vegetation, etc.

Disadvantages of this proposal include coverage of a large area and relatively high distance between uses which makes problems for the uses and authorities of the complex. In addition, some people tend to attend in totally unspoiled natural locations and are reluctant to attend in busy and crowded place. Such organization has no use for this group of users. On the other hand, unspoiled natural views and totally natural environments beside welfare facilities are highly pleasant for the users, which is not predicted in this organization.

Third Proposed Option (Final Option)

This proposal is a combination of previous proposals. It is attempted to use advantages and strengths of them and solving disadvantages and weaknesses. In organizing the final option, each of consideredfunctions are substituted in different locations of the site considering the needs and type of use, each of them constitute a functional area which is combination of multiple uses in relation to each other. In this organization, all functions are designed in three areas including eastern, central, and western areas, which are recognized as suitable considering reviews. Eastern area

Elham Khanghahi Bala

includes cultural, artistic and social spaces, central area includes public space of the park, and western area includes sports spaces and other service spaces in relation with main areas.

Various gardens have been situated in scattered form around the central area so that sense of exploration and search is stimulated in the users. In this organization, it is attempted to use strong vision and movement axes. The other strength for this proposal is compatibility of the geometry of the plan with natural land features. Closeness of the spaces despite of distinctive functions and multiple access routes provide pause spaces for selection of the location and changing path at each point of the complex. Movement and dynamicity, compatibility, and being organic are other advantages of this plan.

CONCLUSION

Results of the study suggest Ardabil women and men have positive view toward designing women's park and they will welcome if it is constructed. Most women at any age and educational level agreed construction of the park. Below 15 percent declared designing women's park would have negative impacts and they maintained separating women's and men's park has no meaning and damages family foundation. Majority of respondents wanted designing sports and cultural facilities. Results of this review in designing women's park in Ardabil (current research) were used. In this design, three proposals were proposed and then the best proposal was raised following investigating advantages and disadvantages.

REFERENCES

1. Lang, J. (2007). Urban design and procedures along with more than fifty species of special case, Tr. by H. Bahraini, Third Edition, Tehran University Press.
2. Almasifar, N. &Ansari, M. (2010). Evaluation of environmental security in regional parks as part of urban spaces from the perspective of women based on CPTED approach (Case Study: Sa'eePark), Journal of Urban Management, No. 25.
3. Iyvazyan, S. (2001). Aesthetics and its origin in Fine Arts Architectural Review.
4. Syed Sadr, A. (2001). Architecture, colors, and man, First Edition, Tehran Publication.
5. Kazemi, M. (2009). Analytical approach to gender and its impact on space quality and city's identity.
6. Pourjafar, M.R. (2009). Impact of organizing visual axes on promoting quality of city's public spaces.
7. Ismaili, (2002). Analyzing public green space (urban parks) from the perspective of urban planning, Master's Thesis in Urban Planning, Faculty of Arts, University of TarbiatModarres.
8. Stiles, R. (2011). A Guideline For Making Space. Urbspace, Central Europe Programme.www.urbanspaces.eu.
9. Jagori. (2010). Understanding Women's Safety: Towards a Gender Inclusive City. Research Findings Delhi 2009–10. New Delhi: Jagori. Jagori, and UN
10. Adibi, A., Manam, A.R. &Ghazizadeh, N. (2005). Status of water and fountain in city parks, Fine Arts.
11. Tabaroki, A. (1992). Proceedings of Seminar on Green Spaces, Parks and Green Spaces Organization of Tehran.
12. Eyesman, L. (2001). Psychology of color application (Pantone), Tr. by Zemzemeh, R. Tehran Publication.
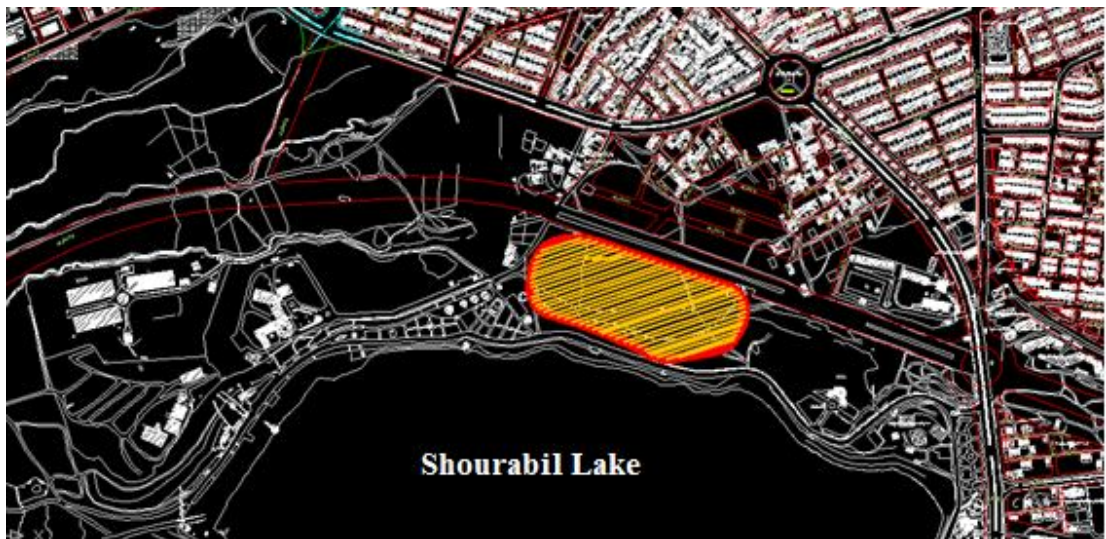
Fig 1. Ardabil city site
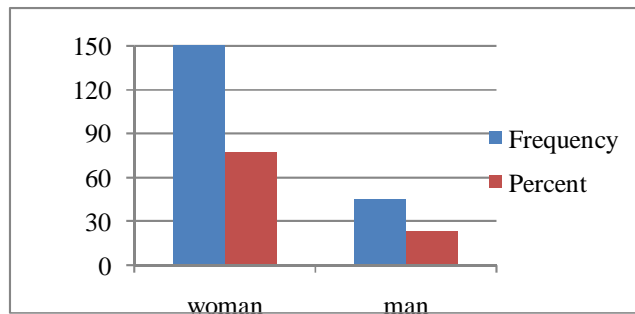
Fig 2. Gender

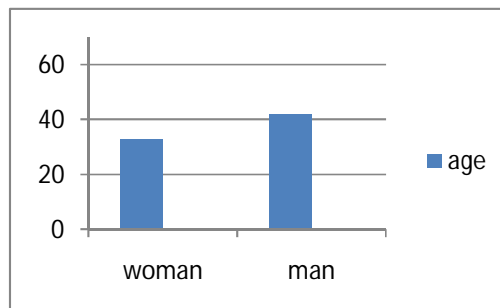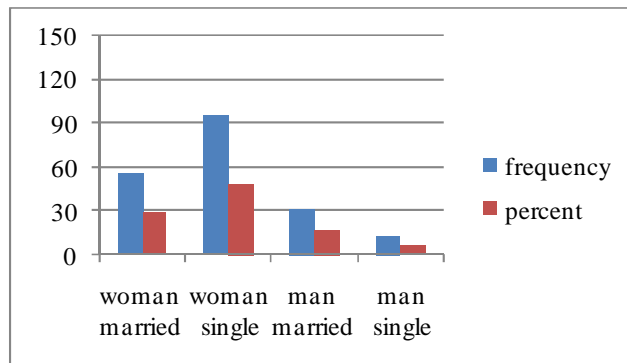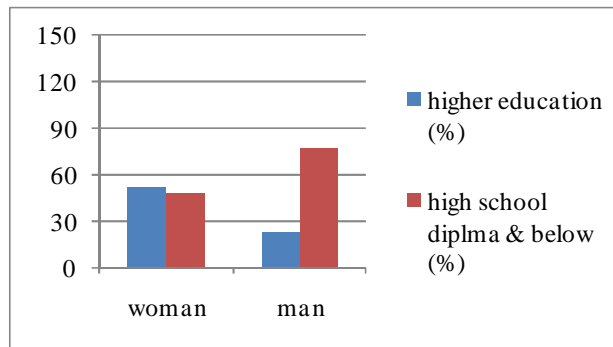**Fig 3. Age**

Fig 4. Marital status

Fig 5. Educational level

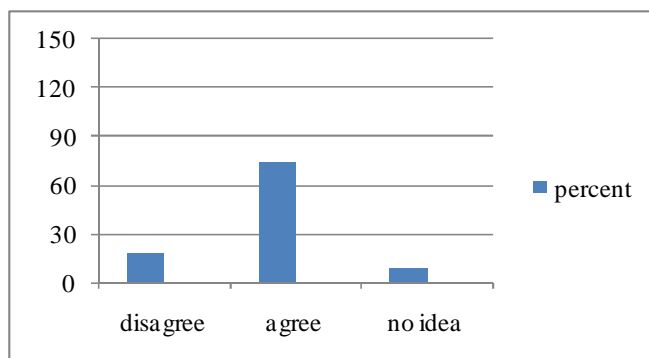**Fig 6. Construction of women's park (opinions)**
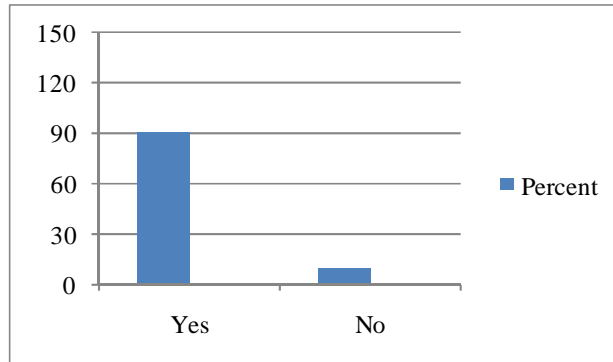
Fig 7. Impact of women's park on women's happiness
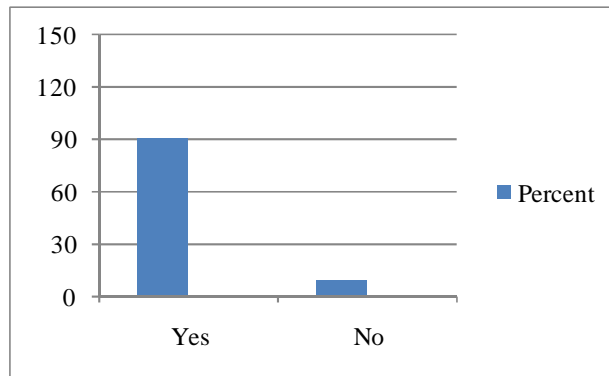

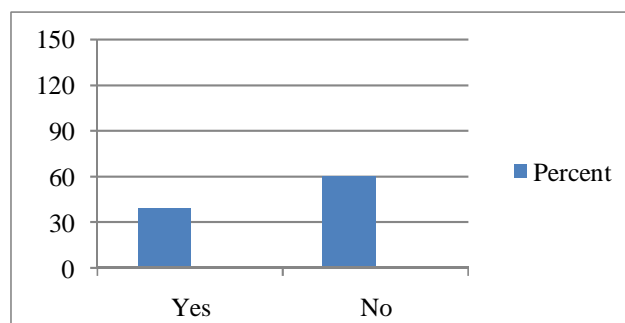**Fig 8. Impact of women's park in strengthening recreational, etc. facilities**

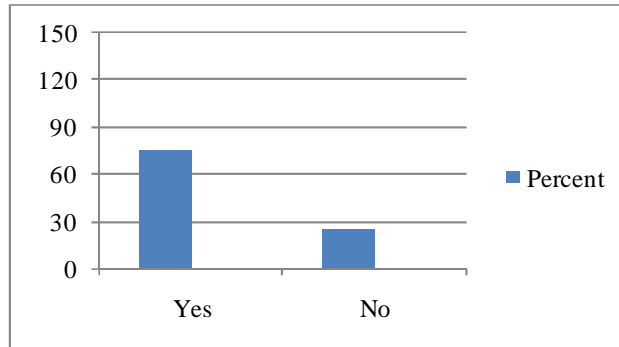**Fig 9. Women's park and risks**

Elham Khanghahi Bala

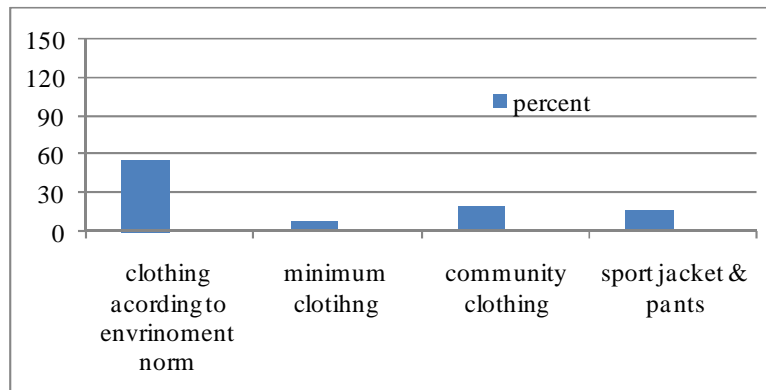**Fig 10. Women's park and advantages and disadvantages**
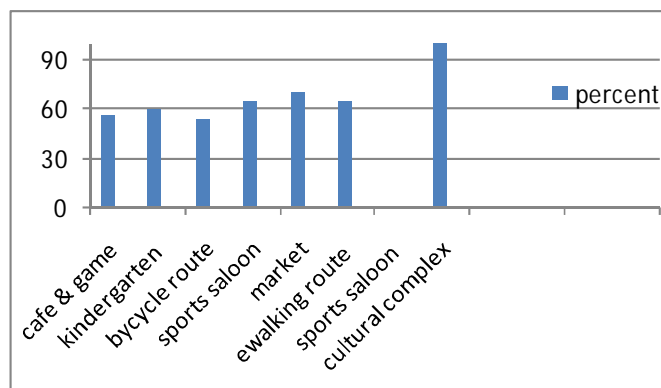

Fig 11. Type of clothing in women's park

Fig 12. Facilities necessary in women's park

Elham Khanghahi Bala
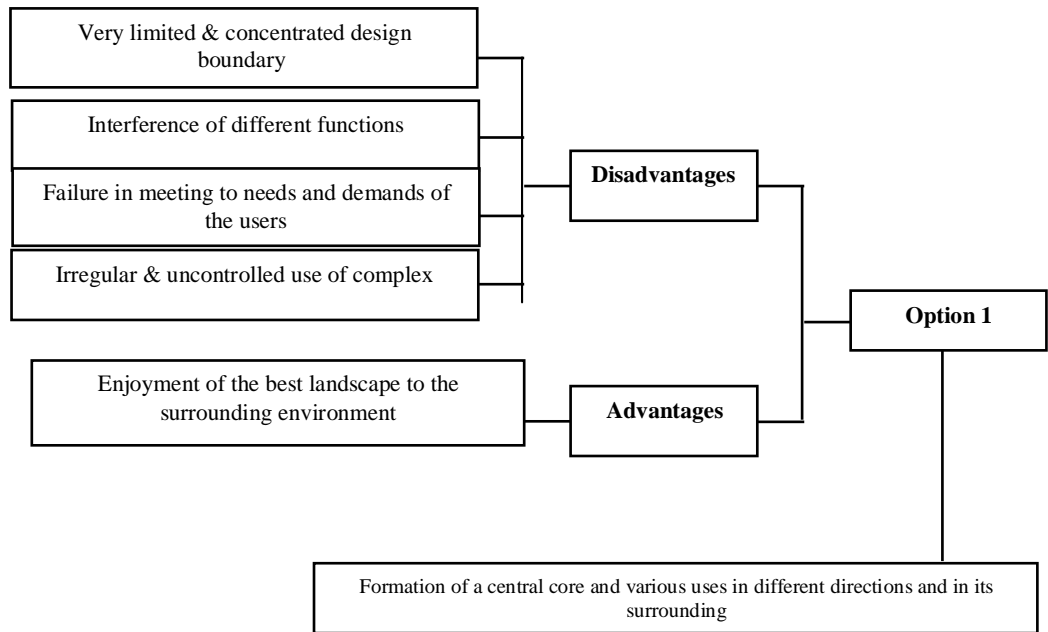
Fig 13. Proposal 1

Fig 14. Proposal 2

RESEARCH ARTICLE
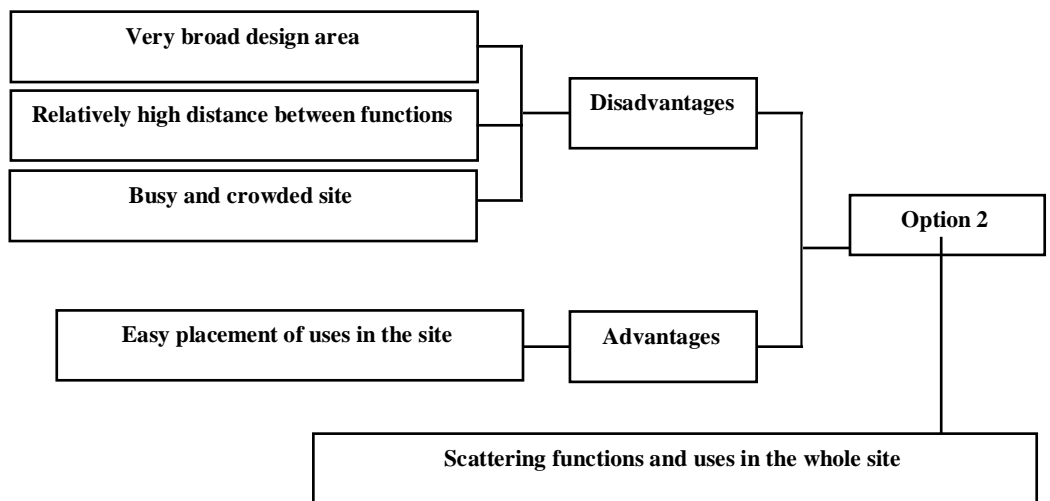
Compound Verb in Gulistan of Saadi

Habibolah Jadidoleslam* and Fereshte Enayati

Department of literature, Faculty of humanities, Branch Sistan and Bluchestan, Islamic Azad University, Zahedan, Iran.

*Address for correspondence
Habibolah Jadidoleslam
Department of literature, Faculty of humanities,
 Branch Sistan and Bluchestan,
Islamic Azad University,
Zahedan, Iran.
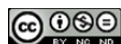
ABSTRACT

In the territory of Iran, Gulistan of Saadi, with its subtle and poetic prose, literary, elegant, and didactic anecdotes, is an unfailing source for the rulers, lovers, and wise men from the seventh century to the present day. Indeed, Saadi's Gulistan is one of the most notable didactic texts in Persian literature. In addition to genealogy of Saadi's Gulistan and enumerating golden period of saadi's poetry, this article tries to concentrate on compound verbs and show poetic delicacies of gulistan in Persian. Compound verb is one of the most current verbal forms in Persian. Nowadays, linguists present different theories and stories about the power of compound verbs in the richness of Persian language. Compound verb has been emerged due to the vanishing of simple verbs in ancient Persian language, which is an inflective language. The process of changing verbs from inflective to non-inflective is a reason for this vanishing resulted in the predominance and superiority of compound verbs in Persian.

Keywords: compound verb, Gulistan, Saadi.

INTRODUCTION

Saadi was apparently born in Shiraz between 600 and 610 Hijri. According to many Saadi researchers, his name and year of birth was an aura of ambiguity for many years. Nowadays, extensive research, discovery and recognition, and correction of many ancient texts have proved Sadi's name and date of birth. For instance, Kamal al-Din ibn al-Fouti has recorded the name and title of Saadi in "Majmaul Adab fi Mojamol Alqab" as Abū-Muhammad Muslih al-Dīn bin Abdallāh Shīrāzī known as Saadi Shirazi (Khazaali, 1976: 53).

Habibolah Jadidoleslam and Fereshte Enayati

Saadi was born in a family of scholars and literature; he was engaged under the strict supervision of his father to learn the sciences of his day from an early age. Saadi lost his father at age 12 and continued his education under the supervision of his mother. In 621 Hijri, he moved to Baghdad, which was a great literary and scientific center of the Islamic world, he continued his lessons in the famous Nizamiyya school in Baghdad and other scientific circles. While Saadi had involved in learning top points from two great Sufi figures, Abol Faraj bin Jozi and Shahab ad-Din Suhrawardi, he left his homeland and set off a long journey around the world that takes about thirty to forty years. He has influenced mostly by teachings of Imam Muhammad Qazali (Qazali is called master Imam by Saadi). After this long journey, Saadi returned to Shiraz while he had changed from an inexperienced youth to a moral trained scholar with virtues of spiritual experiences and thoughts around the year 655. He died in Shiraz in 691. His famous works are Gulistan and Bostan (Ibid: 54).

Biographers divide Saadi's life into three periods: first, youth and education; second, period of the journey; third, aging and sanctity that results in a complete solitude. Poetry was Sheikh's occupation, but he served the society as a single individual. The third phase is undoubtedly the most important period of his life because he has written his texts in this age.

Gulistan

Gulistan was written in 656 and it is a feedback to his sense of depression of losing his times according to its second line. Undoubtedly, the largest prose work of Sheikh that is completely innovation and creativity is the valuable book Gulistan. As Saadi himself says, Gulistan is full of consciousness, and passing of ages cannot destroy it and times would never transform its spring to fall; but it will remove every depression and sadness (Khazaali, 1976: 61).

Gulistan of Saadi an important moral and social book in eight chapters that begins by "the character of kings" and ends in "talk customs". It has imposed a change in Persian prose that has been continued up to now. The end of Saadi's prose has not been born. Exquisite and poetic prose is the most important feature of Golistan.

Saadi's prose, especially in Gulistan, has been famous for fluency and eloquence. Literary and art experts have repeatedly mentioned it in presentations and essays. In classical times, Saadi was known by everyone and his sweet speech was spread all around (Kamali Sarvestani, 1998: 210). The main aspects of his poetry and prose have less been subject of scientific discussions by researchers. The effective factors in the eloquence and fluency of his prose and poetry of a poet (like Saadi) may be investigated from different perspectives; these investigations uncover why some poems are popular and others are not popular. The factors make a poem beautiful, fluent and eloquent (Hasan Li, 2001: 16).

However, there are poets who have written nice texts, but Saadi led Persian prose to its peak.

Homaie talks about prose poem in Gulistan:

"The text of Gulistan is known as a prose poem that is used as an opposite for free verse. In fact, prose poem is a third party in the realm of literature posited between prose and poem because it is like prose in terms of rhyme scheme and like prose as it is not bound by prosody. The claim that literary speech should have three manifestations is a coordinates of Persian and Arabic despite the fact that prose poem emerged in Arabic due to the birth of Quranic verses (rhythm is called space in the verses of Quran). Hence, some scholars prefer this saying about prose, poems, and free verses." (Homaie, 1962: 103)

Saadi's concentration on didactic terms is a significant feature of Gulistan. The book is full of moral and didactic stories and instances. Gulistan also contains a wide range of audiences including rulers and kings to mystics and sages. In terms of meaning, the most important characteristic of Gulistan is the realism of perspectives toward human

and social contexts that influenced his style; this refers to the real descriptions of individuals in Gulistan. In this manner, individual interests are included along with social values so that the personal interests would never be against social interests; this is in fact one of the most current unethical problems in Gulistan (Dashti, 2002: 211). Saadi pays enough attention to the retention of his rights in such a way that the light of caution and conservatism is felt while reading Gulistan. The results from the attentions to material and worldly affairs as Zarrinkoub says, "Gulistan concerns the facts of life" (Zarrinkoub, 2000: 76).

Another feature of Gulistan is the rhyme and harmony in the chain of meanings that contributes in creating musical prosody. Neither sacrifices he the literal decorations for fluency and eloquence of prose nor sacrifices he fluency and eloquence for the literal decorations. Each part complete other parts including the terms and meanings, convenience and verbal arrangement, and poetry and prose. This rhyme is common in Persian verbs and words (Ibrahimi Hariri, 2004: 434-36).

A short look at Gulistan reveals the simplicity and unpretentious of terms and vocabularies. Therefore, all techniques like harmony of rhymes and vocabularies, good choice of words and their poetic composition, and appropriateness of speech, as Saadi says: 'talking according to the listener's mood' (Saadi, 2002: 185) have led Saadi's Gulistan to be one of the prominent texts of Persian literature. Gulistan is a collection of independent, short and long stories divided in three groups of anecdotes, analogies and maqama (Zolfaghari, 2007: 127). The narratives have collected in an introduction and eight chapters. With the exception of chapter eight containing short sayings not narratives, the book has 180 stories. Six stories are composed in poetic style and others in prose (four stories in the second chapter, one story in fifth chapter and one story in sixth chapter) (Rezaee, 2012: 114).

Simple and Compound Verbs In Persian

Linguists have different opinions about compound verbs. Presuming its existence in Persian, Some of them have defined it, but others doubt the existence of such phenomenon in Persian. Another group has divided it into different groups in addition to accepting its existence. Simple verbs are few and there are many compound verbs in Persian. In Persian, there are two methods for expressing a new concept in form of a verb: first creation of a converted verb like "چرخیدن" meaning 'to spin', second creation of compound verb like "آباد کردن" meaning 'to build' (Tabatabaee, 2002: 20). In fact, there is not an agreement about compound verbs among linguists (Dabir Moghadam, 1997: 18).

Compound verb is defined as, "compound verbs are composed of the combination of two independent words. The first word is a non- inflective noun or adjective and the second word is an inflective verb called Hamkord (Khanlari, 1976: 127). For instance, "تب **کردن**" , "انجام **دادن**" , "چرت **زدن**" , "یاد **گرفتن**" , "رنج **کشیدن**" (meaning to fever, to nap, to do, to learn, to suffer) that connote a single meaning (ibid: 218). In other words, they have become an expression, left their primary meanings and they have merely a grammatical function. The verbal part of the speech (bold terms) have the same role as the suffix "ئیدن-" in converted verbs.

As we see in the following examples:

"طلبیدن :طلب **کردن**" meaning 'to ask'

"خشکیدن :خشک **شدن**" meaning 'to dry'

"جنگیدن :جنگ **کردن**،" meaning 'to fight'

"صرفیدن :صرف **کردن**" meaning 'to inflect'.

Habibolah Jadidoleslam and Fereshte Enayati

Khosrou Farshidvard says in defining compound verb contrary to simple verb, "the infinitive of simple verb has a single part (when each infinitive is derived from complex form) like "مانند آمدن، شنیدن، دویدن" meaning coming, hearing, and walking. The infinitive of compound verb has been combinated with an adjective, adverb, noun, or other parts of speech like "پاك كردن، دير آمدن،غذا خوردن" meaning cleaning, coming late, eating (Farshidvard, 1969: 129). Then, he argues that it is very difficult to identify compound verbs in a verbal group because the components of a many compound verbs can be separated by adjectives or other attachments like "غذای خانگی خوردن" and "غذای گرم خوردن" (meaning eating hot food, eating home made food (ibid: 130))

From simple verbs used in the structure of compound verbs, the word "كردن" has the most frequency. A research in this regard shows that 1056 of 3000 compound verbs begin by the verb "كردن". The next frequency ranks belong to verbs "شدن", "دادن", and "زدن" (Rostam Pour, 1980: 36). There are other verbs used in the creation of compound verbs including "آمدن", "بردن", "خوردن", "داشتن", "دیدن", "رفتن", "ساختن", "ساختن".

In terms of dominance of compound verbs over simple verbs in Persian, Ali Ashraf Sadeqi writes:

"The tendency to make compound verbs existed before Islam … as understood from Pahlavi language, the orientation to make conversion nouns, at least in available texts, is older than using compound verbs (Ashraf Sadeqi: 1993, 239). Indeed, the most important difference between simple and compound vers relates to the fact that simple verbs are inflective and compound verbs are syntactic. A characteristic of syntactic units is their capability to place other elements between its components while it is not possible for morphological units. For example, the word "اندیشیدم" (I think) is composed of three parts of "(اندیش + ـ یِد + ـَ م)". It is not possible to put any Persian morpheme between these three morphemes. Nevertheless, the expression "فکر کردم" (I think) that is a compound verb follows a different manner. It is possible to put other components between its verbal or nominal parts: "فکر بکری کردم" , عجب "فکری کردم" (meaning I had a brainstorm / what I thought). This feature makes the compound verbs flexible and sweet.

Another difference between simple and compound verbs is the clarity of compound verb because the simple verbs may be either intransitive or transitive. For instance, the term "ضبطید" meaning both 'to record' and 'to be recorded'. In compound verbs, the speaker is free to select either of the light verbs to connote his intended meaning. For instance, three compound verbs may be made by the adjective happy (خوشحال): "(to make happy, intransitive) خوشحال کردن", "(to become happy, transitive) خوشحال شدن", and "(to be happy, static) خوشحال بودن" (Tabatabaee, 2002: 21).

The most frequent simple verbs are as follows:

- "كردن":

Transitive: حراج **كردن**؛ تهدید **كردن**؛ اذیت **كردن**؛ جارو **كردن**؛ هدایت **كردن** (meaning Auction, threaten, harass, sweeping, conduct ...)

Intransitive: كوشش **كردن**؛ زندگی **كردن**؛ جنگ **كردن**؛ بازی **كردن**؛ سلام **كردن** (meaning to try, live, fight, play, say hello)

"زدن":

Transitive: گول **زدن**؛ شانه **زدن**؛ كتک **زدن**؛ رنگ **زدن**؛ آتش **زدن** (meaning to defraud, comb, beat, paint, fire ...).

Intransitive: سوت **زدن**؛ بوق **زدن**؛ كلک **زدن**؛ حدس **زدن**؛ تلفن **زدن** (meaning to Whistle, horn, play tricks; guess; call).

"دادن":

Habibolah Jadidoleslam and Fereshte Enayati

انـجام **دادن**؛ پس **دادن**؛ شرح **دادن**؛ فـریب **دادن**؛ عادت **دادن** :Transitive (meaning to do, return, describe, cheat, accustomed).

Intransitive: دست **دادن**؛ مزه **دادن**؛ اهمیت **دادن** (meaning to shake hands, taste, and care for ...). (Tabatabaee, 2005: 33)

Compound Verbs in Gulistan of Saadi

Changing the position of verbs in some writings is one of the features of Golistan. To make an imaginative atmosphere, Sadi has sometimes changed the place of verbs from the replace it from the end of sentences, after a subject or object (as Persian language rule) to the initial positions (Bahar, 1997: 118). Many of the rhymes in Gulistan are due to this displacement. For instance, the following underlined verbs are displaced in the following extracts while they should be at the end of the sentences:

"دوان پي در غلامي و روان پایي باد بر ایشان: از دیدم را یكي هفته آن در هم"
 (Saadi, 2002: 118). (I saw one of them in that week: he rode on a horse and a slave followed him).
"سرگشاده را او سفرة و گشاده در ندیدي كس را او خانة الجمله في"
 (Ibid: 117). (No one has ever seen his house open and serving people)
"آورده غارت و كرده سفر آمدند باز دزدان كه شبانگاه"
(Ibid: 61) (at night, the thieves returned from trip with the plunders).
لایعلم؟ حیوان این بر معلم دیباي این بیني مي چون گفت: سعدي كسي
(Ibid: 78), (One said: how do you see the face of this wise person on this stupid animal?)
The displacement of verbs in Gulistan may be carried out due to compliance of speech harmony:
"طرح به دادي را توانگران و حیف به خریدي درویشان هیزم"
(Ibid: 78) (You bought the woods of Sufis by nothing and sold plans to the rich.)
را زاهدان دهم درم چندین برآید من مراد به حالت این انجام گفت: اگر
(ibid: 102) (He said if this action meets my needs, I would give mystics some money.)
و پرهیز و زهد مولع و خیز شب و بودمي متعبد طفلي ایام در كه دارم یاد
(ibid: 89) (I remember that I was an abstemious and devout worshiper at the age of childhood).

Sometimes, the verb proceeds due to rhetorical reasons because the writer decides to describe freely the adjectives for intended nouns (Bahar, 1997: 1048).

دماغ آورده بر كف و شده خشم در و برآمده هم به دید را زورآزمایي صاحبدلان از یكي
(Saadi, 2002: 105) (One of the lovers saw an angry rival)
محضر نیك النفس، كریم بود اي خواجه را زوزن ملك
(ibid: 76) (Malek Zozan had a noble-hearted servant)
بندگان از كس ترین خسیس به مگر را ملك این نبخشم
(ibid: 84) (I may give this property only to the stingiest person in the world)

Sometimes an infinitive eliminated from a compound verb without reference to add the poetic aspects of the poem; for instance, he removes the infinitive "بودن" from "در نیام بودن" and "در كام بودن" in the following sentences:

كام در سعدي زبان و نیام در علي ذوالفقار :لوالالباب او راي نقض و صوابست راه خلاف

It is against the true way and violation of the prophets' manner, Ali's Zolfaghar in pod and Saadi's tongue in mouth (Ibid: 53).

All these syntactic changes have been carried out in Gulistan of Saadi to make it more poetic. Thus, he has eliminated the verb when it becomes more poetic; in fact, ellipsis here means brevity as a poetic technique (Shanbehie, 2010: 99).

Habibolah Jadidoleslam and Fereshte Enayati

In some cases, the main component of a compound verb is repeated in the sentences.

آمد غالب نشستن راي بر آمدن باز خاطر كه بامدادان

(Saadi, 2002: 54) (At morning that the sake of return overcomes staying….)

At the end of above piece, the verb "آمد" is replacing the linking verb "شد". This replacement creates a melodic repetition with the occurrence of "بازآمدن" and "آمد". Other examples are:

كرد خويش وليعهد تا كرد بيش نظر روز هر

(Ibid: 60) (Days by days, he paid more attention to him and assigned him as the Crown Prince.)

The linking verb "كرد" is repeated in two compound verbs of "نظر كرد" (meaning paid attention) and "وليعهد كرد" (meaning assigned him as as the Crown Prince). The remarkable thing is that there are the mediators of "بيش" and "خويش" and their absence causes obscene repetition; but Saadi mas created a sweet repetition by mentioning these two words.

آمدند اسير دشمنان گشاديم و خداوند دولت به را قلعه فلان كه داد بشارت و آمد در در از سواري

(Ibid: 65) (A rider entered and announced the good news that we conquer a castle by God's help and the enemies are in prison.)

In order to emphasize on other parts of the sentence, Saadi puts a long space between components of compound verb to put away the emphasis on the verb:

كرد مي بيت اين به [خود] خاطر و تسكين دوخت مي خرقه بر خرقه و سوخت مي فاقه آتش در كه شنيدم را درويشي

(Saadi: 109) (I heard about a Darvish burning in poverty fire, had no cloth and making himself calm by this line…)

The compound verb here is "تسكين مي‌كرد" (meaning to make calm) there is a long space between two components of the verb. The space highlights the cause of relaxation with the next lines.

تافتن مسكينان مصاحبت از روي است بعيد بزرگان اخلاق و كرم از

(Ibid: 87) (It is far from the leaders' forgiveness and moral to disregard the companionship of the poor.

آورد من نزد به نامساعد روزگار شكايت رفيقان از يكي

(Ibid: 69) (One of my friends complains about the hard life to me…)

In some cases, Saadi uses a verb in another form to balance the literal components of a sentence; for example:

مي‌نگريد او هيأتِ در و شنيد ... مي

(Ibid: 125). (He was listening and looked at his figure)

Habibolah Jadidoleslam and Fereshte Enayati

Instead of using the proper form of the verb "مینگریست", he uses "مینگرید" to balance it with the word "می شنید". It should be noted that both of the verbs are fake past tense. Saadi uses rarely the ancient verbs and the ancient verbs in Gulistan were common in his age. Like the ancient form of "خوشیدن" instead "خشکیدن" (meaning drying up) in the following example:

بخوشانیدی دهان حرورش که تموزي در

(Ibid: 141) (In a summer that warm winds dried up one's mouth.)

CONCLUSION

Gulistan is a prose with all literal and intellectual properties of poetry; its poetic style is simple and clear. Overall, Gulistan of Saadi mixture of prose and verse, and a balance in their combination. In fact, Saadi begins his text by prose and uses poetry to complete it. Sometimes, prose is a background or arrangement of an introduction for a poetic conclusion. The words of Gulistan have unilateral obligations and musical harmony. Brevity is the basis and approach of Golistan. Brevity is a characteristic of Persian having been used mostly from Sassanids to Mongol age by Persian poets. Gulistan prose is to some extent like maqama because the expressions have verbal and emotional figures; the anecdotes narrate usually the Sadi trips around the world.

As this article shows in the position of compound verbs in Saadi's Gulistan, Shaikh has created a subtle and poetic innovation in Gulistan by changing the place of compound verbs. The use of compound verbs is one of the features of the Saadi's prose. There are many ancient and simple words in the text of Gulistan; this pattern reveals the literary and linguistic traditions in the seventh century. However, Persian became non-infective in Sassanid era and the speaker was unconsciously forced to employ compound verbs. The power of simple verbs reduced in either inflective terms or syntactic terms, and the main place of a sentence was occupied by compound verbs. Hence, the use of compound verbs in Gulistan by Saadi represents the poet's attempt to express moral and social conepts in poetic style.

REFERENCES

1. Ashraf Sadeqi, A. (1993). On the Fake Verbs in Persian. In: Proceedings of the seminar on Persian language and the language of science, Tehran University Publishing Centre.
2. Bahar, M.T. (1997). Stylistics. Ninth print, Tehran: Majid.
3. Dabir Moghadam, M. (1997). Compound verbs in Persian. Journal of Linguistics, issue. XII, 1,2: 18-44.
4. Dashti, A. (2002). In the Territory of Saadi. Sixth edition, Tehran: Amir Kabir.
5. Farshidvard, K. (1969). Grammar of today. Tehran: Safi Ali Shah news agency.
6. Hasan Li, K. (2001). A Dictionary of Saadi studies (1922- 1977). Shiraz, Fars Science Foundation.
7. Homaie, Jalal al-Din (1962). Saadi's gulistan. Yaghma Journal. 167: 13-97.
8. Ibrahimi Hariri, F. (2004). Writing Maqama in Persian Literature. Second print, Tehran, Tehran University.
9. Kamali Sarvestani, K. (1998). Saadi Survey. First, second, third, and fourth chapter. Shiraz: Fars encyclopedia in cooperation with Fars Studies Foundation.
10. Khazaali, M. (1976). Gulistan description, third edition, Tehran: Javidan.
11. Nathel Khanlari, P. (1976). History of Persian language. Tehran: New Publication.
12. Rezaei, L. and Jahid Jah, A. (2012). First-person narrator in Gulistan of Saadi. Journal of Persian Language and Literature, summer 2: 109-24.
13. Rostam Pour, Zh. (1980). Research on compound verbs. MA thesis, Department of Linguistics, Tehran University.

14. Saadi Shirazi, M. (2002). Gulistan. (Ed.) Gholam Hossein Yousefi, sixth edition, Tehran, Kharazmi.

15. Shanbehie, R. (2010). How to use the verb in Saadi's prose of Gulistan (a particular feature). Journal of Persian style of poetry and prose (the spring of literature), third issue, fourth number, 86-101.

16. Tabatabaee, A. (2002). Simple and compound verbs in Persian. Journal of Knowledge Promotion, 2: 20-24.

17. Tabatabaee, A. (2005). Compound verbs in Persian. Iranian Academy Newsletter, 26: 26-34.

18. Zarrinkoub, A. (2000). Saadi's nice speech. First edition, Tehran: Sokhan.

19. Zolfaghari, H. (2007). The structure of Gulistan stories. Journal of Literature and Humanities University of Mashhad, 156: 125-40.

RESEARCH ARTICLE

Antibacterial and Antifungal Effects of Prickly Parsnip Extract on Durability of Heat Treated Doogh

Nasrin Fayyaz[1]*, Ali MohamadiSani[1] and Masoud Najaf Najafi[2]

[1]Department of Food Science and Technology, Quchan Branch, Islamic Azad University, Quchan, Iran.
[2]Institute of Scientific - Applied Higher Education Jihad-e- Agriculture, Iran.

*Address for correspondence
Nasrin Fayyaz
Department of Food Science and Technology
Quchan Branch, Islamic Azad University,
Quchan, Iran.

ABSTRACT

To increase food safety, dairy drinks can be enriched by plant extracts. The purpose of this study was the investigation of antifungal and antibacterial effects of Prickly parsnip in increasing durability and creating new flavors of heat treated doogh. In vitro, antimicrobial effect was investigated against Staphylococcus aureus, Bacillus subtilis, Escherichia coli, Listeria monocytogenes, Proteus mirabilis, Pseudomonas aeruginosa, Aspergillus niger, Candida albicans and Saccharomyces cerevisiae by diffusion disk method. For Positive control in disk Diffusion method, 3 antibiotics including ampicillin, gentamicin and Natamycin were used. Finally, in the period of 90 days (at room temperature) Prickly parsnip extract effect on the doogh was evaluated. Test results showed that the effect of the extract against Staphylococcus aureus, Escherichia coli and Candida albicans were the highest amount. With increasing concentration, the diameter of the zone of inhibition also increased. Minimum inhibitory concentrations for most pathogens were reported 0.05 mg/ml. Prickly parsnip extract increases the durability of heat treated doogh. Prickly parsnip extract has antibacterial and antifungal effects and therefore it can be used as a natural preservative in the areas of biotechnology in dairy products and the pharmaceutical industry.

Key words: Prickly Parsnip Extract, Disk Diffusion, Antimicrobial, Doogh.

INTRODUCTION

Echinophora platyloba (local name: Prickly parsnip) is a perennial, divergent branches, fragrant, green, and prickly plant with a height of 20 to 55 cm (valiolah Mozaffarian, 1996). Prickly parsnip in total has 10 species and its species distribution is observed in regions of Iran, Anatolia, Armenia, Russia, Turkmenistan, Afghanistan, the Balkan Peninsula, Crete, Cyprus and Syria. It is a rich source of flavonoids, saponins and alkaloids (Nourozi, 2010). This herb has antibacterial and antifungal properties. Kelvandy introduced this plant as an antiseptic, antimicrobial and diary preservative in 2002 (Hasani, 2005). During studies that have been done on other species of Echinophora in England, it was found that a high percentage of methyl eugenol is located in E. tenuifolia. This material is widely consumed as an aromatic flavoring and preservative in foods.

Mahbubi et al (2009) examined the effect of extract on the Candida platyloba and concluded that this extract has antifungal effect and characterized its minimal growth inhibitory and minimum bactericidal growth. Firas et al. (2007) examined antimicrobial activity of essential oils and extracts of thyme species and concluded that it has strong antimicrobial effect against pathogenic bacteria such as Staphylococcus aureus, Bacillus cereus, Escherichia coli and Proteus mirabilis strong antimicrobial effect. Firas et al (2007) in a study conducted on oil and extract of anise herb found that they have antibacterial effects on the pathogens of Staphylococcus aureus, Salmonella typhi and Proteus vulgaris. Oke et al (2009) examined antibacterial and antioxidant activity of savory herb. They observed Minimal growth inhibition (MIC) on Escherichia coli, Staphylococcus aureus and Pseudomonas aeruginosa at low concentrations and confirmed its antioxidant property.

Sokmen et al. (2004) examined antimicrobial and antioxidant activities of the essential oil and methanol extract of thymus spathulifolius. Antimicrobial tests were performed on various bacteria such as Bacillus, Staphylococcus, Streptococcus, and Enterobacters and various mold and yeast such as Candida, Fusarium, Rhizopus and trichophyton. The results showed that the extract of this plant has seriously hindered the growth of the microorganisms, except for the 4 species of mold that their nonpolar and polar fractions of the methanol extract showed moderate antimicrobial effect. This extract has the high extent of Carvacrol and thymol that are phenolic compounds with high levels of antimicrobial activity. Tepe et al. (2005), examined antimicrobial and antioxidant activity of different extracts of Salvia officinalis. The plant essential oils have strong antimicrobial activity, while the non-polar and secondary extracts showed moderate activity. Analysis of the essential oil compounds showed 44 compounds that the major component were the beta - pinene, alpha - pinene and camphor. To evaluate the antimicrobial activity, the microorganisms such as Staphylococcus aureus, Streptococcus Pneumoniae, Bacillus cereus, Enterobacter aerogenes, Escherichia coli, Pseudomonas aeruginosa and Proteus mirabilis was used. Agar diffusion method was used to determine antimicrobial activity. To determine the MIC, micro-dilution assay and Mueller-Hinton medium was used. The experiments showed that the essential oil of this plant has the greatest effect on M. smegmatis and Streptococcus Pneumoniae. While it has no effect on Escherichia coli, Proteus, and Pseudomonas. Water-soluble extracts have antibacterial properties, but insoluble extracts have shown moderate antimicrobial activity.

One of the methods for antimicrobial activity study in plants is diffusion assay. In this method, the influence of the reservoir containing the sample is exposed to the inoculated culture medium and after incubation; the diameter of zone of inhibition represents a typical antimicrobial potency. Agar diffusion method does not depend on homogeneous distribution in aqueous extract. Dependent techniques are divided based on the type of tank containing samples to paper disc, plate and cylinder. In the above methods to measure the amount of antibiotics in inoculated crude extracts before incubation, they are putted for a short period in cold. This causes that the antimicrobial substance have sufficient penetration into the medium and ultimately lead to increased inhibition zone (Mahon and Manuselis, 1995). In The disk method, the paper discs is impregnated to antimicrobial substance (essence) and placed on the surface of fresh medium. This is a common method used to determine the antibacterial activity that is performed before major studies.

Nasrin Fayyaz *et al.*

Factors such as the amount of oil on paper disc and agar layer thickness varies in different studies (Jorgensen et al., 1999). The plate method is based on the influence of antimicrobial substance or essence of cavities in agar to the surrounding. The diffusion of the named substance is caused the inhibition of inoculated microorganism growth and the mean of inhibition zone is investigated as a measure of the strength of the antimicrobial agent.

The plate cylinder has the same general principles of past methods. For a reservoir of antimicrobial cylinders, the porcelain or stainless steel cylinder are used. After incubation, the cylinder is removed and the diameter of the inhibition halos was measured and recorded (Mahon and Manuselis, 1995).

The present study aims to investigate and identify the effects of antifungal and antimicrobial effect of Prickly parsnip in increasing the durability and creating new flavors of heat treated doogh. After the extraction, its antibacterial activity against 9 microorganisms including Staphylococcus aureus, Bacillus subtilis, Escherichia coli, Listeria monocytogenes, Proteus mirabilis, Pseudomonas aeruginosa, Aspergillus niger, Candida albicans and Saccharomyces cerevisiae was studied using diffusion disk method. For a positive control in diffusion disk method 3 antibiotic of ampicillin, gentamicin and Natamycin were used. Results showed Prickly parsnip extract has high antibacterial and antifungal properties. Also, with the addition of the extract to heat treated doogh, it was found that this herb increases the shelf life Heat treated Doogh and creates a new flavor and desirable taste.

EXPERIMENTAL

Materials

Ethanol 96%, sulfuric acid 1%, barium chloride dehydrated and Dimethyl Sulfoxide 40% were purchased from Merck, Germany and were used without any purification. Medium Mueller Hinton, Hinton broth medium and ringer tablets were prepared from Merck, Germany. Extraction was performed at the Center for Higher Education Agriculture Khorasan. Bacterial strains as lyophilized ampoule were prepared from IROST. In Table 1, the characteristics of each microorganism are shown. Mirabilis, Saccharomyces cerevisiae and Pseudomonas aeruginosa were prepared from Razi Serum Institute of Tehran. Used antibiotics include ampicillin, gentamicin, natamycin that were prepared one gram in powder form from Sigma.

Methods

Extractions:

First Prickly parsnip plant was milled and crushed. Next, 4 times distilled water was added to the chopped plant. Plant-water mixture was heated to boil. Finally, the boiled mixture was filtered by 0.02 mm filter. The obtained extract obtained was in pale green color.

McFarland standard suspension preparation:

To prepare McFarland standard, 0.5 mL of barium chloride was added to 99.5 ml of sulfuric acid. The above mixture was stirred continuously until the suspension is prepared. Correct density turbidity standard was determined using a spectrophotometer. Absorbance at 625 nm should be about 0.08 to 0.13. The tubes were sealed door and were kept in the dark at room temperature (Mahon et al., 1995).

McFarland microbial suspension:

First, the lyophilized ampoules containing standard strains of microorganisms were opened at sterile conditions. Triptone broth was added to the dry material in the ampoule using sterile pipette, the microbial suspension is achieved after the homogenization. To prepare mother culture, suspension was prepared to provide some data on Mueller Hinton agar medium and incubated for 24 hours in the incubators. Mother culture was kept in the fridge was renewed every two months. 24 hours before the test, the bacteria was transferred from the storage medium to Mueller Hinton agar medium and after growth of the culture, the surface was washed with normal saline solution and concentrated bacterial suspension was obtained. Then an amount of bacterial suspension was poured into tubes containing sterile saline. Its turbidity was measured with spectrophotometer at a wavelength of 530 nm and the solution was diluted with normal saline until its turbidity become equal to McFarland solution (Mahon et al., 1995).

Preparation of extract dilutions:

At first, extracts was passed through 2.0 micron syringe filter. Extract was mixed in the ratio of one to one with 40% dimethyl sulfoxide and concentration of 1000 mg per mL is achieved. It is concentration of the first wells of microplate. The concentration of each well of the microplate will be half in the next well. In the disc method, the 5 initial concentrations of (500, 250, 125, 62.5 and 31.25 mg / ml) were used.

The determination of Minimum Inhibitory Concentration (MIC) and minimum bactericidal concentration (MBC) for Prickly parsnip extract:

To determine the minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) of Prickly parsnip extract, macro dilution method was used. In this way, the microplate with 96 well and Hinton broth culture were used.

In the first stage, 100 microliter of Mueller-Hinton broth medium was poured in all microplate wells. In Each row in horizontal wells, 100 ml of Prickly parsnip extract with certain concentration (50 mg/ml) were poured and was mixed with the liquid medium by Sampler. After mixing, dilution procedure was performed. For the microplate dilution, 100 microliter of the first well was transformed to the second plate and from the second plate to the third plate until No. 11. In this way the concentration was reduced continuously.

In the Next step, 5 microliter of microbial suspension containing 10^6 bacteria or 10^4 fungi were added to all wells except No. 12 that was a negative control well that contained extract and medium (no microorganisms) and well No.11 was positive control well that contained the microorganism and the medium (no extraxt). Microplate were placed in incubator for 24 hours at 37 degrees Celsius for bacteria and 48 hours at 25 ° C for fungi. After the desired time, the microplate was placed in microplate reader device. This aperatus indicates absorption of light for eah well. The first well that its opacity is less than well No. 11 is considered as the minimum inhibitory concentration (MIC).

To determine the minimum bactericidal concentration (MBC) 5 microliter of the well where their turbidity is negative or equal to observed turbidity negative control (extract + medium) were transferred to Mueller Hinton agar medium culture. Plate was incubated for 24 hours at 37 for bacteria and 25 degrees Celsius for fungi. After 24 hours, the lowest concentration that has no microorganism growth was determined as a minimum of bactericidal (MBC). All experiments were repeated 3 times and the results were reported as mean.

Nasrin Fayyaz *et al.*

Disc diffusion:

This method was used to demonstrate the inhibitory effect of the extract. 5 microliter of the bacterial suspension was transferred to plates containing Mueller Hinton broth culture and superficial culture was performed. The control discs were impregnated with specific concentrations of the extract and incubated for 24 h at 37 ° C for bacteria and 25 degrees Celsius for fungi. After 24 hours, around each disc halo is formed which represents the growth inhibition of microorganisms. The diameter of the inhibition halos was measured by ruler and was reported in millimeters. All experiments were repeated 3 times and the results were reported as mean. An example of halo formation is shown in Figure 1.

Extract addition to heat treated doogh:

First, the density of raw milk and alcohol and etc. were examined. After confirmation, raw milk was passed from stainless steel filters and cooled while the cylinder walls were used for maintenance. Milk was pasteurized at 95 ° C for 300 seconds. Milk fat was removed and then re-homogenized milk fat was added. At this stage, the culture was added to produce yogurt from homogenized milk. After yogurt formation, salt and water were added to yogurt. At the same time the extract with 3 concentration (5000, 10000 and 20000 ppm) were added to the product. The door closed and the products were pasteurized at 85 ° C for 16 min and were kept at room temperature. The control sample was prepared too.

Effect of Extract on heat treated doogh durability:

To assess the durability of doogh, microbial test was performed on production during 3 months for once every two weeks. Microbial testing was performed in accordance with Iran standards of No. 2406.

1) Total count Test of mesophilic aerobic bacteria: 1 ml of doogh sample was poured into a sterile plate and 15 ml of medium was added to the count agar plate and was mixed. After coalescence, the culture plate was reversely incubated upside down at 37 ° C for 72 hours and then all grown colonies were counted. The maximum allowed colonies is 10.

2) Mold and yeast counts: 1 cc of doogh was poured into sterile plate and 15 ml sterile YGC agar medium was added to the mixture and was mixed as pour plates. After coalescence, it was incubated in 25 ° C for 72 to 120 hours and then all grown colonies were counted.

3) The total form count: 1 ml of sample doogh poured into sterile plates and the amount of 7 ml Violet Red Bile Agar is added (VRBA) and it was mixed as pour plates. For Anaerobic coliform count, after initiation of coalescence about 8 ml of the culture medium was added. After the coalescence, the culture plate was placed upside down in an incubator at 30 ° C for 24 to 48 hours and then all grown colonies were counted.

4) E. coli count: 1 dilution of the sample was prepared and 1 ml of the sample was poured into a test tube containing 10 ml Lauryl sulphate and tubes were incubated for 24 to 48 hours at 37 ° C.

5) Detection test of positive staphylococcal coagulase- cocci: To enrich the sample 1 ml of sample was poured into the tube containing 10 ml of Cook Mitt salty environment and incubated at 37 ° C for 24 to 48 hours.

Organoleptic test:

Panel test or organoleptic tests were performed to check the taste, texture, color, flavor and overall feeling.

The test was performed by 5 specialist in food industry (constantly) every two weeks and the results were reported in numbers from 1 to 5 (no: 1, barely recognizable: 2, weak: 3, average: 4 Strong 5).

Devices:

To determine the appropriate density of turbidity, a spectrophotometer (model UV-2100, American UNICO Company) was used. Turbidimetry of samples was performed using microplate reader (state fax2100 model). The incubator model INB 400 (memmert Germany), Autoclave Medical Industries (model 121A) and the mixer tube (Fisons Whirlimixer, Inc. Britain) were used.

RESULTS AND DISCUSSION

Antimicrobial Prickly parsnip extracts test results and determination of the MIC and MBC

The minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) of tested Prickly parsnip extract against all pathogens (in milligrams per milliliter) is shown in Table 2.

According to Table 2, Staphylococcus aureus and Escherichia coli in a dilution of 0.9 mg/ml were completely suppressed. The MIC of extract was 0.9 for these microorganisms. Bacillus subtilis, Pseudomonas aeruginosa, Proteus mirabilis, E. coli at a dilution of 1.9 mg/ml were supressed completely. The extract MIC for these microorganisms was 9.1. Listeria monocytogenes and Saccharomyces cerevisiae were diluted to 7.8 milligrams per milliliter. MIC for these microorganisms was 7.8. Growth inhibition for Candida albicans and Aspergillus niger were reported 3.9 and 125 (mg / ml), respectively.

MBC for microorganisms Staphylococcus aureus, listeria monocytogenes, pseudomonas aeruginosa, Candida albicans and Aspergillus niger were reported 500 (mg / ml). MBC for mirabilis, listeria monocytogenes and Saccharomyces cerevisiae was reported 250 (mg/ml).

The highest MIC of extract was related to Aspergillus niger that at 125 mg/ml inhibited from mold growth and at a concentration of 500 milligrams per milliliter completely destroyed the mold. Bacillus subtilis due to its high resistance did not disappear even at high concentrations of the extract.

Avijgan et al (2006) investigated antifungal effect of Prickly parsnip extract against Candida albicansby agar dilution method and concluded that the extract has inhibitory effect on the microorganisms at concentrations equal or above 2 mg/ml.

In another research, Prickly parsnip extract effect on Candida albicans and Staphylococcus aureus and Pseudomonas aeruginosa and Aspergillus niger was studied in vitro. The study found that a high concentration of the extract has antibacterial activity (Entezari et al., 2009).

Avijgan et al (2005), in a study investigated the antifungal effect of extract on the number of common dermatophytes and concluded that the plant extract has significant effect on Trichophyton, Microsporum canis and Epidermophyton floccosum.

The diameter of formed halos of extract in disk diffusion method

The diameter of formed halos of extract in disk diffusion method is shown in Table 4. With increasing concentration, the diameter of the inhibition zone also increased. Extract showed maximum resistance against Saccharomyces, Candida albicans and Staphylococcus aureus. It was most sensitive to both Bacillus subtilis and Listeria monocytogenes. Mirabilis, Escherichia coli and Aspergillus niger did not formed any halo at 31.25 mg/ml of the extract. In a study by Mahboubi et al. (2008) that was performed for investigation of Prickly parsnip extract effect against Candida albicans, the results of our work have confirmed. In this study also by increasing of Prickly parsnip extract concentrations, inhibition zone diameters also increased.

The diameter of formed halos by antibiotics

For Positive control in disk diffusion method, 3 antibiotics were used. In Table 5 the halo diameter is presented in millimeter. Ampicillin showed the maximum resistance to microorganisms and gentamicin showed the lowest resistance and the greatest sensitivity against microorganisms.

Kazemizadeh et al. (2009) also reported that the diameter of the inhibition zone of Staphylococcus aureus and Escherichia coli to ampicillin is lower in comparison with Bacillus subtilis.

Comparisons between the diameter of the inhibition zone of the extract and Natamycin antibiotic

In Figure 2, the comparison between 5 concentration of antibiotic Natamycin and extract is done and the results are shown as a column chart. Natamycin has the highest resistance against Bacillus subtilis and has the least effect against Candida albicans.

Comparisons between the diameter of the inhibition zone of the extract and antibiotics gentamicin

In Figure 3, five concentrations of antibiotic gentamicin and extract were performed to compare the results which are shown as a column chart.

In Figure 3, the comparison between 5 concentration of antibiotic Gentamycin and extract is done and the results are shown as a column chart.

Comparisons between the diameter of the inhibition zone of the extract and antibiotics ampicillin:

Figure 4 shows the effect of different concentrations of extract and the antibiotic ampicillin. In this diagram, the antibiotic ampicillin has more inhibition effect in comparison with Prickly parsnip but in the fight against Candida albicans, the effect of the highest concentration of extract is more than concentration of antibiotics. Effect of antibiotics and the highest concentration of extract versus Saccharomyces cerevisiae are identical.

Comparisons between the diameters of the inhibition between antibiotics:

In Figure 5, the 3 antibiotics used in this study were compared. The maximum effect is related to ampicillin and minimum is related to gentamicin. Antibiotic gentamicin had no impact against Candida albicans, Pseudomonas and Listeria monocytogenes. Highest impact was related to ampicillin against Proteus mirabilis, Pseudomonas aeruginosa and Bacillus subtilis. Natamycin had the highest resistance against Bacillus subtilis.

Statistical results of turbidity:

Results of turbidity differences between the concentrations of the extract are shown in table 6. As shown in Table 6, we see significant differences between the concentrations.

Investigation of the heat treated doogh durability

In this section, experimental results about heat treated doogh durability are presented. As a result, anaerobic total counts were negative. Total counts result was negative due to gas formation. Cocos staphylococcal coagulase-positive result was reported negative due to lack of turbidity or sediment.

Storagetime for doogh containing extract were significantly different than the control doogh. After 45 days, the control doogh starts to deteriorate and 10 days after the doogh containing extract was beginning to decay.

There are significant differences between the durability of doogh in different concentrations. Increase in doogh durability confirms all results of this project. This increase in the durability is due to the antibacterial and antifungal compounds in the essence and extracts of Prickly parsnip.

The results of sensory properties

The results of this stage are presented as a comparison between 3 or 4 concentrations in a linear diagram. As clearly seen in the following chart, the lowest concentration had the least smell, taste and overall feel. With increasing concentration, intensity of flavor and overall feel was increased. After 30-40, the intensity sensory factors decreased. The results of tests on the smell, taste and overall feel are gathered in fig. 6 to 8. During this period, no color change was observed in doogh containing extract.

CONCLUSION

In this study, antibacterial and antifungal effect of Prickly parsnip extract on doogh durability was studied. The experiment was performed against 9 microorganisms including Staphylococcus aureus, Bacillus subtilis, Escherichia coli, Listeria monocytogenes, Proteus mirabilis, Pseudomonas aeruginosa, Aspergillus niger, Candida albicans and Saccharomyces cerevisiae. Analysis method was the disk diffusion method. Five initial different concentrations (500, 250, 125, 62.5, 31.25 mg/ml) were used. The results showed Prickly parsnip extract has high antibacterial and antifungal properties. There was significant difference in the reduced number of microorganisms in different concentration of extract and it also eliminated microorganisms at high concentrations. The highest MIC of Prickly parsnip extract was related to Aspergillus niger so that in 125 (mg / ml) prevent the growth of mold and completely ruined mildew in a concentration of 500 milligrams per milliliter. Bacillus subtilis due to its high resistance did not disappear even at high concentrations of the extract. Disk diffusion test results showed that with increasing concentration, the diameter of inhibition increases. Also, it was found with the addition of the extract the durability of heat treated doogh will increase and a new desirable flavor is created.

REFERENCES

1. Avijgan, M., Hafizi, M., Saadat, M. (2006). Anti fungal effect of Hydroalcohlic Extract of Echinophora Platyloba DC OnCandida albicans. Iranian J. of Med. and Aromatic Plants, 21 (4), 545 – 52.
2. Avijgan, M., Saadat, M., Nilforoushzadeh, M., Hafizi, M. (2005). Antifungal effect of extract on the number of common Dermatophytes. Journal of Medicinal Plants, Vol. 5, No. 18.

Nasrin Fayyaz *et al.*

3. Entezari, M., Hashemi, M., Ashki, M., Ebrahimian, S., Bayat, M., Azizi Saraji, A.R., Rohani, S.R. (2009). Studing the effect Echinophora platyloba Extract on Bactira(Staphilococus aureus and Pseudomonas aeroginoza) and Fungi (Candida albican, Aspergillus flavous and Aspergillus niger) In vitro. Word Journal of Medical Sciences, 4(2), pp. 89-92.

4. Firas, A. Al-Bayati. (2007). Synergistic antibacterial activity between Thymus vulgaris and Pimpinella anisum essential oils and methanol extracts. Journal of Ethnopharmacology, 116, pp. 403-406.

5. Hassani, M. (2005). Investigation of ecological characteristics and aromatic plants Echinophora platyloba presentation in Kurdistan province.. Agriculture and Natural Resources Research Center of Kurdistan province.

6. Jorgensen, J. H., Turnidge, J. D., Washington, J. A. (1999). Antibacterial Susceptibility Test: Dilution and Disk Diffusion Method.In : Murray, P. R., Pfaller, M. A., Tenover, F. C., Baron, E.J. and Yolken, R. H., ed. Manual of Clinical Microbiology, 7th ed. ASM Press, Washington, pp. 1526-1543.

7. Kazemizadeh, Z., Habibi, Z., Yousefizadeh, M., Ashabi, M., Haidari Rikan, M. (2009). Investigation of chemical composition and antibacterial properties of essential oils of Salvia officinalis flowers grown large in Azerbaijan, Journal of Medicinal Plants, 9th years. No. 33.

8. Mahboubi. M., Avijgan, M., Darabi., M., Kasaeian, N. (2008). Investigation of antifungal effects on yeast Candida albicans compared with amphotericin. Journal of Medicinal Plants. 8th years. No. 30.

9. Mahon, C.R., Manuselis, G. (1995). Diagonostic Microbiology W.B. Saunders. Company. london, pp, 58-96.

10. Mozafarian. (2006). Cultural name of plants. Publications contemporary culture, Tehran.

11. Mozafarian, V. (1996). Encyclopedia of Iranian Plants, Publication of Farhang Moaser, Tehran, pp, 2-3.

12. Nourozi, M. (1989). Evaluation of photochemical and antimicrobial effect of Echinophora platyloba: Phd Thesis. Faculty of Pharmacy of Tehran University of Medical Sciences. Pharmacogenosy Department, pp. 34-35.

13. Oke, F., Aslim,B.,Ozturk, S.,Altundag, S. (2009). Essential oil composition, antimicrobial and antioxidant activities of Satureja cuneifolia Ten.Journal Food chemistry, 112, pp. 874-879.

14. Oosterhaven, K., Poolman, B., Smid, E.J. (1995). S-carvone as a natural potato sprout inhibiting, fungistatic and bacteristatic compound. Industrial Crops and Products 4, pp. 23–31.

15. Sokmen, A., Gulluce, M., Akpulat, H. A., Daferera, D., Tepe, B., Polissiou, M., Sokmen, M. and Sahin, F. (2004). The in vitro Antimicrobial and Antioxidant Activities of the Essential oils and methanol Extracts of Endemic Thymus Spathulifolius. Food Control, 15, pp. 627-634.

16. Teixeira, B., Marques, A., Ramos, C., Batista, I., Serrano, C., Matos, O., Neng, N., Nogueirae, J.M.F., Alexandre Saraiva, J., Leonor Nunes, M. (2012). European pennyroyal (Mentha pulegium) from Portugal: Chemical composition of essential oil and antioxidant and antimicrobial properties of extracts and essential oil. Industrial Crops and Products, 36, pp. 81–87.

17. Tepe, B., Daferera, D., Sokmen, A., Sokmen, M., Polissiou, M. (2005). Antimicrebial and Antioxidant Activities of the Essential oil and Various Extracts of Salvia tomentosa Miller (Lamiaceae). Food Chemistry, 90, pp. 333-340.

Table 1: Characteristics of microbial strains

NO name	ATCC	NTCC	PTCC
Staphylococcus aureus	6538	-	-
Bacillus subtilis	6633	-	-
Listeria monocytogenes	-	-	1294
Escherichia coli O157	-	12900	-
Candida. Albicans	10231	-	-
Aspergillus niger	16404	-	-

Nasrin Fayyaz *et al.*

Figure 1: The halos of growth inhibition in Diffusion disc method

Table 2: The MBC and MIC of Prickly parsnip extract (mg / ml)

Test bacteria	MIC	MBC
Staphylococcus aureus ATCC 6538	0.9	500
Bacillus Subtilis ATCC 6633	1.9	***
Listeria monocytogenes PTCC 1294	7.8	500
Pseudomonas aeruginosa	1.9	500
Proteus mirabilis	1.9	250
Escherichia coli O157 12900 NTCC	0.9	250
Candida. albicans ATCC 10231	3.9	500
Saccharomyces cerevisiae	7.8	250
Aspergillus niger ATCC 16404	125	500

Nasrin Fayyaz *et al.*

Table 3: MIC and MBC of several plant extracts

Extract	Bacterial species	MIC$_{(mg/ml)}$	MBC$_{(mg/ml)}$	Reference
Ehinophora platyloba	Candida. albicans	1560	3120	(Avijgan et al, 2006)
	S.aureus	3100	12500	
Thymus Vulgaris	P. aeruginosa	>500	***	(Firas et al.2007)
	E. coli	250	***	
	P. mirabilis	62/5	***	
	B. Cereus	31/2	***	
	S.aureus	15/6	***	
Pimpinella anisum	P. aeruginosa	>500	***	(Firas et al.2007)
	E. coli	500	***	
	P. mirabilis	125	***	
	S.aureus	62/5	***	
	B. Cereus	125	***	
Ehinophora platyloba	S.aureus	0/9	500	(Current study)
	B. subtilis	1/9	***	
	L.monocyogenes	7/8	500	
	P. aeruginosa	1/9	500	
	P. mirabilis	1/9	250	
	E.coli	0/9	250	
Mentha pulegium	L.monocyogenes	2.6	***	(Teixeira et al., 2012)
	E.Coli	3.2	***	

Table 4: diameter of formed halos of extract in disk diffusion method in millimeters

Test bacteria			Halo diameter in millimeters				
			31.25	62.5	125	250	500
Staphylococcus aureus ATCC 6538			11	13	15	16	18
Bacillus Subtilis ATCC 6633			11	13	13	14	15
Listeria monocytogenes PTCC 1294			12	12	13	14	15
Pseudomonas aeruginosa			11	13	14	14	16
Proteus mirabilis			***	10	12	15	17
Escherichia coli O157 12900 NTCC			***	10	12	14	16
Candida. albicans ATCC 10231			12	12	13	14	18
Saccharomyces cerevisiae			15	16	16	17	17
Aspergillus niger ATCC 16404			***	***	13	16	18

Table 5: the diameter of the inhibition zone in various antibiotics (µg / disk) in millimeters

Test bacteria			Halo diameter in millimeters		
			Gentamicin	Natamycin	Ampicillin
Staphylococcus aureus ATCC 6538			12	13	20
Bacillus Subtilis ATCC 6633			12	19	24
*Listeria monocytogenes **PTCC 1294***			***	14	15
Pseudomonas aeruginosa			***	12	23
Proteus mirabilis			11	12	24
Escherichia coli O157 12900 NTCC			10	13	20
Candida. albicans ATCC 10231			***	***	10
Saccharomyces cerevisiae			14	12	17
Aspergillus niger ATCC 16404			13	15	22

Nasrin Fayyaz *et al.*
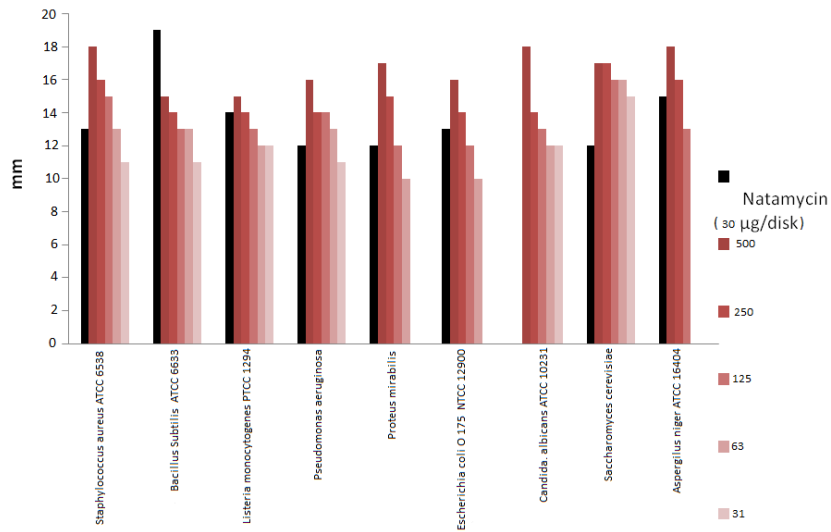
Figure 2: Comparison between the inhibition zone diameter of extract and Natamycin antibiotics.
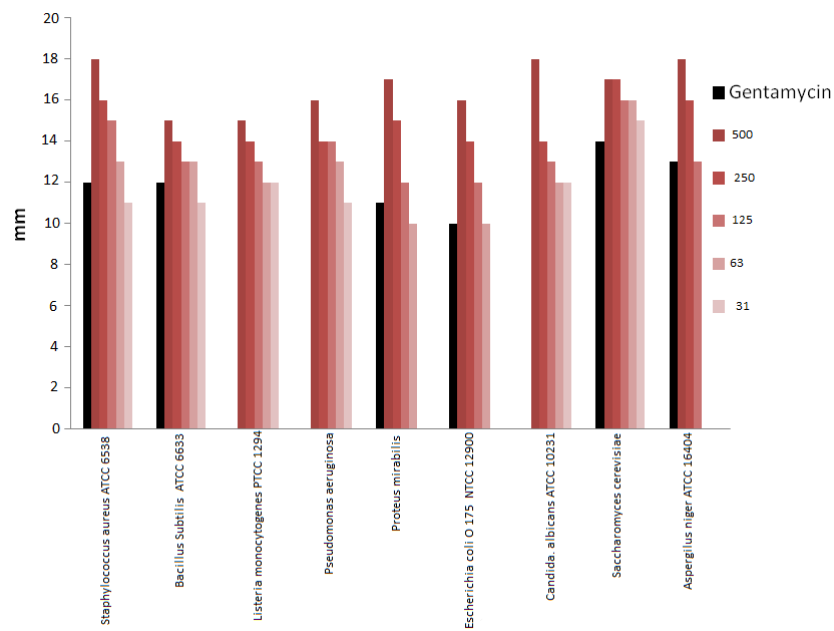
Figure 3: Comparisons between the diameter of the inhibition of the extract and Natamycin antibiotic

Nasrin Fayyaz *et al.*
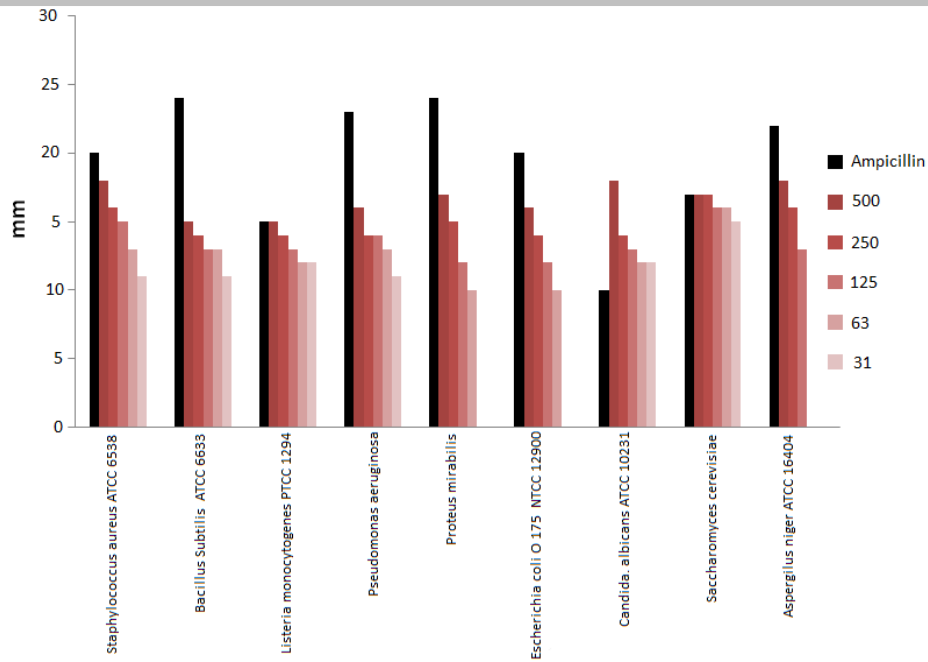
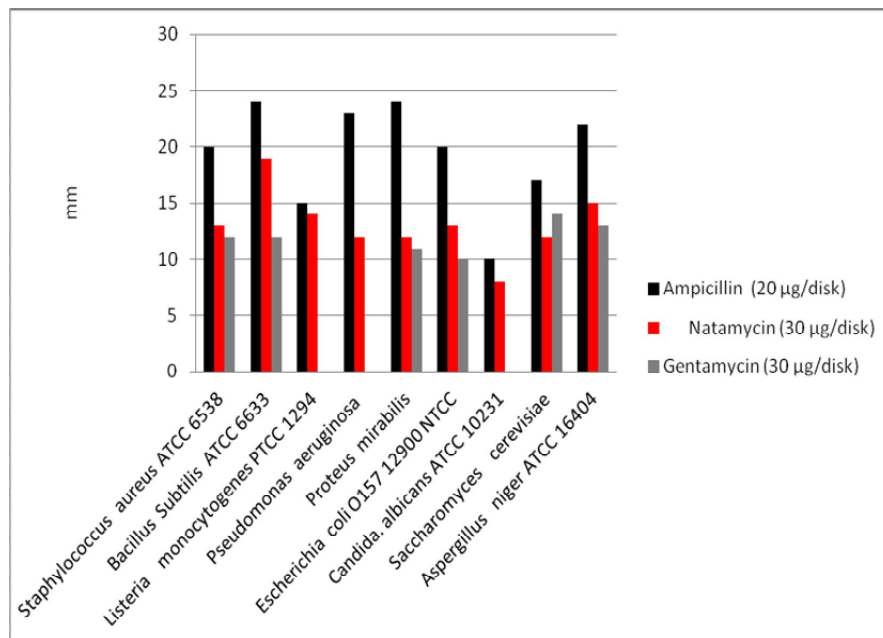**Figure 4: Comparison between the diameter of the inhibition of the extract and ampicillin antibiotic**

Figure 5: Comparison between the inhibition zone diameters of antibiotics.

Nasrin Fayyaz *et al.*

Table 6: Turbidity difference between the concentrations of the extract

Microorganism Name	Extract concentration									
	0.9	1.8	3.9	7.8	15.62	31.25	62.5	125	250	500
Staphylococcus aureus ATCC 6538	0.979a	0.9237b	0.8873c	0.9857a	0.9703a	0.9183b	0.9253b	0.8753c	0.6867d	0.4117e
Bacillus Subtilis ATCC 6633	1.0155ab	1.0725a	1.0785a	1.0275ab	0.993b	0.985b	0.8295c	0.593e	0.724d	0.5395e
Listeria monocytogenes PTCC 1294	1.145a	1.1385a	1.13a	0.85b	0.75c	0.608d	0.59d	0.586d	0.495e	0.4945e
Pseudomonas aeruginosa	1.224a	1.225a	1.3137a	1.1877b	1.1033c	1.0927c	0.9997d	0.9283e	0.747f	0.4253g
Proteus mirabilis	1.1183d	1.1253b	1.101b	1.0553c	1.121b	1.128ab	1.1593a	1.1067b	0.8967e	0.4833f
Escherichia coli O157 12900 NTCC	0.9407a	0.9406a	0.8417cd	0.8883b	0.8563c	0.8347de	0.8163e	0.7793f	0.6697g	0.412h
Candida. albicans ATCC 10231	1.18a	1.032b	0.84c	0.8265cd	0.769d	0.622e	0.605e	0.535f	0.455g	0.421g
Saccharomyces cerevisiae	1.315a	1.265a	1.195b	1.1205c	0.952d	0.936d	0.771e	0.5075f	0.453g	0.427g
Aspergillus niger ATCC 16404	1.223a	1.2a	1.1237a	1.2077a	1.2943ab	1.2483c	1.171d	1.1017d	0.7197e	0.4083g

Nasrin Fayyaz *et al.*
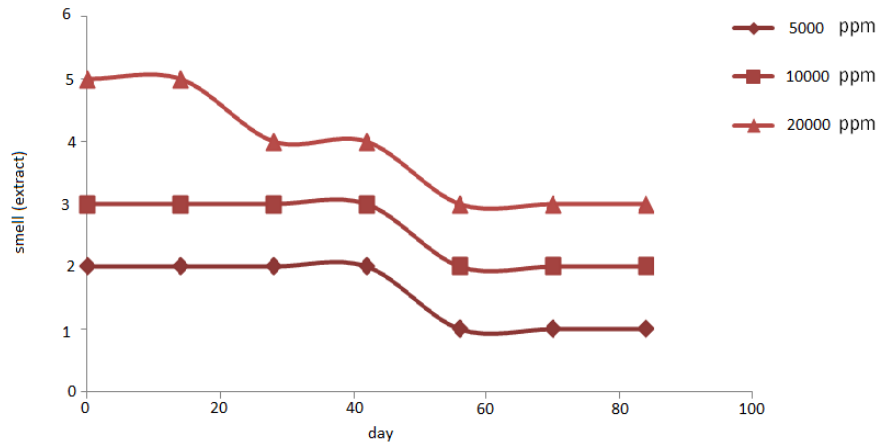
Figure 6: Effect of Prickly parsnip extract concentration on the smell of heat treated doogh within 84 days.
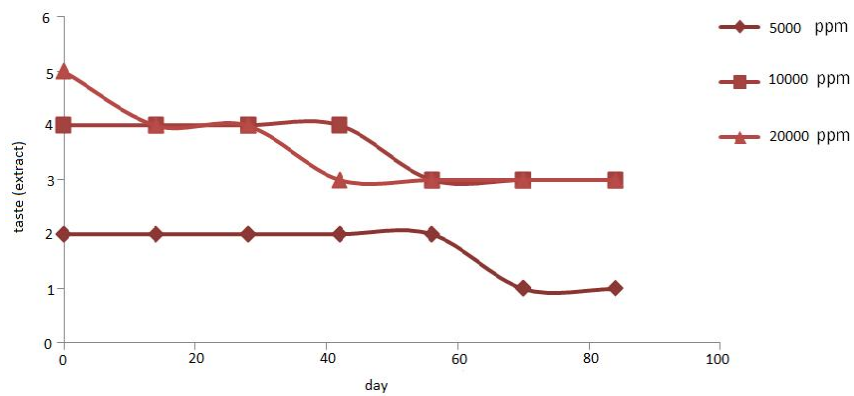
Figure 7: Effect of Prickly parsnip extract concentration on taste of Heat treated Doogh within 84 days.
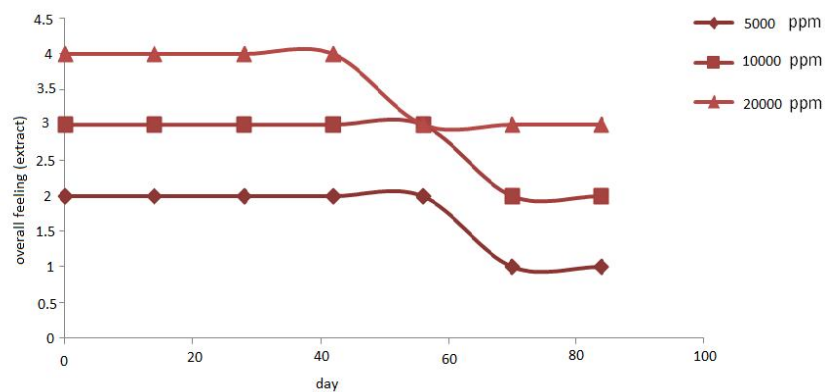

Figure 8: Effect of Prickly parsnip extract concentration on overall feeling of Heat treated Doogh within 84 days.

RESEARCH ARTICLE

The Inter Relationship between Service Features, Job Satisfaction and Customer Satisfaction (Case Study: Branches of Agricultural Bank in North and East of Tehran)

Sousan Alaei[1]* and Ghazaleh Afsari[2]

[1]Department of Art and Cultural Management, Faculty of Management and Social Science, North Tehran Branch, Islamic Azad university, Tehran, Iran.
[2]Department of Commercial Management, Faculty of Management and Social Science, North Tehran Branch, Islamic Azad university, Tehran, Iran.

*Address for correspondence
Sousan Alaei
Department of Art and Cultural Management,
Faculty of Management and Social Science,
North Tehran Branch, Islamic Azad university,
Tehran, Iran.

ABSTRACT

Today, human factors play crucial role in organizations success. Organization employees are important information sources to guide the services based on customer needs and have key role in increasing customer perception of services. Job satisfaction of employees is the main factor of achieving customer satisfaction. On the other hand, customers' satisfaction is mostly dependent upon service delivery process. The investigation of the internal relation between the variables and determining their effect can attract the satisfaction of customers via job satisfaction of employees under current competitive conditions. This study is applied in terms of purpose and is descriptive-survey in terms of data collection. The study population is 250 employees of agricultural bank branches in the east and north of Tehran, of which 151 people are selected by simple random method. For data collection, 3 standard questionnaires are used: The quality of SERQUAL services, job satisfaction of Spector and Lam customer satisfaction. The data are analyzed using descriptive and analytical statistics (confirmatory factor analysis, path analysis technique, VIF statistics and Kolmogorov-Smirnov test). The results show the internal relation between study variables as follows: the impact of interaction features of services on customer satisfaction is 0.411, the impact of physical features on customer satisfaction is 0.408, the impact of interactive features of services on physical features is 0.851, the impact of job satisfaction on interactive features of services is 0.343, the impact of physical features of services on job satisfaction is 0.505. The mediating impact of

Sousan Alaei and Ghazaleh Afsari

physical features between interactive features and customer satisfaction is 0.347 and the impact of mediating of interactive features between job satisfaction of employees and customer satisfaction is 0.140. The mediating role of job satisfaction of employees between physical features and customer satisfaction and the impact of job satisfaction on customer satisfaction were not supported.

Key words: Services features, Job satisfaction of employees, Customer satisfaction, Quality management

INTRODUCTION

To continue and outperform the competitors in competition market and their own progress, organizations should identify the problems at the shortest time. The best way to fulfill this goal in organization is recognition of interests, needs, desires, and awareness of opinions, recommendations and critics of employees of organization. As services of organization are presented via them , they are aware of the problems in terms of direct relation with organization activities. On the other hand, the role of customer in organizations and companies with direct impact on organization growth and profitability cannot be ignored (Samadi, 2009). Thus, keeping good customers in long-term is much useful than attracting new customers. The customers with high satisfaction of organization express their positive experiences to others and it is an advertisement for organization and this reduces absorbing new customers. This is of great importance for banks as their reputation and expressing positive points by others is key information source for new customers (Venus, 2002).

Thus, being informed of image of organization by customers and effective factors can provide suitable strategies and improve performance level. The increase of quality of services is a method to achieve success in banking industry. Thus, improving the quality of services is of great importance as it has considerable effect on reduction of costs, increasing satisfaction level, customer retention, increasing profitability and Word of mouth (Mohammadi, 2009).

Awareness of the concept of services quality and its improvement can lead to presenting high quality services and by increasing services quality, we can increase customers' satisfaction. Thus, all monetary, financial, credit institutions and banks attempt to present better services to customers. Like all banks, agricultural bank requires creating a strategic view to design and presenting services to achieve customer satisfaction. Based on the importance of mentioned items, the present study aimed to investigate the internal relation between service features, job satisfaction and customer satisfaction of branches of agricultural bank in the north and east of Tehran city.

Theoretical Basics of Study

Customer satisfaction is a key factor in future purchases intention of customers. Also, satisfied customers talk about good experience with others. This is of great importance in the culture of eastern countries with high communication in social life with other people in society (Jamal and Nasser, 2002). In measurement of customers' satisfaction, the most important evaluated issue is the method of presenting services. The services make the customer satisfied or dissatisfied. According to organization, in terms of customer, it is an opportunity to prove organization capabilities as service providers and it is to increase customer loyalty. Positive and negative interactions cause that the customer is doubtful regarding the consistency in service delivery. Thus, attracting customer satisfaction in all service interactions has major benefits for company (Hosseini Hashemzade, 2008). Customers' satisfaction is dependent upon services quality and we can say by increasing services quality, customers satisfaction is increased. This attitude to customer commitment refers to tendency to return (stability of service purchase), development of commercial relations between the customer and service provider, increasing tolerance and customer patience to probable shortcoming of future services and also increasing positive advertisement about organization (Roberts, et al., 2003). Service includes the economic activities generating value for customers at definite time and place and transfers positive and good meaning to the service recipient (Lovelock and Wright, 2006).

Sousan Alaei and Ghazaleh Afsari

Services have some features distinguishing them from other goods: Customers don't obtain the ownership of services, Service products are intangible performances, there is greater involvement of customers in the production process, there is typically an absence of inventories, the time factor is relatively more important and finally delivery systems may involve both electronic and physical channels (Lovelock and Wright, 2006).

Quality is the most important factor in purchase decisions. In addition, like reduction of operating costs and productivity growth, quality plays important role in increasing market share and return rate of investment (ZIvaryar, 2011). The quality of the services received by customers compared to what customers imagine the s service provider can present (customers' expectation) arises from what the service providers can provide (Parasuraman and Zeithaml, 1994). A service organization can take one of two main methods of reactive or passive, strategic or active service quality management.

On the other hand, job satisfaction of employees shows the attitude and feelings of people about the entire job or its various aspects. One individual can be highly satisfied of some aspects of his job and less satisfied with other aspects (Spector, 2008). The effective factors on job satisfaction of employees are classified into two main groups: First, environmental factors and job related factors with the highest impact on job satisfaction and include the behavior of people, job duties nature, communication with other people in work place and rewards, Second: Individual factors that people transfer to their job, as previous experiences of a person and personality. Both types of factors interact with each other. The consistency between job and worker is important in job satisfaction of employees (Kristofer, 1996).

Theoretical Framework of Study

In the review of literature, to evaluate the quality of services, among various models as Lehtinen and Lehtinen, Gronroos and SERVQUAL, SERVQUAL is selected as it can rank services quality dimensions based on importance from the customer view.

Servqual model consists of 22 componets as follows (Seyed Javadin, 2005):

Tangible factors (modern equipment, considerable physical facilities, clean and neat employees, regular documents).Reliability (doing the tasks at definite time, showing much interest to solve the customer problems, doing the reforms at the immediate time, performing services at definite time, presenting reports without any mistake).

Responsiveness (employees tell the customers to do which services exactly, the employees give immediate services to customers, the employees are inclined to help the customers, the employees are prepared to respond to the questions of customers).

Assurance (employees behavior creates trust among the customers, customers feel secure in their interactions with organization, employees are polite to customers, employees have adequate knowledge to respond the customers questions).Empathy (individual attention to customers, suitable working hours for all customers, employees show personal consideration to customers, they need the best benefits for customers, employees perceive specific needs of customers).

Regarding the evaluation of job satisfaction, among need satisfaction models of Porter (1961) and Job satisfaction scale Spector (JSS,) (1985(Spector model evaluating 9 dimensions of job satisfaction is selected. The nine dimension of this model include:

Sousan Alaei and Ghazaleh Afsari

Pay, Promotion, Supervision, Fringe benefits, Contingent rewards, Operating Conditions, Coworkers, Nature of work and communication (Zaki, 2004).

To evaluate customer satisfaction, after the study of various models and theories as Kano and Shun Yin Lam, Lam model is selected. Lam presented his customer satisfaction questionnaire in Singapore in 2004. The customer satisfaction questionnaire of Lam consists of 5 dimensions as suitable for customers referring, fairness in behavior with customers, meeting the customers' expectations, general satisfaction of customers of services and general satisfaction of customers of communicating with this branch (Lam, 2004).

Pantouvakis and Bouranta (2011) model is used to show the relation between variables and conceptual model of study showing the relation between three variables of study. Figure 1 indicates conceptual model of study.

Study Hypotheses

Based on the theoretical framework and conceptual model of study, the following hypotheses are considered:
The service features (interactive and physical) are effective on customers' satisfaction of received services.
Interactive features of services are effective on physical features of services.
Job satisfaction of employees is effective on interactive features of services.
Physical features of services are effective on job satisfaction of employees.
Job satisfaction of employees is effective on satisfaction of customers.
Physical features of services are mediating between interactive features of services and satisfaction of customers.
Job satisfaction of employees is the mediating between the physical features of services and customers satisfaction.
Interactive features of services are meditating between job satisfaction of employees and customers' satisfaction.

METHODOLOGY

The present study is descriptive-survey and as it evaluates the relation between independent and dependent variable is correlation type. The study population is including all employees of branches of agricultural bank in the north and east of Tehran city and the number of employees of these branches is 250, of which 151 people are selected by simple random method. The questionnaires are distributed among 160 people and 151 questionnaires as completed correctly are analyzed.

For data collection, besides library studies, three standard questionnaires of services quality evaluation SERQUAL, Lam customer satisfaction and Spector job satisfaction are used and their validity and reliability are confirmed in the previous studies. To be sure of its validity, the opinions of lecturers, managers and experts of agricultural bank are used. To evaluate reliability of measures, Cronbach's alpha is used. Total Cronbach's alpha is 0.918 and its value is acceptable.

For data analysis in descriptive and analytic levels, SPSS and LISREL software are used. At first, at descriptive level, by statistical indices, we can describe and summarize the demographic features and descriptive data of study variables are used and then to test significance of variables relations and fitness of measured models, Confirmatory factor analysis is applied. Also, path analysis technique is used for modeling dependent variables based on linear relation of some independent variables. It can be said that to evaluate the fitness of regression sub-models to evaluate co-linearity among the variables, VIF statistics is used and Kolmogrov-Smirnov test is used to evaluate normality of residuals and finally path analysis is performed to be sure of validity of regression models.

STUDY FINDINGS

The demographic features condition is as follows: In terms of gender, 53% men and 47% women and in terms of age, most respondents 78.1% are between 31 to 40 years. In terms of education, 14.6% have diploma, 18.5% associate, 51.7% BA and 15.2% MA and above. In terms of work experience, 15.2% of respondents are below 6 years, 23.8% of respondents between 7-12 years, 49.0% are ranging 13-18 years, 7.9% between 19-24 years and 4.0% of them have 25-30 years' work experience. In terms of organizational position in branch, 13.2% of respondents are in bank affairs, 49.7% banker, 25.8% top banker and 11.3% chief of branch.

Study hypotheses test

First hypothesis test
Interactive features of services (independent variable)- customer satisfaction (dependent variable)
Physical features of services (independent variable)- customer satisfaction (dependent variable)

The results of Table 1 show that interactive features (IF) and physical features (PF) have significant effects on customer satisfaction (CS). As their P-value is smaller than 0.05 and T-value is greater than 1.96. The path coefficient of interactive features impact on customer satisfaction is 0.411 and path coefficient of physical features on customer satisfaction is 0.408. The second and fourth columns of this Table show non-standardized coefficients (B) and standardized coefficients (Beta) for each variable. In non-standardized coefficients, the variables scale is not similar but in standardized coefficients, variables scale is similar and we can compare the variables. Thus, to compare the effects of some independent variables on dependent variable, we can apply standardized coefficients. Thus, we can say the order of effective factors on customer satisfaction is including interactive and physical features.

Second hypothesis test: Interactive features (independent variable)-Physical features (dependent variable)

The results of Table 2 show that interactive features variable (IF) has significant effect on physical features (PF) as its P-value is smaller than 0.05 and T-value is above 1.96. Path coefficient is equal to 0.851.

Third hypothesis test: Job satisfaction (independent variable)- interactive features (dependent variable)

The results of Table 3 show that job satisfaction (JS) has significant impact on interactive features (IF). As its P-value is smaller than 0.05 and t-value is bigger than 1.96. In addition, path coefficient is 0.343.

Fourth hypothesis test: physical features (independent variable)-job satisfaction (dependent variable)

The results of Table 4 show that physical features (PF) has significant impact on job satisfaction (JS) as p-value is smaller than 0.05 and T-value is bigger than 1.96. The path coefficient is 0.505.

Fifth hypothesis test: Job satisfaction (independent variable)-customer satisfaction (dependent variable)

The results of Table 5 show that job satisfaction variable (JS) has no impact on customer satisfaction (CS) as their p-value is bigger than 0.05 and T-value is smaller than 1.96.

The investigation of hypotheses 6-8 hypotheses with mediating variable

Sousan Alaei and Ghazaleh Afsari

As it was said, as hypothesis 5, the impact of job satisfaction and customer satisfaction is not confirmed , thus mediating role of job satisfaction is not confirmed. Thus, hypothesis 7 in which job satisfaction variable is raised as mediating variable can be rejected.

The result of hypotheses test with the impact is shown in Table 6.
The direct and indirect effects of each of independent variables on dependent variable are shown in Table7.
Based on the direct and indirect effects of each of the variables in the above Table, the impact of interactive features on physical features (H2) has the highest impact.
Finally, the study model based on study findings is presented in Figure 2.

DISCUSSION AND CONCLUSION

The results showed the internal relation between study variables and only the impact of job satisfaction on customer satisfaction was not supported. The hypotheses test shows that interactive features variable of services as 0.411 and physical features services as 0.408 are effective on customer satisfaction. We can say that the order of effective factors on customer satisfaction is including interactive features and physical features. The impact of interactive features of services on physical features is 0.851. The effect of job satisfaction on interactive features is 0.343 and the impact of physical features of services on job satisfaction is 0.505. In the second section, the impact of mediating of physical features regarding interactive features and customer satisfaction is 0.347. The mediating role of job satisfaction of employees between physical features and customer satisfaction is not supported. On the other hand, the impact of mediating of interactive features between job satisfaction of employees and customer satisfaction is 0.140. It means that the employees' satisfaction leads to better quality of services. The improvement of interactive quality of services leads to customer satisfaction and improvement of image of customers of business environment.

Based on the investigation of all study variables and analyses results, the followings are proposed.

The managers of banks interested in improvement of customers' satisfaction should consider physical and interactive features and have specific emphasis on physical environment of services due to the impact on job satisfaction of employees. They should pay much attention to technical progresses, cash investment and equipment. The efforts and resources should be dedicated to improvement of relations, greater equipment, lighting, security and etc.

To increase services quality in terms of tool to present services, it is required to present all brochures and forms as cash drawing and entering available to customers.

To establish order in documents archive, standard systems execution of services quality as ISO standard can be recommended to the bank managers.

To increase customer satisfaction in terms of tangible factors of service quality, it is proposed that managers have specific attention to internal and external space of bank in terms of aesthetics and health and by using cooling and heating tools, water cooler, chair and modern equipment as ATM, telephone and internet services and SMS can increase the services quality.

Establishing relation with customers and continuous evaluation of their opinions regarding their satisfaction, of the quality of services and using critical opinions of customers of bank at appropriate time.

Holding at-service training courses for the employees of branches due to direct and face to face relation with customers, because branches employees should present service to customers.

Sousan Alaei and Ghazaleh Afsari

REFERENCES

1. Spector, P. (2008). Industrial and organizational psychology. Translated by Shahnaz Mohammadi. Arasbaran publications. Tehran. First edition, Third publications.

2. Hosseini Hashemzade, D. (2009). The investigation of effective factors on satisfaction of customers of industry and mine bank, Tehran. Business management. 2.

3. Zaki, M. A. (2004). The investigation of the impact of job satisfaction dimensions on organizational commitment. Journal of administrative sciences and economy of Isfahan University. Year 16. 1.

4. Zivyar, F., Ziayi, M. S., Nargesian, J. (2011). The study of effective factors on customers satisfaction by SERQUAL model. Scientific-research journal of new marketing researches. Year 2, 3.

5. Seyed Javadin, R., Kimasi, M. (2005). Services quality management, Tehran, Negah Danesh publications. First edition.

6. Samadi, A., Eskandari, S. (2009). The investigation of the impact of services quality on customers satisfaction of Bank Meli of Tuiserkan town based on SERQUAL Model. Journal of management. Year 8. 21.

7. Lovelock, K., Wright, L. (2006). The principles and management of services marketing. Translated by Bahman Foruzande. Tehran. Amukhte edition.

8. Mohammadi, M. (2009). The study of satisfaction, loyalty, customer commitment in services (applied case of Bank Melat). MA thesis. Tehran University.

9. Venus, D., Safayian, M. (2002). Applied methods in marketing of bank services for Iranian banks. Tehran. Negah Danesh edition.

10. Jamal, A., Kamal, N. (2002). "Customer Satisfaction and Retail Banking: an Assessment of Some of Key Antecedent of Customer Satisfaction in Retail Banking", International Journal of Bank Marketing, 4: 146-160.

11. Kristofer, H. (1996). "Extrinsic and Intrinsic Job Satisfaction", Journal of Business Management, 2: 10-25.

12. Lam, S.Y., Shankar, V., Erramilli, M.K., Murthy, B. (2004). "Customer value, satisfaction, loyalty, and switching costs: an illustration from a business-to-business service context", Journal of the Academy of Marketing Science, 3: 293-311.

13. Pantouvakis, A. Bouranta, N. (2011), "The interrelationship between service features, job satisfaction and customer satisfaction" The TQM Journal, 2: 186-201.

14. Roberts, K. et al. (2003). "Measuring the Quality of Relationship in the Consumer Services: An Empirical Study", European Journal of Marketing, 1: 69-196.

15. Zeithaml, V. Leonard, A., Berry, L., Parasuraman, A. (1994). "The Nature of Customer Expectation of Service", Marketing Science Institute Research Program Series (May). Report, 91-113.

Sousan Alaei and Ghazaleh Afsari
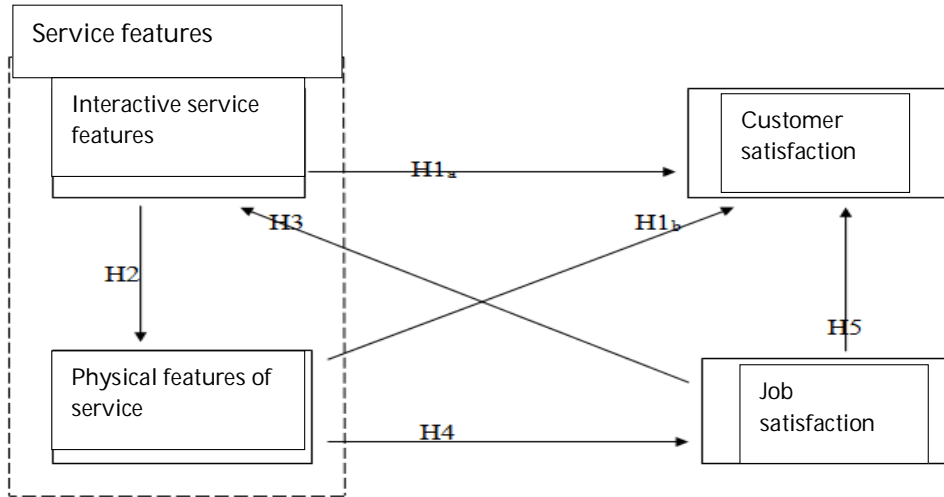
Angelos Pantouvakis, Nancy Bouranta "The interrelationship between service features, job satisfaction and customer satisfaction"(2011)186-201.

Figure 1- Conceptual model of study

Table 1- Regression coefficients of first hypothesis

Sub-model	Non-standard coefficients		Standardized coefficients	T	Sig	Co-linearity statistic
	B	Std. Error	Beta			VIF
Constant	0.965	0.263		3.670	0.000	
IF	0.411	0.091	0.384	4.509	0.000	2.303
PF	0.408	0.082	0.433	4.944	0.000	2.437

Table 2- Regression coefficients of second hypothesis

Sub-model	Non-standard coefficients		Standardized coefficients	T	Sig	Co-linearity statistics
	B	Std. Error	Beta			VIF
Constant	0.513	0.259		1.982	0.049	
IF	0.851	0.062	0.748	13.766	0.000	1.000

Sousan Alaei and Ghazaleh Afsari

Table 3- Regression coefficients of third hypothesis

Sub-model	Non-standard coefficients		Standardized coefficients	T	Sig	Co-linearity statistics
	B	Std. Error	Beta			VIF
Constant	2.956	0.215		13.753	0.000	
JS	0.343	0.061	0.420	5.645	0.000	1.000

Table 4- Regression coefficients of fourth hypothesis

Sub-model	Non-standard coefficients		Standardized coefficients	T	Sig	Co-linearity statistics
	B	Std. Error	Beta			VIF
Constant	1.424	0.318		4.481	0.000	
PF	0.505	0.078	0.471	6.511	0.000	1.000

Table 5- Regression coefficients of fifth hypothesis

Sub-model	Non-standard coefficients		Standardized coefficients	T	Sig	Co-linearity statistics
	B	Std. Error	Beta			VIF
Constant	0.965	0.263		3.670	0.000	
JS	-0.062	0.056	-0.07	-1.099	0.274	1.302

Table 6- The results of study hypotheses test

	Study hypotheses	Coefficient of determination	Path coefficient	Result of hypothesis test
H_{1a}	The impact of interactive features of services on customer satisfaction	17	0.411	Supported
H_{1b}	The impact of physical features of services on customer satisfaction	16	0.408	Supported
H_2	The impact of interactive features on physical features of services	72	0.851	Supported
H_3	The impact of job satisfaction on interactive features	12	0.343	Supported
H_4	The impact of physical features of services on job satisfaction of employees	25	0.505	Supported
H_5	The impact of job satisfaction of employees on	-	-	Rejected

Sousan Alaei and Ghazaleh Afsari

	customers satisfaction			
H_6	The physical features of services mediating the relation between interactive features and customers satisfaction	12	0.347	Supported
H_7	The job satisfaction of employees as the mediating relation between physical features and customers satisfaction	-	-	Rejected
H_8	Interactive features of mediating the relation between job satisfaction and customers satisfaction n	20	0.140	Supported

Table 7- The comparison of the direct and indirect effects of study hypotheses

The impact of interactive features of services on customer satisfaction

Type of impact	Path	Coefficients
Direct	$H1_a$	0.411
Indirect	$H2, H1_b$	$(0.851)(0.408)=0.347$
Total indirect effects	-	0.347
Total direct and indirect effects	-	0.758

The impact of physical features of services on customer satisfaction

Type of impact	Path	Coefficients
Direct	$H1_b$	0.408
Indirect	$H4, H5$	$(0.505)(0)=0$
Indirect	$H4, H3, H1a$	$(0.505)(0.343)(0.411)=0.071$
Total indirect effects	-	**0.071**
Total direct and indirect effects	-	0.479

The impact of interactive features of services on physical features of services

Type of impact	Path	Coefficients
Direct	H2	0.851

The impact of job satisfaction on interactive features of services

Type of impact	Path	Coefficients

Sousan Alaei and Ghazaleh Afsari

Direct	H3	0.343

The impact of physical features of services on job satisfaction

Type of impact	Path	Coefficients
Direct	H4	0.505

The impact of job satisfaction on customer satisfaction

Type of impact	Path	Coefficients
Direct	H5	-
Indirect	H3, H1a	(0.343)(0.411)=0.140
Total indirect effects	-	0.140
Total direct and indirect effects	-	0.140

Table 8- The results of study hypotheses test based on the highest direct and indirect effect

	Study hypotheses	Coefficient of determination	Path coefficient	Result
H_2	The impact of interactive features on physical features of services	72	0.851	Supported
H_4	The impact of physical features of services on employees job satisfaction	25	0.505	Supported
H_{1a}	The impact of interactive features of services on customer satisfaction	17	0.411	Supported
H_{1b}	The impact of physical features on customer satisfaction	16	0.408	Supported
H_6	The impact of physical features of services mediating the relation between interactive features and job satisfaction	12	0.347	Supported
H_3	The impact of job satisfaction on interactive features	12	0.343	Supported
H_8	The interactive features mediating the relation between job satisfaction and customers satisfaction	20	0.140	Supported
H_5	The impact of job satisfaction of employees on customers satisfaction	-	-	Rejected
H_7	Interactive features of mediating the relation between job satisfaction and customers satisfaction	-	-	Rejected

Sousan Alaei and Ghazaleh Afsari
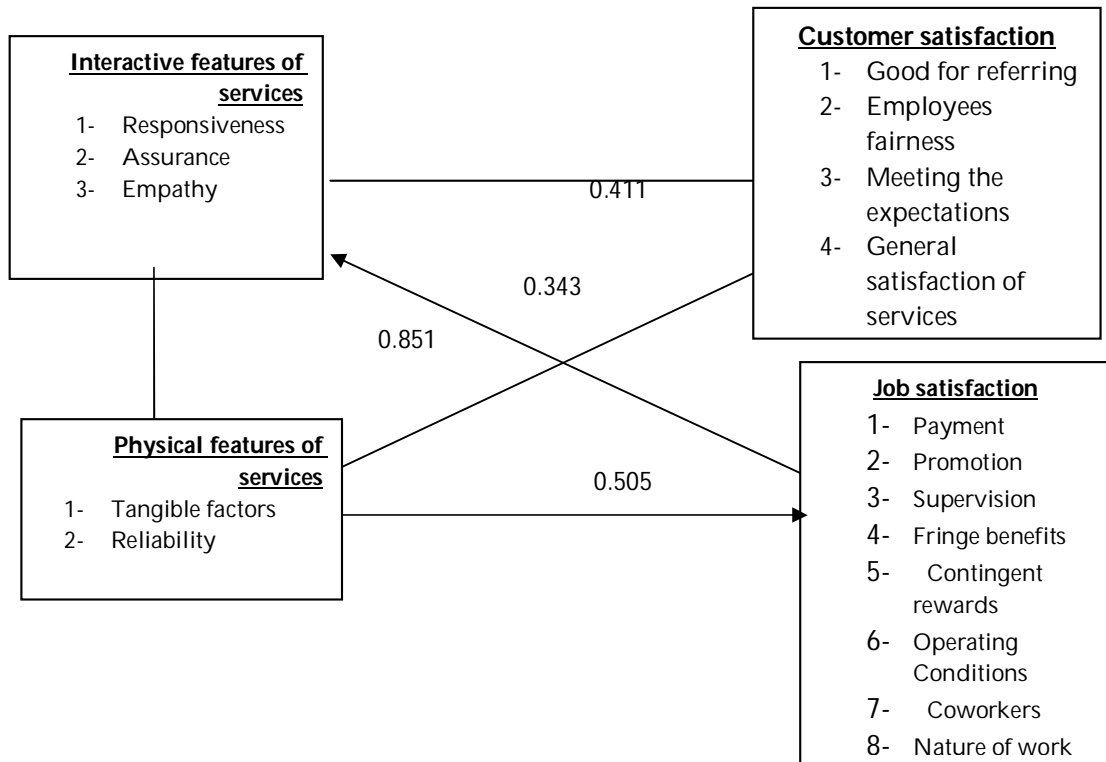
Figure 2- Tested model of study

RESEARCH ARTICLE

Reinforced Concrete Enhancement Using Frp Sheets

Seyed Jalal Khaleghi, Benyamin Ganjeh Khosravi and Milad Jahanchi*

[1]Department of Civil Engineering, Faculty of Central, Lahijan Branch, Deylaman Institute, Lahijan, Iran.

*Address for correspondence**
Milad Jahanchi
Department of Civil Engineering,
Faculty of Central, Lahijan Branch,
 Deylaman Institute,
 Lahijan, Iran.

ABSTRACT

One of the most important factors affecting the joint performance in reinforced concrete structures is armature layout in joints or in other words connection confinement which leads to difficulties in building and performance. Confinement connection is possible with the implementation of the stirrups and longitudinal armatures and recently using FRP sheets.In this study, first the concepts of the performance of the joints in the concrete structures reinforced with fiber polymer (FRP) has been investigated and in the following, in order to investigate the moment frame joints, different models in different modes of moment frames ofdifferent states of joints with strrups in presense and absence of FRP sheets were evaluated. The results of this study suggest that the use of GFRP sheets in comparison with FRP sheets increased ductility but its force resistance vs displacement is less than the FRP sheets. In reinforced concrete columns,the destruction caused by the earthquake led to the failure of column before the plastic hinge formation in the beam.As a result, various methods to improve the capacity of bending, shear and ductility of columns by increasing lateral confinement of plastic hinge region is presented which provided a good performance during different earthquakes including the use of jacket concrete and FRP fibers. Increasing the number of FRP sheets from 1 to 3 layers increases the resistance, but with an increase of 3 to 5 layers, its effect disapears and adding more layers does not increase loading capacity. The non-using of FRP sheet and the transverse stirrups also reduces ductility and resistance and as a result the use of at least one of the abovementioned factors appears mandatory.

Key words: reinforced, FRP, enhancement

Milad Jahanchi *et al.*

INTRODUCTION

In order to provide stability and prevent serious injuries in a reinforced concrete structure occured in the case of the earthquake, significant shear forces that are created in the joints and thereby a many forms of change in the structure is common.reinforced concrete joints in the structure, in addition to providing sufficient strength to withstand the forces must be able to withstand the formed deformations.Because the tensile stresses formed in the connection via the intermittent loads of fissuring in the diameters of their structures caused by the earthquake, it will eventually led to the destruction. Hence, in the design of a reinforced concrete joint, connections should be designed in such a way that be able to resist moreagainst the forces exerted from the adjacent members to use the maximum capacity of its connected members.Ductile connection should be such that prevent it from its brittle failure. when the earthquake occures, reasonable force energy dissipation must be observed in the structures. Width cracks under operational loads should be limited and acceptable. Rebar placement arrangement should be in a way that have the appropriate administrative ease. the joint displacementshould be prevent significant structural shift by moderate earthquakes and remains in the resilient range . In the case of severe earthquake and after the formation of the plastic hinge, the joint must be able toexperience change in many ways without substantially reduction in the resistance and also during an earthquake, it is desirable that the plastic hinges formed out of the joint area (weak beam – column recommendation).

For a structure to havegood ductility and resistance capacity against the lateral load capacity and could absorbe sufficient energy in the face of the power, the philosophy of weak beam and strong power must be considered in the design time.In other words, plastic hinges first form in beams and then in the columns and possibly their formation in the joints shold be prevented(Li, J., et al.(2002)).Usually this hinge form in beams and near the columns faces under the lateral load and this formation may influence the formation of cracks in the inside of joints and reduces the loading capacity or early destruction.Several strategies in the past few years have been provided to meet the objective of the proposed research that mainly refers to the rebar placementin the joint region.But because the low space of the joint to the armature, implemented connections will not often execute well and therefore it needs to address this problem.

As mentioned in the previous section, in recent years, polymer fibers (FRP) is very common for seismic strengthening of reinforced concrete buildings, especially in the joints of the structure. The construction method is that the walls of the building are reinforced by strips of plastic and carbon fiber or glass attached to the surface as a cross or vertical walls. Polymer cross stripes on the wall increases the strength and ductility of the wall in the direction and perpendicular to the wall plate. Due to the above mentioned issues,firstly, the concept of performance of the joints in concrete structures reinforced with fiber polymer (FRP) has been investigared and its general formulations have been evaluated. In the following, in order to investigate the behavior of the frame bending joints, different modes of moment frames with different states of joint with strrups in presense and absence of FRP sheets were evaluated.For the validation of the results obtained in each case, the results of validation were compared with experimental models.

LITERATURE SERVEY

Research and reports about the failure of reinforced concrete structures show that many of these structures have failed in connections. Procedures for the design of reinforced concrete structures have provided various criteria. These rules are codified to ensure sufficient joint strength and confinements to provide the necessary ductility in the structure. Confinement and resistance in the joint depend on tranverse and longitudinal armatures in the joints based on existing regulations. That's why most of the joints in concrete structures, due to the high density of armaturesdo not perform well and arenot able to satisfy the conditions of a proper connection.Thus providing a convenient way to reduce congestion of armatures at the joints and facilitate the conditions of implementation is considered as an important issue (Talai Taba, S. B. (2003), Sharma, A. (2011)). Due to the above reasons, many researchers have attempted to investigate the factors influencing the behavior of this structural member. In research conducted on the behavior of reinforced concrete joints generally determination of the impact and effectiveness of the details of the

Milad Jahanchi *et al.*

implementation and execution of armaturesin joint behavior is investigated. In this context, the external use of FRP in reinforced concrete joints with the use of different techniques to confine concrete instead of mass use of stirrups is considered as a new idea.

These researcheshave continued between 1980 and 2000 by researchers such as Ehsani and White (1983) (Sharma, A. (2011)), Oda et al (1984) (Sharma, A. (2011), Bakis, C.E., et al (2002)),Abrams (1986), Ha et al (1992) (Mosallam, A.S. (2000)), Lu et al (1994) (Antonopoulos, C.P. (2002)), Cotto et al. (2000) (Ghobarah, (A. 2000)), Mosallam (2000) (Ghobarah, A. (2000)), Antonopoulos et al (2000) (Ghobarah, A. (2000)), Ghobarah et al.(2002) (Prota, A., et al (2001)), Mostowfi and Sobhani (2003) (Ghobarah, A.(2005)), Prota (2004), (Prota, A., et al (2001)),(Ghobarah (2005)(Mukherjee (2005), Al-Salloum (2007), Tsonos (2008), Karayannis (2008), Pantelides (2008) about the joints enhancement with the use of FRP and CFRP methods in various ways.

In 2010, Umut Akguzel investigated the results of experiments involving 4 control joints and 6 sample of enhanced joints in the twoshort and long half buildings. To evaluate the impact of minimum transverse stirrupsin control and reinforced sample in the first series of experiments, one stirrups were placed in the joints(Akguzel, U.(2010)). But in the second series of experiments, the samples were free of rebal placement cross the junction area. The results of experiment conclude the axial load changes on the lateral connections that increase deformation and a sharp reduction in the resistance and also recommendation for monitoring this effects in conventional designs. In the same year, Kien Le-Trung tested 8 samples included a non-seismic connection and a connection joint seismic and 6 joints reinforced with CFRP sheets in various forms of reinforcement. His test results revealed the effect of the use of reinforcement plates to increase the strength and ductility of joints. In this experiment,non-seismic samples showed brittle behavior and suffered a lot of damage during the experiment while seismic sampledemonstrated incraese in strength and good ductility (Le-Trung, K. (2010)).

Lee also (2010) tested three connection based on older regulations where there is no transverse rebarin the joint.The results of this study can be used to investigate the influence the reinforcement sheetes to increase rigidity, strength and energy dissipation.The researcher also presented an analysis to estimate the shear strength reinforced with FRP sheets and tested the accuracy of the proposed model with measured test results(Lee, W.T.(2010)) also conducted tests on joints reinforced with FRP sheets. Test results showed the effectiveness of the proper use of these sheets in increased hardness, strength, ductility and energy dissipation capacity of the connections.His research findings also pointed to a connection failure due to separation of the sheet or beginning of the plate separation. In other words, the importance of using a mechanical restraint system appropriate to prevent detachment of reinforcement sheetes is evident in this research (Mahini, S.S.(2010)).

Model Analysis

The use of composite materials in retrofitting and upgrading of structures is one of the world's newest academic debate and extensive research has been performed about the use of composite materials as the repairing and strengthening cover of concrete structures.Loadingcapacity, strength and ductility of concrete structurescan increaseby applying the retrofitted techniques.

In the following, in order to investigate the behavior of the moment frame behaviour, six models of (1) moment frame connections with transverse stirrups and without FRP sheet, (2) moment frame connections with inadequate stirrups and without FRP sheet, (3) moment frame connections with sufficient transverse stirrups and without FRP sheet, (4) moment frame connections without transverse stirrups and with GFRP sheets (sheets of glass fibers), (5) moment frame connections with transverse stirrups and GFRP sheets and also conditions related to the use of 3-layer and 5 layers of FRP sheetsin joints (sheets of carbon fiber), (6) moment frame connections without transverse stirrups and FRP sheet without wrappingthatFRP sheets only attached on the joints and the conditions related to the use of 3-layer and 5 layers of carbon fiber FRP sheets modeled and analyzed in Abaqus software. Also for validation of the

obtained results for the validation of models, in each case the obtained results are compared with the results of experimental models.

Characteristics ofmodeling elements for investigation of reinforced concrete joints behavior in Abaqus software

To account three-dimensional elementsof the concrete behavior, three-dimensional eight-node elements of C3D8R are used as follows.Also to examine the behavior of the concrete, plastic concrete damaged ductility model based on two types of failure mechanisms include failure by cracking tensile and compressive fracture of concrete is applied. Under uniaxial tensile,stress-strain response is in accordance with a linear elastic relation to the failure stress (σ_{to})and failure stress starts at the beginning of microcracks placed in concrete. Under uniaxial pressure, response is linear until the initial yield point (σ_{co}).In the plastic range, the response is generally characterized by the curing stress.When stress valuepasses from ultimate stress (σ_{cu}), the response is determined by strain softening. It assumes that the uniaxial stress-strain curve of concrete can be converted to the stress vs. plastic strain according to equation 1that in this relation T and c is related to tension and pressure.Parameters of $\varepsilon_t^{\sim pl}$ and $\varepsilon_c^{\sim pl}$ is related to the plastic strain rate of increase or decrease in tensile and compression modes, θ indicates the temperature,and $f_i(i=1,2,3,...)$ is preset for different areas.

When the sampling is performed in one of the stress-strain curve points in the strain softening area, the curve will branch. Because the response of unloading is weak and cause degradation in elastic resistance of materials. This elastic stiffness degradation can be described by two parameters of d_t and d_c as a function of plastic strain and temperature according to the following equation:

$$d_t = d_t(\varepsilon_t^{\sim pl}, \theta, f_i); \quad 0 \le d_t \le 1; \qquad d_c = d_c(\varepsilon_c^{\sim pl}, \theta, f_i); \quad 0 \le d_c \le 1; \text{(2)}$$

Variable damage can take a value between 0 to 1 and a value of zero indicates that the material is not damaged while the number 1 represents the concrete is completely damaged. If the E_0 parameter is equal to the initial elastic stiffness (not damaged) concrete, the stress-strain relationship under tensile and compressive loading will be as follows:

$$\sigma_t = (1-d_t)E_0(\varepsilon_t - \varepsilon_t^{\sim pl}); \qquad \sigma_c = (1-d_c)E_0(\varepsilon_c - \varepsilon_c^{\sim pl}); \text{(3)}$$

In this regard, the effective tensile and compressive stresses of the following equation is obtained:

$$\overline{\sigma}_t = \sigma_t/(1-d_t) = E_0(\varepsilon_t - \varepsilon_t^{\sim pl}); \qquad \overline{\sigma}_c = \sigma_c/(1-d_c) = E_0(\varepsilon_c - \varepsilon_c^{\sim pl}); \text{(4)}$$

Reinforced concrete structures modeled systemmeans a single one-dimensional reinforcement or embedded rowin concrete in the directed surfaces that these rebars are described with metal ductility models and the effects of integration between the steel and concrete has performed with descriptions of some of the tensile hardening concrete model to simulate the transport of loading carried in the bars like the slip bond insertion,. To introduce the transverse and longitudinal armatures in studied models, three-dimensional truss elements with linear transformations is used that these types of elements just transfer the axial force and would not tolerate any anchor.On the basis of the models, armatures are described together using concrete elements and truss elements have embedded in concrete.

Milad Jahanchi *et al.*

To model the FRP, S4R elements from the SHELL family element is used(Mahini, S.S. (2010), Mahini, S.S. (2009)) .In this model, the coupling between FRP sheet and concrete columns forms as a node,i.e. the body of the sheet with concrete columns will be absolutely continuous. Damages in FRP sheets aredefined by reducing hardness parameters that these parameters play a crucial role in the analysis of fiber reinforced composites.Many of the materials have a brittle elastic behavior that their damage begins withoutsignificant plastic deformation of the material that for this purpose, the fibers in the material is assumed to be parallel.

Model validation

Developing a reliable finite element model for a functional analysis seems necessary. Thus revising the model validity is one of the most important and necessary step in a numerical study.For this purpose, a sample of the results obtained in practicenumerically simulated using three-dimensional numerically simulation model and the accuracy of the model will be control using the results so that whatever this model is closer to the experimental conditions the errors reduce moreand more realistic results will be achieve in the software. Since the samples analyzed in this study generally includes states with and without FRP under axial and lateral load, so we tried to prepare an example of every experimental work and compare the found results to verify the modeling and analysis. It should also be noted that each of the models that have been proposed for validation have been analyzed with several different mesh analysis and appropriate and optimal mesh is selected after the ensurance of the convergence of the results.

Modeling of reinforced concrete columns wrapped by FRP fibers under axial and lateral load

The aim of modeling and analysis of the sample is to ensure the software Abaqus capabilities in modeling and simulation of FRP composite sheet and the confinement of concrete by these sheets. In this way, WI4 sample of Hosseini et al tested samples was selected and the results of numerical analysis have been compared with the results of the experiment of the sample (column confined by FRP fiber). In order to evaluate the effect of wrapping of reinforced concrete columns by the composite CFRP sheets on plasticity and loading capacity, six square columns divided into three groups,with the width of 260 mm, height 1650 mm and the base with dimensions of 400 x 500 x 900 mm under constant vertical load andreciprocating lateral load have been tested. Details of the columns I and II are designed according to the requirements of ACI for intermediate moment frames. Group I columns have wrapped with CFRP, group II are control and samples of group III are desined for Special Moment Frames in accordance with the requirements of ACI. Each of these groups consists of two columns $\rho_{sl} = 1.5\%$ and $\rho_{sl} = 3\%$ of longitudinal rebars that the ρ_{sl} parameters represents the longitudinal rebars in the concrete surface. As mentioned above, the modeled sample in this study is the WI4 column that is placed in the first group.

Based on the results of the test, for the special moment frames, wrapped column has better performance even than unwrapping columns but designed according to the requirements of ACI.Concrete tested in this study has the high resistance $f_c^{'} = 53\ MPa$. In the simulation model of reinforced WI4, given that the plastic damage model is used for the concrete, it is expected that the model has the ability to simulate confinement.by appling the unconfined concrete stress-strain of Hagnstad relationship. But it is important to note that the ultimate strain of confined concrete is considered 0.01 here. The study also showed that if the dilation angle for confined samples be less than unconfined ones, better results are obtained.Steel are also Grade40. To model the nonlinear behavior of the rebarsunder tension and pressure, the relationships that have been used beforeare applied. The used CFRP in this experiment consisted of three layers, each with a thickness of 0.16 mm, the ultimate tensile strength of 3500 MPa, the elastic modulus of 230 GPa and ultimate strain of 0.015 and the brittle fracture model was used to simulate the behavior of FRP sheets.Stress-strain relationship of composite tape until itsfractureis elastic-linear. Also the element used for FRP sheets arethe type of S4R (one of the all-purpose of Shell elements).

Milad Jahanchi *et al.*

As noted before, two independent loading system is used, first the constant axial load equals to 15 percent of maximum loading capacity of the column is applied on the column and then this loading is appliedto simulate the dead load on the column.Then the lateral loads with the help of a hydraulic cylinder of 500 kN in compressive and tensile direction to be imported. The following figures show the detailed modeling for validation.

By comparing the force-displacement curves of experimental model and finite element, it can be seen that there is good agreement between the results.However, as can be seen in the figure, the ultimate load analysis of samples is greater than the experimental sample.Perhaps the source of this error is the hardening behaviour of steels and related problems of numerically solving.Since in the confined sample definition pressure damage is important and also due to the extreme sensitivity of the model to these parameters, it would be said that numerical problems are more challenging in confinement problem.Analytical resultsshow greater difficulty in the elastic rangein copmarison with experimental results that is the intrinsic properties of a finite element model, because transformations within certain defined limits the displacement field and constraints created more difficulties and thus the more energy is absorbed and during the deformation of the surface is higher than the actual values.The selection of hexagonal elements and fully tangly backrest effects on increase of the original hardness.This issue reflects the fact that the used numerical model and selected Shell Elements for FRP sheets have the ability to simulate the confinement of concrete by FRP sheets.

Studied Model

In the following a three-dimensional frame (space) is shown as figure (6). First, in order to analyze the frame the state of without transverse amatures and without retrofitting with FRP sheets are considered (Figure 6 (b)), then a few number of armatuares is placed in the joints (distance of stirrups in this case is double value of standard position and about 15 cm), Yet the FRP sheets were not used (Fig. 7 (a)). Inthe next state, the transverse Stirrups which is suitably located at the junction (transverse amature spacing 7.5 cm) is considered while in this case, FRP sheets have not been used at the joints (Figure 7 (b)).Next, transverse Stirrups is not used and GFRP sheets were used (Figure 7 (b)). It should be noted that GFRP sheets is made froe the glass while FRP sheets is composed ofcarbonate.This state is considered to show the ductility of the used material. In the next state FRP sheets are used andtransverse Stirrupsis eliminated(Fig. 7 (b)). Also to consider the effect of the number of layers in this case, the number of 3 and 5 FRP layers has also been used and the results are also shown. In the last case, the FRP sheets are used where the wrapping mode is not used and the transverse stirrups also not been used (Figure 7 (b)). Beam and column frame surface area are 40 * 40 and 40 * 50, respectively, and 6 Armature with diameter of 18 mmand 8 armature with diameter of 18 mm were used in the beam and column, respectively and FRP sheet thickness is 1 mm.

Abbreviations used in the figures of the studied models are summarized in Tables 1 and 2. Also resistive characteristics ofGFRP and FRP sheets used in modeling is presentedin Tables 3 to 5. (1) moment frame connections with transverse stirrups and without FRP sheet, (2) moment frame connections with inadequate stirrups and without FRP sheet, (3) moment frame connections with sufficient transverse stirrups and without FRP sheet, (4) moment frame connections without transverse stirrups and with GFRP sheets (sheets of glass fibers), (5) moment frame connections with transverse stirrups and GFRP sheets and also conditions related to the use of 3-layer and 5 layers of FRP sheets in joints (sheets of carbon fiber), (6) moment frame connections without transverse stirrups and FRP sheet without wrapping that FRP sheets only attached on the joints and the conditions related to the use of 3-layer and 5 layers of carbon fiber FRP sheets modeled and analuzed in Abaqus software.

In Figures 8 to 10 cases of output graphics software such tensions arisen in the concrete moment frame, in the frame armatures using FRP sheets and FRP sheets in the joints is given.

The results of the study that evaluates the load-displacement curves for the cases mentioned in this research are demonstrated in the following figures.

Milad Jahanchi *et al.*

In concrete beams, stirrups which are perpendicular to the beam direction, provide the shear resistance. Due to low shear strength of concrete, the stirrups are used to provide sufficient shear strength in beams. If beam lacks sufficient shear strength, shear cracksare formed in the maximum cut place on the backrest at an angle of about 45 degrees. Polymer fibers as shear reinforcement for beams were putted in the side bar usually vertical or inclined (perpendicular to the shear cracks). Whatever the angle between the fibers perpendicular to the direction of shear cracks be less, their effect to increase the shear strength of the beam is more. Plastic strips that are used to enhance the shear beam can be U-shaped or totally covered. Beam-to-column connection is also sometimes fully covered by plastic sheets for retrofit of concrete buildingsat the junction of the beams and columns. This reinforcement techniques in addition of the shear and beam strength increase at the junction, will increase the ductility of the structure.

It should be noted that structural ductility i.e. the ability to withstand the plastic deformations, plays a decisive role in ensuring the stability of the building during an earthquake. Polymer sheets that are attached to the surface of the concrete are vulnerableagainst shock, heat, fire and ultraviolet and to prevent damage to the surface,enhancement with the reinforcement polymer can be used. In this way the slots with a depth less than the thickness of concrete cover is made and armatuares of carbon polymer (CFRP) are placed in the gaps. In this way, good adhesion between CFRP reinforcement member is created. In the following force-displacement graphs for different situations of reinforcement of concrete joints with FRP sheets in different scenarios that were introduced earlier is shown.

CONCLUSION

In this study the behavior of moment frame connections reinforced with FRP sheets has been investigated.

First For the purpose of the verification of software Abaqus for modeling of reinforced concrete frames, a reinforced concrete frame modeling was compared with the experimental results.

Then different states of Steel Reinforced Concrete connectionsinvestigated that included(1) moment frame connections with transverse stirrups and without FRP sheet, (2) moment frame connections with inadequate stirrups and without FRP sheet, (3) moment frame connections with sufficient transverse stirrups and without FRP sheet, (4) moment frame connections without transverse stirrups and with GFRP sheets (sheets of glass fibers), (5) moment frame connections with transverse stirrups and GFRP sheets and also conditions related to the use of 3-layer and 5 layers of FRP sheets in joints (sheets of carbon fiber), (6) moment frame connections without transverse stirrups and FRP sheet without wrapping that FRP sheets only attached on the joints and the conditions related to the use of 3-layer and 5 layers of carbon fiber FRP sheets modeled and analuzed in Abaqus software.

After modeling and analyzing different scenarios of studied connections in reinforced concrete members, the following results were obtained:

The use of GFRP sheets compared with FRP sheets increased ductility resistance but its resistance force vs. displacement is less than the FRP sheets. FRP connection in bending face of tensile elements in the way that the fibers are placed along the length of the member and be effective in transmission of tensile forces due to bending effects (such as tensile rebars) can increase the shear strength of the concrete elements. Several factors such as the aspects of concrete elements, surface area and mechanical properties of existing rebars and used FRP as well as the concrete strength involve in the shear strength of concrete structures using FRP systems.

In columns of reinforced concrete, the destruction caused by the earthquake led to the failure of columns before formation of the plastic hinge in the beam.As a result, various methods to improve the capacity of bending, shear and ductility of columns have suggested by increasing confinement of plastic hinge regionwhich provided a good

performance during different earthquakes including the use of jacket concrete and FRP fibers.Increasing the number of FRP layers from 1 to 3 increases the resistance of FRP, but with its increase from 3 to 5 layers, its effect disappears and adding more layers does not increase loading capacity.polymer sheets that are attached to the surface of the concrete are vulnerable against shock, heat, fire and ultraviolet rays. analysis results shows that ductility does not vary with increasing FRP sheets.

In structurs thatductility is more important than loading capacity, the use of GFRP sheets are more desirable rather than FRP sheets. To prevent damage, the surface equipment with the polymer armatuares can be used. In this way the slots with a depth less than the thickness of concrete cover is created and armatures of concrete made of carbon polymer (CFRP) are placed within the gaps and good adhesion between CFRP reinforcement member is created.

The non-useof the FRP sheet and transverse stirrups reducesducibility and resistance and as a result, the use of at least one of the abovementioned recommendation appears mandatory.

REFRENCES

1. Li, J., et al (2002). Behaviour of concrete beam–column connections reinforced with hybrid FRP sheet. Composite structures, 1: 357-365.
2. Talai Taba, S. B. (2003). increased ductility of reinforced concrete Connections using sheets of FRP, master's thesis, Structural Engineering, University of Technology, Isfahan.
3. Sharma, A., Eligehausen, R., and Reddy, G.R., (2011). A new model to simulate joint shear behavior of poorly detailed beam–column connections in RC structures under seismic loads, Part I: Exterior joints. Engineering Structures,. 3: 1034-1051.
4. Bakis, C.E., et al (2002). Guide for the design and construction of externally bonded FRP systems for strengthening concrete structures. Reported by ACI Committee, 440.
5. Mosallam, A.S., (2000). Strength and ductility of reinforced concrete moment frame connections strengthened with quasi-isotropic laminates. Composites Part B: Engineering, 31: 481-497.
6. Antonopoulos, C.P. and Triantafillou, T.C., (2002).Analysis of FRP-strengthened RC beam-column joints. Journal of composites for construction, 6: 41-51.
7. Ghobarah, A. and Said, A. (2002).Shear strengthening of beam-column joints. Engineering Structures, 7: 881-888.
8. Prota, A., et al. (2002). Selective upgrade of beam-column joints with composites. in Proceedings of the International Conference on FRP Composites in Civil Engineering, Hong Kong.
9. Ghobarah, A. and El-Amoury, T. (2005) Seismic rehabilitation of deficient exterior concrete frame joints. Journal of Composites for Construction, 5: 408-416.
10. Mukherjee, A. and Joshi, M., (2005).FRPC reinforced concrete beam-column joints under cyclic excitation. Composite structures, 2:185-199.
11. Al-Salloum, Y.A. and Almusallam, T.H. (2007). Seismic response of interior RC beam-column joints upgraded with FRP sheets. I: Experimental study. Journal of Composites for Construction, 6: 575-589.
12. Tsonos, A.G., (2008). Effectiveness of CFRP-jackets and RC-jackets in post-earthquake and pre-earthquake retrofitting of beam–column subassemblages. Engineering Structures, 3: 777-793.
13. Karayannis, C.G. and Sirkelis, G.M. (2008).Strengthening and rehabilitation of RC beam–column joints using carbon-FRP jacketing and epoxy resin injection. Earthquake Engineering & Structural Dynamics, 5: 769-790.
14. Pantelides, C.P., Okahashi, Y., and Reaveley, L. (2008).Seismic rehabilitation of reinforced concrete frame interior beam-column joints with FRP composites. Journal of Composites for Construction,. 4: 435-445.
15. Akguzel, U. and Pampanin, S. (2010).Effects of variation of axial load and bidirectional loading on seismic performance of GFRP retrofitted reinforced concrete exterior beam-column joints. Journal of Composites for Construction, 1: 94-104.

Milad Jahanchi *et al.*

16. Le-Trung, K., et al (2010). Experimental study of RC beam–column joints strengthened using CFRP composites. Composites Part B: Engineering, 1: 76-85.

17. Lee, W.T., Chiou, Y.J., and Shih, M. (2010).Reinforced concrete beam–column joint strengthened with carbon fiber reinforcedpolymer. Composite Structures, 1: 48-60.

18. Mahini, S.S. and Ronagh, H.R. (2010).Strength and ductility of FRP web-bonded RC beams for the assessment of retrofitted beam–column joints. Composite structures, 6: 1325-1332.

19. Mahini, S.S, (2009). providing a three-dimensional model for nonlinear analysis of reinforced concrete frames under cyclic loads, taking into account the effect of the interaction of concrete and rebar, Civil-Structural Engineering PhD thesis, University of Tarbiat Modares,.
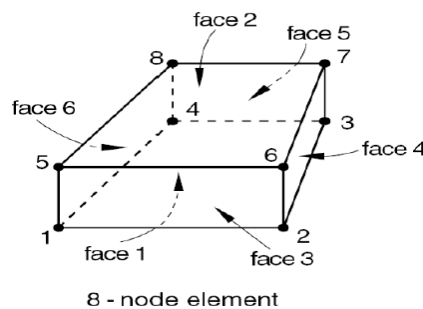
Figure 1. C3D8 elements and the number of its local faces
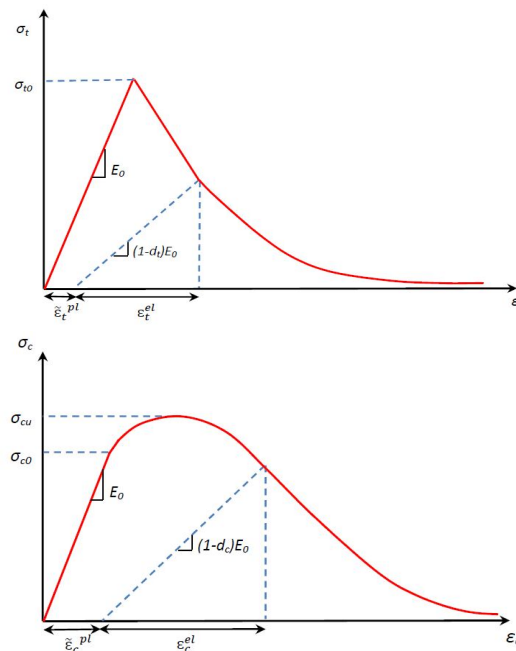
Figure 2. The concrete response to uniaxial loading in (a) tension and (b) pressure (Hashemi, Sh. (2009))

Indian Journal Of Natural Sciences

www.tnsroindia.org. © *IJONS*

Vol.5 / Issue 29/ April 2015

International Bimonthly

ISSN: 0976 – 0997

Milad Jahanchi *et al.*
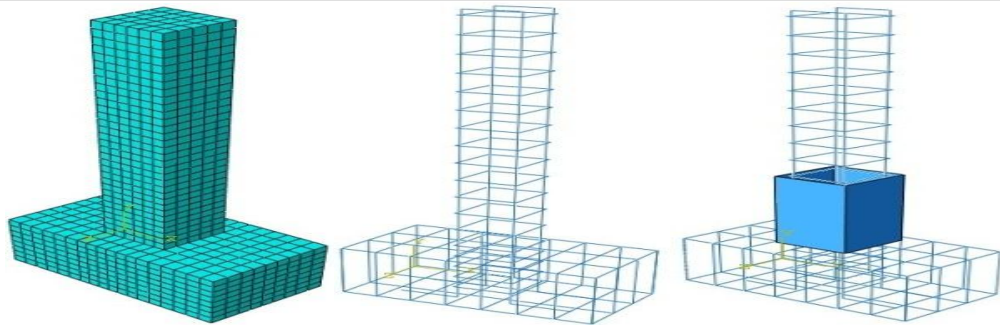
Figure 3 - details of the modeling: the arrangement of mesh, stirrups, longitudinal armatures and FRP fiber placement
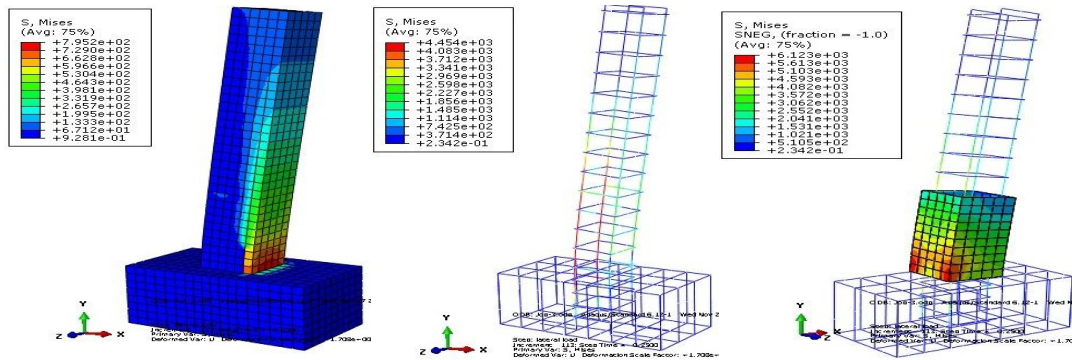
Figure 4 –ductility after analysis and contours of stress in the concrete, steel and FRP
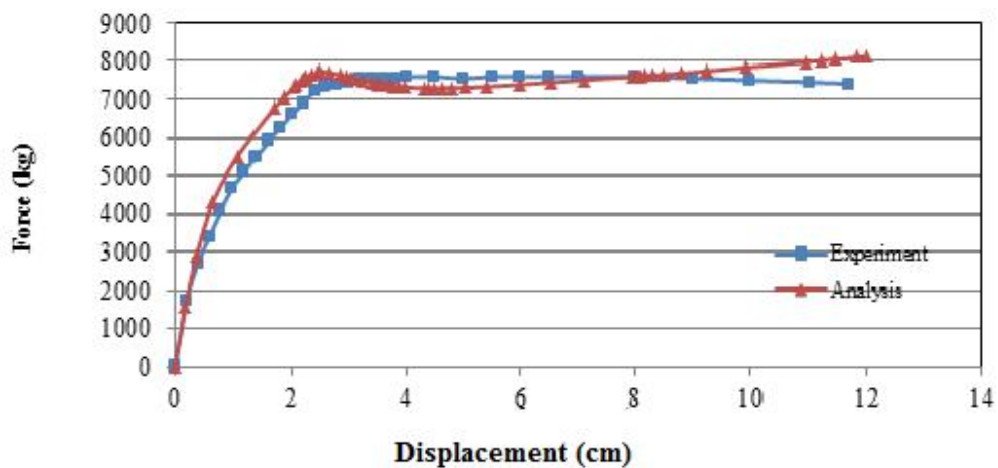
Figure 5. Comparison of force-displacement curves of tested column in both experimental and software conditions

Milad Jahanchi *et al.*
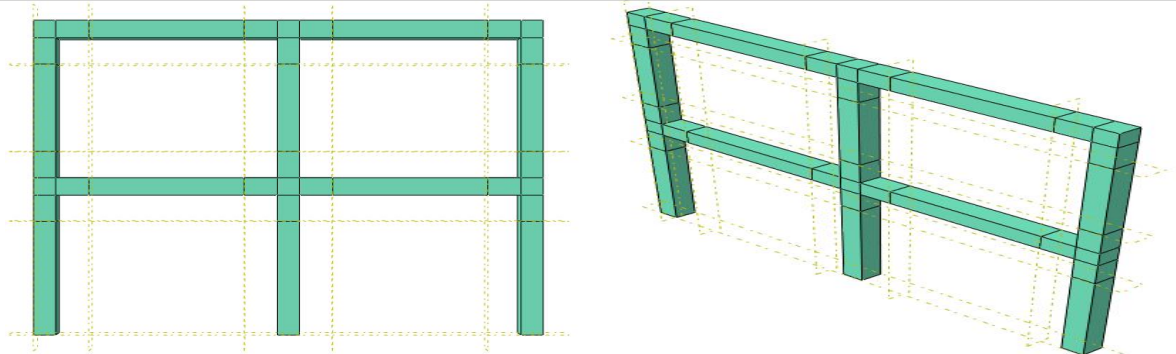
Figure 6- (a) Three-dimensional view of the studied frame, (b) view of the front frame of the studied frame
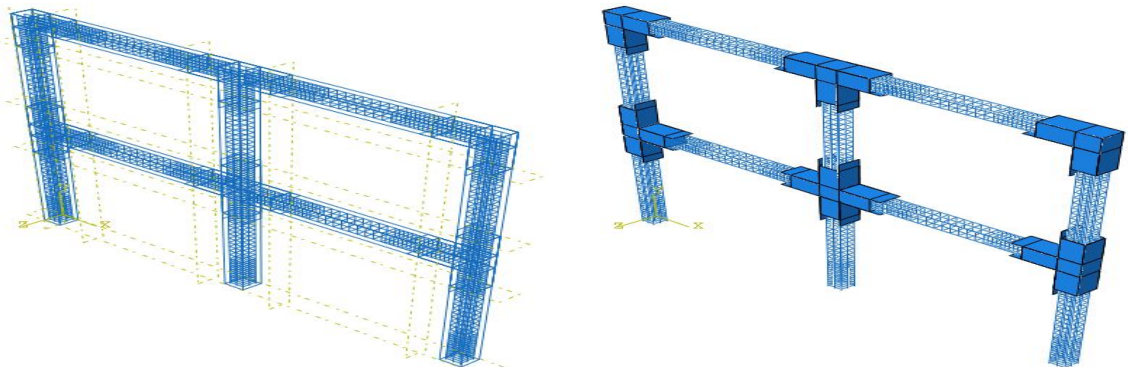
Figure 7- (a) placement of FRP sheets in the joints, (b) longitudinal and transverse Armature in the joint

Table 1. The symbols used in research

Concrete frame	**CFR**	Without the use of FRP	**NCF**
Without stirrups	**NB**	Using FRP	**WCF**
With proper transverse Armature	**WB**	Using FRP but without wrapping	**LCF**
With low transverse Armature	**LW**	FRP glass	**wGF**

Table 2. Abbreviations of studied models in the research

The model abbreviattion	Charachteristics
CFR- nB-wGF	moment frame connections without transverse stirrups and FRP sheets without wrapping
CFR-nB-nCF	moment frame connections with transverse stirrups and without FRP sheet

Milad Jahanchi *et al.*

CFR-wB-nCF	moment frame connections with sufficient transverse stirrups and without FRP sheet
CFR-IB-nCF	moment frame connections with inadequate stirrups and without FRP sheet
CFR-nB-wCF	moment frame connections without transverse stirrups and with FRP sheets
CFR-nB-wCF-3L	moment frame connections without transverse stirrups and with 3 layers of FRP sheets
CFR-nB-wCF -5L	moment frame connections without transverse stirrups and with 5 layers of FRP sheets
CFR-nB-LCF	moment frame connections without transverse stirrups and with FRP sheets without wrapping
CFR-nB-wCF-3L	moment frame connections without transverse stirrups and with 3 layers of FRP sheets without wrapping
CFR-nB-wCF -5L	moment frame connections without transverse stirrups and with 5 layers of FRP sheets without wrapping

Table 3. Mechanical properties of GFRP, CFRP and AFRP sheets

	E_1 (GPa)	E_2 (GPa)	υ_{12}	G_{12} (GPa)	G_{13} (GPa)	G_{23} (GPa)
GFRP	69.65	5.6	0.22	3.27	3.27	2.15
CFRP , AFRP	230	20	0.22	13.1	13.1	7.7

Table 4. The stress values fall of GFRP, CFRP and AFRP sheets

	Tension	Compression	Tension	Compression	Shear
	σ_{11} (MPa)	σ_{11} (MPa)	σ_{22} (MPa)	σ_{22} (MPa)	τ_{12} (MPa)
GFRP	1667.7	-890	44	-161	65
CFRP , AFRP	2800	-1900	70	-456	98

Table 5. The strain values fall of GFRP, CFRP and AFRP sheets

	Tension	Compression	Tension	Compression	Shear
	ε_{11}	ε_{11}	ε_{22}	ε_{22}	γ_{12}
GFRP	0.0239	-0.01278	0.007857	-0.0287	0.01987
CFRP , AFRP	0.01217	-0.00826	0.0035	-0.0228	0.00748

Milad Jahanchi *et al.*
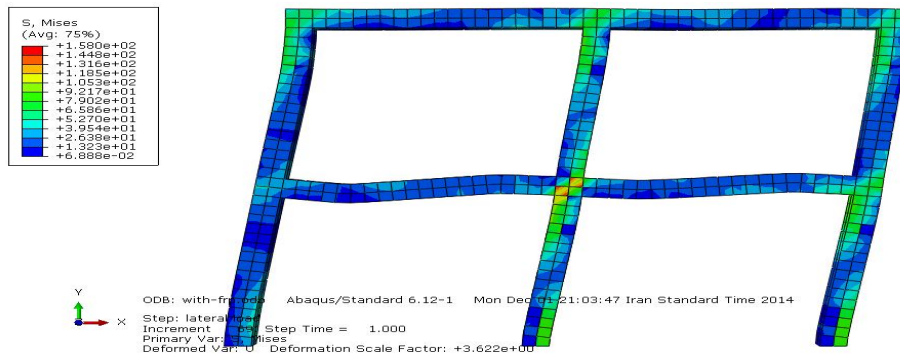
Figure 8. stresses occurring in the concrete moment frame
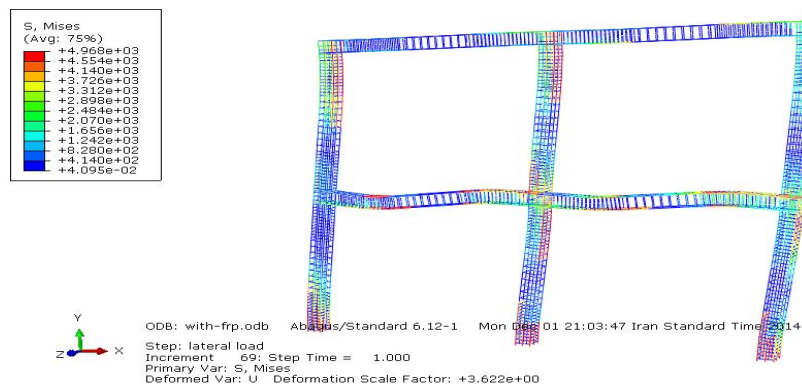
Figure 9. stresses occurring in the frame armatures in the joints using FRP sheets
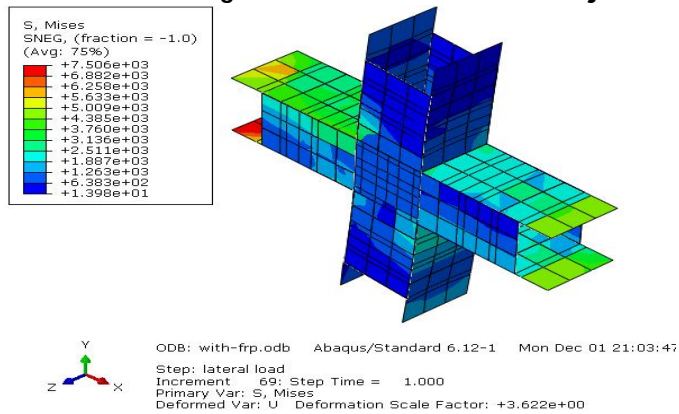
Figure 10. stresses occurred at FRP sheetsin the joints
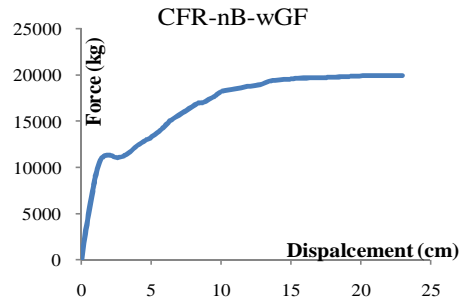
Milad Jahanchi *et al.*

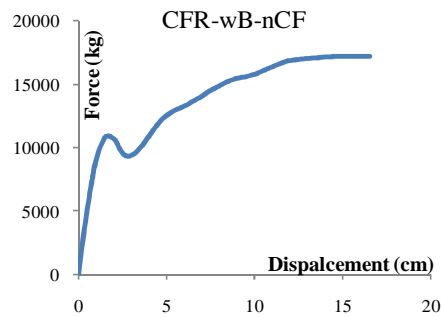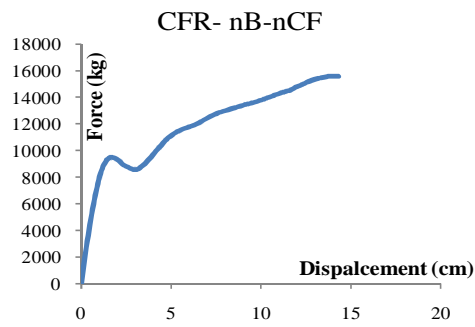

Figure 11. force vs. displacement for CFR- nB-wGF state

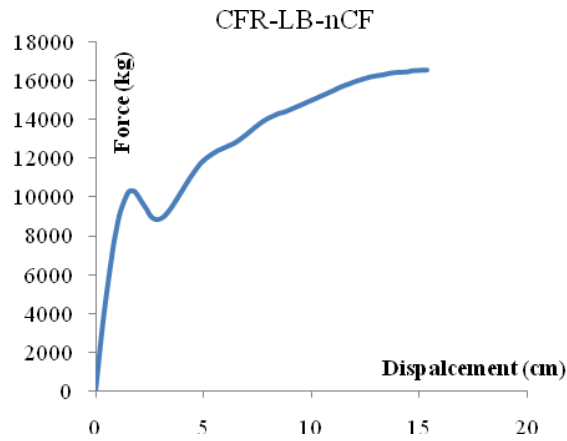**Figure 13. force vs. displacement for CFR-wB-nCF state**

Milad Jahanchi *et al.*

Figure 14. force vs. displacement for CFR-LB-nCF state
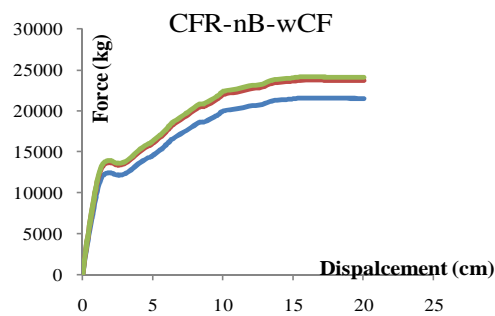
Figure 15. force vs. displacement forwCF-5L, CFR- nB-wCF-3L, CFR- nB-wCF states
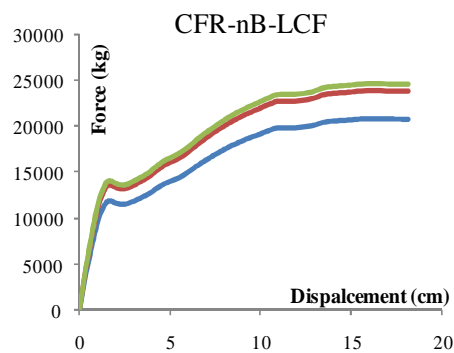
Figure 16. force vs. displacement forCFR- nB-LCF-5L, CFR- nB-LCF-3L, CFR- nB-LCF states

Milad Jahanchi *et al.*
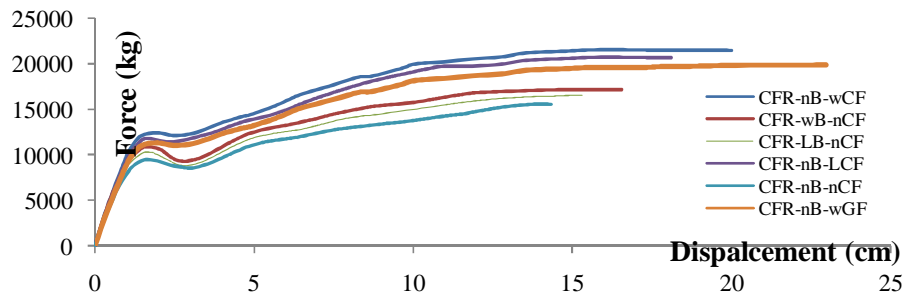
Figure 17. force vs. displacement to compare different states of studied joints in this research
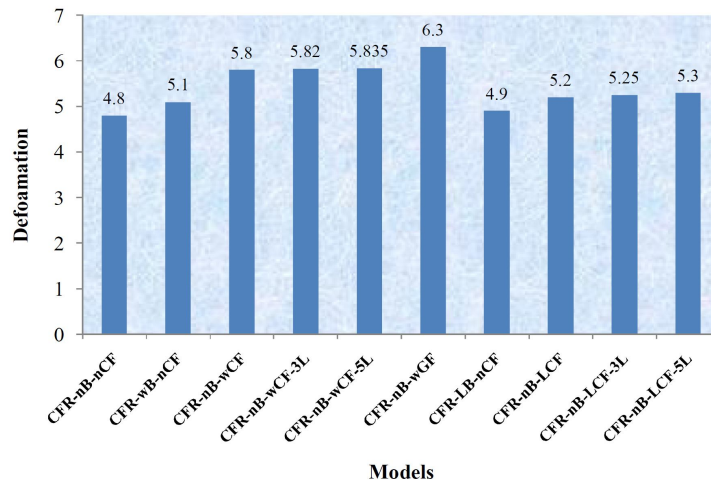
Figure 18. ductility of different states of studied joints in this research

RESEARCH ARTICLE

The Effect of Cultural Components on Life Insurance Demand from the View of Central Insurance Staff of Iran

Leila Gohari Shabestari[1], HajiehRajabi Farjad[2] and Niloufar Mirsepasi[3]

[1]Department of Public management, Faculty of Management, Central Tehran Branch, Islamic Azad University, Tehran, Iran.
[2]Assistant Professor, Police University, Tehran, Iran (Corresponding Author)
[3]Department of Commercial management , Faculty of Management and Accounting , Islamshahr Branch, Islamic Azad University, Islamshahr, Iran.

*Address for correspondence
Leila Gohari Shabestari
Department of Public management,
Faculty of Management, Central Tehran Branch,
Islamic Azad University,
Tehran, Iran.

ABSTRACT

The present study aimed to evaluate the impact of cultural components on life insurance demand from the view of employees of central insurance of Iran by descriptive-correlation method. The study population is all staffs of Iran central insurance in 214. According to the latest statistics, the staffs are 513. A sample size of 220 is selected by Cochran's formula. Simple random sampling method is used for sampling method. To evaluate effective cultural components on life insurance demand, a researcher-built questionnaire is used with the same title. Pearson correlation test and regression analysis are applied for data analysis. The results of study show that there is a direct and positive association between cultural components and life insurance demand. In other words, cultural components lead to the increase of life insurance demand. The results of the study show that futuristic views component has direct and positive association with life insurance demand. IN other words, futuristic views lead to increase of life insurance demand. Also, there is a direct and positive association between awareness and life insurance demand. In other words, awareness leads to the increase of life insurance demand. It is shown that there is a direct and positive association between reasoning and life insurance demand. In other words, reasoning increases life insurance demand. Also, the results of the study showed that reasoning, futuristic views and awareness was predictor of increasing life insurance demand.

Key words: Reasoning, Futuristic views, Awareness, Social trust, Life insurance demand

Leila Gohari Shabestari *et al.*

INTRODUCTION

In the current world in which economic growth and development show the international position of the country, to emerge in international arena, the countries attempt to improve their development indices. By their position in economic condition and improvement and increasing their effective role, they can improve economy in global arena. As one of development indices, insurance industry is one of the major economic institutions and supports the activities of other institutions. In other words, insurance industry by collecting premiums plays important role in economic development. Also, by creating security and assurance for service and manufacturing activities and etc. facilitates progress and construction (Zarekhalili, 2011). Despite insurance services development in Iran and acceptance of Iranian society of some insurance fields as car insurance, life insurance didn't achieve its real position. Some of the effective factors on life insurance development in all countries including improvement of income level for many people, people are much familiar with insurance and its benefits in our country. However, life insurance didn't achieve its actual development based on our society social and economic condition (Shakerin, 1997).

The technical sources of life insurance provide investment in public and private sectors and besides creating job, national production is increased. Due to the type of their activities, insurance companies invest a part of profit and the investment can be classified into two groups of physical or real investment and financial investment. Ignoring the role of insurance in macro economy is impossible and by providing capital security, insurance can provide a good ground for economic activities. One of the economic growth conditions is growth of financial saving and by increasing the share of financial saving in GDP, life insurance can play important role in economic growth. Thus, the role of life insurance via equipment of financial sources can lead to investment increase (Talebnia and Pirosi, 2007).

The recognition of failure factors in development of life insurance and failure of authorities to introduce it to the needy people can be the topic of discussions, articles, speech and seminars. Based on all these efforts, life insurance in Iran can not be compared with other insurance types as car insurance. In most countries all over the world, life insurance premium is alone equal to the sum of premium of other types of insurances and also they are higher (Shakerian, 1997, 82). In the current world, life insurance is one of the economic tools and it is used in various fields. Also, life insurance funds are great investment sources as life insurance firms are considered as one of the main investment centers in the world. After many years of activities in this industry in Iran, it has no considerable progress (Mehrara and Rajabian, 2005, 24). Indeed, we can say in the past decade, about 57% of collected premiums in global insurance industry are dedicated to life insurance. After many years of activity in Iran, there is no considerable growth in this industry and life insurance share in Iran economy is about 8.7% and non-life insurance share is 91.3% of insurance industry of country. According to the statistics of global insurance markets in 2012, the comparison of purchased premiums shows that in Northern America, Western Europe, Japan, South eastern Asia and Australia, life insurance premiums dedicated 2 times more than the non-life insurance premiums. This shows the lack of tendency of Iranian people to life insurance and savings compared to advanced countries (Mahdavi and Bakhshi, 2011, 45). One of the effective factors on life insurance demand is cultural factor as fatalism, beliefs and etc. affecting life insurance demand (AzizzadeNiari, 1999, 74).

Any behavior and action depends upon the cultural and social backgrounds of people. As values, beliefs and norms are set of models forming the goals selection of people. As life insurance is not a merely economic phenomenon and it is a social and cultural phenomenon, this type of cultural view to life insurance creates new view to insurance and life insurance. It is predicted that research in this regard has good results regarding life insurance demand (Safayi, 2005, 25). The researcher is encountered with this issue that how is the impact of effective cultural components life insurance? The results of the study present the required information regarding life insurance demand to the managers and experts of insurance companies.

Leila Gohari Shabestari *et al.*

Theoretical basics

Any behavior and action depends upon the cultural and social backgrounds of people. As values, beliefs and norms are set of models forming the goals selection of people. As life insurance is not a merely economic phenomenon and it is a social and cultural phenomenon, this type of cultural view to life insurance creates new view to insurance and life insurance. It is predicted that research in this regard has good results regarding life insurance demand (Mahdavi, 2008, 48).

Aghazade et al., (2012) investigated the effectiveness of life insurance sale methods and found that customer-oriented, consulting, participative, relational, consistency, systematic and crossing sale methods had positive and significant association with effectiveness indices.

Regression analysis showed that among seven sale methods of effectiveness indices, only two methods of consulting and participative sale methods determined the highest changes of dependent variable and consulting sale was much important than another one.

Hosseinpour (2012) by identification of effective social –cultural factors on life insurance non-development in Tehran city (Case study of district 12 of Tehran) and found that there was a significant association between social trust, looking for future, activism, futuristic views, fatalism, awareness , reasoning, gender and life insurance development and study hypotheses are supported. In other words, the higher the social trust, looking for future, activism, futuristic views, awareness and reasoning of citizens, the higher the tendency of citizens to life insurance. Based on model of study, the more the cultural system (values, beliefs and norms) takes steps toward increasing social trust, looking for future, activism, awareness and reasoning and the lower the fatalism in cultural system, the higher the tendency of citizens to life insurances.

Malekmotie (2013) investigated the impact of income distribution on life insurance demand in Iran during 1978-2008 and based on his finding, income distribution had positive and significant impact on life insurance demand. Indeed, balanced distribution of income led to the reduction of life insurance demand. Also, inflation rate had negative and significant impact on life insurance demand. The per capita national income and literacy rate variables had direct and significant impact on life insurance demand. Based on the results, it was shown that household load had negative impact on life insurance demand in Iran and it was not significant statistically.

Zarbaf et al., (2013) evaluated the effective factors on life insurance development with the approach of detection of barriers in Tehran city (case study: Insurance company of Saman)their scientific expectation regarding the direct, positive and significant effect of structural, economic, social-cultural factors and support and supply on life insurance developed was supported.

Jean kwon (2010) investigated organizational, marketing, social-cultural factors on life insurance development and increase of economic costs, delay in loan repayment, number of loan recipients, the number of women loan recipients, life insurance influence coefficient, the number of household were effective on life insurance development.

Curak et al., (2013) evaluated the impact of social and demographic factors on life insurance development in Kuravat country. Based on their findings, age and education were the factors effective on life insurance development but marital status, family members and gender had no significant role in the life insurance development.

Akpan (2013) evaluated the life insurance trading in AkvanAybum of Nigeria. Based on the results, income, low level of insurance culture, indifference, customer satisfaction, IT, benefit-cost analysis and transparency are the factors effective on life insurance trading in Nigeria and they are the challenges of life insurance development in Nigeria.

Leila Gohari Shabestari *et al.*

Research Hypotheses

First hypothesis: Cultural components were effective on life insurance demand from the view of central insurance staffs.
Second hypothesis: Social trust was effective on life insurance demand.
Third hypothesis: Futuristic views were effective on life insurance demand.
Fourth hypothesis: Fatalism was effective on life insurance demand.
Fifth hypothesis: Awareness was effective on life insurance demand.
Sixth hypothesis: Reasoning was effective on life insurance demand.

Research Methodology

The present study is applied in terms of purpose. As the researcher attempted to evaluate the views of employees of central insurance of Iran, the study is survey. As the researcher had objective description of study data, the study method is descriptive and as a questionnaire is used for data collection, the method is survey.

The study population in the present study is all employees of central insurance of Iran in 2014 and they are 513 based on the latest statistics. A sample size of 220 is selected by Cochran's formula. To avoid sample exclusion, 240 questionnaires are used and finally 221questionnaires are returned to the researcher. For sampling, simple random sampling method is used.

Study measures

Based on the review of literature, cultural, social trust, futuristic views, fatalism, awareness of insured and reasoning components are identified. To evaluate the effective cultural components on life insurance demand, a researcher-built questionnaire is used. This questionnaire is based on five-item Likert scale (very much=5, Much=4, To some extent=3, Low=2 and very low=1) including 33 questions.

The reliability of the questionnaire of the study is calculated by SPSS software, version 20 and Cronbach's alpha method as shown in Table 1.

Findings

To investigate the normality of study variables data, Kolmogrov-Smirnov test is used.
Based on findings of Table 2, it can be said at significance level of Kolmogrov-Smirnov test for all variables of test is greater than first rank error 0.05 and H0of this test regarding normality of probable distribution of scores is not rejected. Thus, we can apply Pearson and regression parametric test.
First hypothesis test: The cultural components are effective on life insurance demand from the view of central insurance employees.
To evaluate the relationship between cultural components on life insurance demand, Pearson correlation method is used and the results are presented in Table 3.

Table 3 shows that futuristic views component has direct and positive association with life insurance demand (r=0.267) and this relation is significant at level 0.05. Two stars (**) means the relation at significance level (α<0.05). In other words, futuristic view leads to the increase of life insurance demand. Also, there is a direct and positive association between awareness and life insurance demand (r=0.237) and it is significant at level 0.05. In other words, the awareness leads to the increase of life insurance demand. It is shown that there is a direct and significant association between reasoning and life insurance demand (r=0.376) and this relation is significant at level 0.05. In other words, reasoning leads to the increase of life insurance demand.

Leila Gohari Shabestari *et al.*

To investigate whether cultural components can predict life insurance demand and determining share of each of predictive variables in prediction of life insurance demand, concurrent regression is used. According to regression analysis in Table 4, we can say reasoning, futuristic views and awareness components as predictive variables can have the criterion of entering the final regression equation to explain the life insurance demand changes. As shown in Table 4, based on coefficient R2, reasoning, futuristic views and awareness components can determine 0.175 of life insurance demand variable. In addition, to determine cultural components share in prediction of life insurance demand based on regression coefficients (Beta), we can say the share of reasoning, futuristic view and awareness is 0.344, 0.264 and 0.134, respectively. The social trust and fatalism components are excluded due to the lack of significant share in prediction of insurance demand.

Social trust is effective on life insurance demand.

To evaluate the relationship between social trust and life insurance demand, Pearson correlation method is used and the results are shown in Table 5. The findings of Table 5 show that there is a direct and positive association between social trust and life insurance demand (r=0.047) and this relation is not significant at alpha level 0.05.

Futuristic view is effective on life insurance demand.

To evaluate the relationship between futuristic views and life insurance demand, Pearson correlation method is used and the results are shown in Table 6. Findings of Table 6 show that there is a direct and positive association (r=0.267) between futuristic view and life insurance demand and this relation is significant at alpha level 0.05. It is expected that futuristic view from life insurance clients and people increases life insurance demand in society.

Fatalism is effective on life insurance demand.

To evaluate the relationship between fatalism and life insurance demand, Pearson correlation method is used and the results are shown in Table 7. Findings of Table 7 show that there is a direct and positive association (r=0.022) between fatalism and life insurance demand and this relation is not significant at alpha level 0.05.

Aswareness is effective on life insurance demand

To evaluate the relationship between awareness and life insurance demand, Pearson correlation method is used and the results are shown in Table 8. Findings of Table 8 show that there is a direct and positive association (r=0.237) between awareness and life insurance demand and this relation is significant at alpha level 0.05. It is expected that awareness from insurance clients and people can increase life insurance demand in society.

Reasoning is effective on life insurance demand.

To evaluate the relationship between reasoning and life insurance demand, Pearson correlation method is used and the results are shown in Table 10. Findings of Table 9 show that there is a direct and positive association (r=0.376) between reasoning and life insurance demand and this relation is significant at alpha level 0.05. It is expected that reasoning from insurance clients and people can increase life insurance demand in society.

To evaluate the prioritization of cultural components on life insurance demand from the view of central insurance staffs, Friedman test is used.

Leila Gohari Shabestari *et al.*

As shown in Table 10, based on the mean of ranks, the highest cultural component: reasoning component (3.26) and then futuristic view (2.81), awareness (2.53), social trust component (2.11) and fatalism component (2.08) are considered.

DISCUSSION AND CONCLUSION

The results of study show that there is a positive and direct association between cultural components and life insurance demand. IN other words, cultural components can lead to increasing life insurance demand. The results of study show that futuristic view component has direct and positive association with life insurance demand. In other words, futuristic view leads to the increase of life insurance demand. Also, there is a direct and positive association between awareness and life insurance demand. IN other words, awareness leads to the increase of life insurance demand. Later, it is shown that there is a direct and positive association between reasoning component and life insurance demand. In other words, reasoning leads to the increase of life insurance demand. The results of study show that reasoning, futuristic view and awareness can predict the increase of life insurance demand. Hosseinpour (2012) found that there was a significant association between social trust, look for future, activism, futuristic view, fatalism, awareness, reasoning, gender and marital status and life insurance development. The study hypotheses were supported. The higher the social trust, look for future, activism, futurist view, awareness and reasoning of citizens, the higher the tendency of citizens to life insurance. Based on the study model, the more the cultural system (values, beliefs and norms) takes steps toward increasing social trust, looking for future, activism, awareness and reasoning and the lower the fatalism in cultural system, the higher the tendency of citizens to life insurances.

The result of this study is consistent with a part of results of Zarbaf et al. , (2013) study supporting the direct, positive and significant effect of structural, economic, social-cultural, support and supply factors on life insurance development. The result of this study is consistent with a part of the results of study of Akpan (2013) as income, low level of insurance culture, indifference, customer satisfaction, IT, benefit-cost analysis, transparency are effective factors on life insurance trading in Nigeria country and they are challenges of insurance life development .

The results of study show that there is no significant association between social trust and life insurance demand. In other words, social trust doesn't leads to the increase of life insurance demand. This result is consistent with the results of Lee et al ., (2008), Hatkaver (2004) and Lingoyr (2003).

The results show that there is direct and positive association between futuristic view and life insurance demand. IN other words, futuristic view leads to increasing life insurance demand. The results show that futuristic view determines life insurance demand. In addition, the results show that futuristic view predicts life insurance demand. This result is in line with the results of the study of Hosseinpour (2012). Hosseinpour (2012) found that there was a significant association between futuristic view and life insurance development and study hypothesis was supported. The higher the futuristic view of citizens, the higher the tendency of citizens to life insurance. This result is consistent with the results of Mahdavi et al., (2011) and the impact of future concern on life insurance demand is significant. The results show that there is a significant association between fatalism and life insurance demand. In other words, fatalism doesn't lead to increasing life insurance demand. The results of the study are consistent with the study of Tajdar (1996), Hosseinpour (2012) and Berent and Palmer (1983). The results show that there is a positive and significant association between awareness and life insurance demand. Awareness leads to the increase of life insurance demand. The results show that awareness determines life insurance demand. In addition, the results show that awareness predicts life insurance demand.

The results show that there is a direct and positive association between awareness and life insurance demand. IN other words, awareness leads to increase of life insurance demand. Also, the results show that awareness determines life insurance demand. In addition, the results show that awareness predicts life insurance demand.

The results show that there is a direct and positive association between reasoning and life insurance demand. IN other words, reasoning leads to the increase of life insurance demand. The results show that reasoning determines life insurance demand. In addition, the results show that reasoning predicts life insurance demand. Zarbaf et al ., (2013) found that there is a direct and positive and significant structural, economic, social and cultural, support and supply on life insurance development.

REFERENCES

1. Aghazade, Hashem; Jandaghi, Qolamreza, Khalil, Maryam. 2012. The evaluation of effectiveness of life insurance sale methods. Insurance research (insurance industry), Winter, Period 27, NO. 4,Serial 108. P. 71-95.

2. Akpan, S.S (2013). Life Insurance Business in AkwaIbom State: Challenges and Strategic Options. Journal of Business and Management, 8(1)31-37.

3. AzizzadeNiari, Aref. 1999. Identification and determination of most important effective factors on life insurance demand in Iran and presenting a good model. MA thesis.Business management.Management school.Tehran University.

4. Burnett. J. J and B. A. Palmer, 1983, Reliance on Life Insurance Agents: Ademographic and psycho-graphic Analysis of Consumers , Journal of Risk andInsurance, No. 3,510-520.

5. Ćurak, M; Džaja, I; Pepur, S (2013). The effect of social and demographic factors on life insurance demand in Croatia, International Journal of Business and Social Science, 4(9): 65-72.

6. Hautcoeur, P.-C. (2004). Efficiency, competition, and the development of life insurance in France (1870–1939): Or: should we trust pension funds? Explorations in Economic History, 41(3), 205–232.

7. Hosseinpour, Hamid. 2012. The identification of social-cultural factors effective on lack of development of life insurance in Tehran city (case study, district 12, Tehran). MA thesis.Management and economy school.Islamic Azad University of researches and sciences of Tehran Markaz.

8. Jean kwon, W (2010). An Analysis of Organizational, Market and Socio-cultural Factors Affecting the Supply of Insurance and Other Financial Services by Microfinance Institutions in Developing Economies, Micro insurance , 35:130-160

9. Lee, H.-Y., Park, S. E., Park, E.-C., Hahm, M.-I., & Cho, W. H. (2008). Job satisfaction and trust in Health Insurance Review Agency among Korean physicians. Health Policy, 87(2), 249–257.

10. Lengwiler, M. (2003). Technologies of trust: actuarial theory, insurance sciences, and the establishment of the welfare state in Germany and Switzerland around 1900. Information and Organization, 13(2), 131–150.

11. Mahdavi, Qadir, Bakhshi, FatemeSoghra. 2011. The impact of risk aversion on life insurance demand (case study: Life insurance market of Iran). Insurance research (insurance industry): Winter, Period 26, No. 4(Serial 104). 81-106.

12. Mahdavi, Qadir. 2008. Solutions for development of life insurance of country. Fourteenth insurance conference and development.Central insurance of Islamic Republic of Iran.

13. MalekMotiei, Abdollah. 2013. The investigation of the effect of income distribution on life insurance demand in Iran. 1968-2008. MA thesis.Economy research.Islamic Azad University of Yazd branch.

14. Mehrara, Mohsen; Rajabain, Azam. 2005. The demand for life insurance in Iran and countries exporting oil. Economic research journal. 74: 57-81.

15. Safayi, Samia. 2005. The study of effective factors on purchasing life insurance policy (case study of Tehran city). Insurance research. NO. 80, p. 73-94.

16. Shakerin, Mehdi. 1997. Hopeful vision for life insurance. Asia journal. NO. 4, p. 25-26.

17. Tajdar, Rasul. 1996. The investigation of reasons of lack of growth of insurance life in Iran. MA thesis, Management school.Tehran University.

18. Talebnia, Qodratollah, Peirosi, Saeed. 2007. The study of effects of bank profit rate change on life insurance return in insurance industry of Iran. Journal of insurance industry.22 (2) Serial 2007: 105-121.

Leila Gohari Shabestari *et al.*

19. Zarbaf, Mehdi; Karbasivar, Alireza, kie, Somaye. 2013. The investigation of effective factors on development of life insurance with approach of detection of barriers in Tehran city (case study: Saman insurance company), Researcher (management). 10, 29, 35-47.

20. Zarekhalili, Mojtaba. 2011. The evaluation of the relationship between social capital with knowledge management in Partnership Company of Asian insurance. MA thesis.Psychology and educational sciences.Tehran University.

Table 1- Reliability of study measures

No	Spectrum	Number of items	Cronbach's alpha coefficient
1	Life insurance demand	5	0.826
2	Social trust	6	0.798
3	Fatalism	4	0.773
4	Futuristic views	7	0.859
5	Reasoning	6	0.774
6	Awareness	5	0.820

Table 2- The results of normality test of study variables in regression model

		Life insurance demand	Social trust	Futuristic view	Fatalism	Awareness	Reasoning
Normal parameters	Mean	3.411	3.206	3.107	3.508	3.487	3.384
	SD	0.648	0.608	0.642	0.618	0.711	3.538
Highest differences	Absolute value	0.084	0.063	0.086	0.074	0.097	0.0103
	Positive	0.84	0.074	0.082	0.068	0.089	0.087
	Negative	0.517	-0.063	-0.086	-0.074	-0.097	-0.086
Kolmogrov Z statistics		0.607	0.648	0.518	0.613	0.582	0.567
Significance level		0.325	0.107	0.118	0.214	0.258	0.263

Table 3- Correlation between cultural components and life insurance demand

		1	2	3	4	5	6
1	Life insurance demand	1					

Leila Gohari Shabestari *et al.*

2	Social trust	0.047	1				
3	Futuristic views	0.267**	0.217**	1			
4	Fatalism	0.022	0.119	0.209**	1		
5	Awareness	0.237**	0.186**	0.348**	0.269**	1	
6	Reasoning	0.376**	0.315**	0.518**	0.169**	0.056**	1

Table 4- The results of regression with concurrent entrance to evaluate the relationship between predictive cultural components and life insurance demand

Predictive variables	R	R²	B	Beta	T	P
Reasoning			0.486	0.344	4.595	0.001
Futuristic views	0.418	0.175	0.318	0.264	3.003	0.024
Awareness			0.157	0.134	2.092	0.038

Table 5- Correlation between social trust and life insurance demand

Variables	Correlation type	Correlation value	Squared R (R)²	Squared R (R)²Adjusted	Correlation direction	Significance level
Social trust and life insurance demand	Pearson	0.047	0.002	-0.002	Positive	0.490

Table 6- Correlation between futuristic view and life insurance demand

Variables	Correlation type	Correlation value	Squared R (R)²	Squared R (R)²Adjusted	Correlation direction	Significance level
Futuristic view and life insurance demand	Pearson	0.267	0.071	0.067	Positive	0.001

Leila Gohari Shabestari *et al.*

Table 7- Correlation between fatalism and life insurance demand

Variables	Correlation type	Correlation value	Squared R $(R)^2$	Squared R $(R)^2$ Adjusted	Correlation direction	Significance level
Fatalism and life insurance demand	Pearson	0.022	0.001	-0.004	Positive	0.749

Table 8- Correlation between awareness and life insurance demand

Variables	Correlation type	Correlation value	Squared R $(R)^2$	Squared R $(R)^2$ Adjusted	Correlation direction	Significance level
Awareness and life insurance demand	Pearson	0.237	0.056	0.054	Positive	0.008

Table 9- Correlation between reasoning and life insurance demand

Variables	Correlation type	Correlation value	Squared R $(R)^2$	Squared R $(R)^2$ Adjusted	Correlation direction	Significance level
Reasoning and life insurance demand	Pearson	0.376	0.141	0.137	Positive	0.004

Table 10- Friedman test to evaluate the prioritization of cultural components on life insurance demand

Components	Rank mean	Priority	df	sig
Social trust	2.11	Fourth		
Futuristic view	2.81	Second		
Fatalism	2.08	Fifth	4	0.011
Awareness	2.53	Third		
Reasoning	3.26	First		

RESEARCH ARTICLE

The Study of Foucauldian Disciplinary Power in the House of Bernarda Alba by Lorca

Maral Keramat

Department of English Literature, Faculty of Literature and Foreign Languages,Tehran Central Branch, Islamic Azad University, Tehran, Iran..

*Address for correspondence

Maral Keramat

Department of English Literature,

Faculty of Literature and Foreign Languages,

Tehran Central Branch,

Islamic Azad University,

Tehran, Iran.

ABSTRACT

Coercing the body by regulating its movement, "discipline" is a type of power which controls the movement of the body in a constant way. The concept of Disciplinary Power has been changed since the eighteenth century. Without the mass control over bodies and their operations, the modern state would be unthinkable. The abstract existence of Disciplinary Power with its main elements is investigated in Lorca's The House of Bernarda Alba.

Key words: Foucauldian, House of Bernarda Alba, Lorca

INTRODUCTION

Written in 1936, Lorca's The House of Bernarda Alba is continuously read as a realist narrative which dramatizes the state of women in the village of Spain. The play, along with Yerma and Blood Wedding, is established in the context of the outbreak of the Spanish Civil War. Considered as a tragic drama, it is also an expression of the results of repressing the noblest feelings and freedom of others. Although Lorca's focus is on the portrait of the confined female household, the traces of Foucauldian discourse is nested within the framework of Disciplinary Power. The intention of this essay rests upon the discussion of Disciplinary Power's elements in the script under the titles of hierarchical observation, normalizing judgment and examination.

Maral Keramat

Hierarchical Observation Shadows across the House of Bernarda Alba

Bentham's Panopticon serves as an example for disciplinary power; it is a building with centered tower from which each of the individuals could be controlled and administered efficiently. The first principle of disciplinary power, which is hierarchical observation, can be implemented through Gaze. The gaze brings about a sense of permanent visibility that ensures the operating of power. Throughout the play, this operation is portrait by an all- female household restricted by the outside world. The restriction is grounded in the role of a domineering mother and the fear of paparazzi. Bernarda, who has imposed eight years mourning on her daughters, tries to make an isolated room by excluding all the others. Her rejection of the exterior is a manifestation of her preoccupations with Panopticon. The tension between the interior space of the house , which is decorated simply as if it were a prison, and the space of hidden actions, in which the most important events take place, result in the dominance of the unverifiable power. Both the exterior and interior spaces create an atmosphere within which Bernarda subjects her daughters. The imposed subjugation represents the regime's control that doesn't require an overt presence since it has been psychologically internalized. The closed interior space entraps the daughters and restricts their movements.

Bernarda's despotism is treated ambivalently: At one hand, she is standing on the verge of being a concerned mother. Being concerned about her daughter's honor, she stands against the outside world and takes everything exterior or foreign as something dangerous and immoral that threatens the reputation of her house. Bernarda tries to protect the house by delimitation of space:" Through the eight years of mourning not a breeze shall enter this house. Consider the doors and windows as sealed with bricks. That's how it was in my father's house and my grandfather's. Meanwhile, you can embroider your trousseaux. In the chest I've twenty pieces of cloth from which you can cut sheets and covers. Magdalena can embroider them"(Bernarda act1).

As it is stated in these lines, Bernarda tries to distract her daughters from their own limitations and delimitations by urging them to pursue their own feminine obsessions. On the other hand, the ambivalence reveals itself by the fear of being watched by the outsiders. She negates the implied power by exerting her own controlling manner:

> Bernarda: Go with her and take care she doesn't go near the well.
> Servant: I doubt she'll throw herself in.
> Bernarda: No, not that…but if she's there the neighbors can see her from their window. (Bernarda act 1)

The misunderstanding that appears between Bernarda and servant is directed towards their different notions of fear. While servant is obsessed with Maria's unintentional suicide, the fear of being watched under a gaze haunts Bernarda.

The built-in notion of structure in the title, the House, reinforces the construction within which individual's experience of space and time could be controlled. In the single-focused structure even the body's operation could be coerced by prearranged disciplines. To clarify the statement, Adela's longing to be a part of invisible current of power could be investigated:"I wish I were invisible, so as to walk through these rooms without you forever asking where I'm going!"(Bernarda act 2). These lines seem to show that the imposed structural power finds a place in the subliminal depth of Adela's psyche; she is consciously struggling to repress the disciplines:" She follows me everywhere. She even looks in to my room to see if I'm asleep. She doesn't let me breathe. And always its:' what a shame about that pretty face! What a shame about that body, that no one will ever see!'It's not so! My body will be for whomever I want!"(Bernarda act 2) .She is condemning her sister's secretly investigations in order to protect her own privacy.These lines could be accounted for the punishment's reform in the 18th century. The reformers proposed a theatre in which a complex system of signs regarding punishment could be represented in an open atmosphere.Historically, the body was considered as a target of punishment. Ironically, Adela is announcing her authority over a self-exposed structure which is her own body:"(angrily) Leave me alone! Sleeping or working, it's nobody's affair but mine! I'll do as I want with my body"(Bernarda act 2).

Maral Keramat

Adela goes to the extent of being an authenticator by criticizing the act of spying and controlling:
La Poncia: Old woman can see through walls. Where do you go at night
when you get up?
Adela: You should have your eyes put out.
La Poncia: My hands are as full of eyes as my head when it comes to this
business.(Bernarda act 2)

Although the power has remained unverifiable until the end, it has its own explicit exposure in the signification of domineering role. It even furthers its own territory by manipulating the components of Bernarda's full fixed structure that is servants and daughters. Adela, the only daughter who stands up to Bernarda, tries to mimic the domineering despotism by repeating the despotic order of Bernarda at the end of the playthat is Silence:

Adela: Be silent!
La Poncia: I won't be silent!
Adela: Mind your own business, you nosy traitor!
La Poncia: I shall be your shadow. (Bernarda act 2)

Adela wants to be at the centre of power by repressing Bernarda's dominance. Therefore, she couldn't hold on to the centricity for long.

According to Foucault, the hierarchical observation proves the presence of power which is shaped through the structural relations. When the structure fails to restore itself, the power is ceased to appear. Being considered as a dictatorial figure, Bernarda tries to negate the implied gaze by repressing her daughter's freedom; even the temporary self- made structure of Adela couldn't last for long, so by committing suicide she sacrifices her body to transcend the whole. The tragic ending of the play foregrounds the Spanish society with all its hindrances preventing its people from gaining alertness about the changes.

Normalizing Judgment Shadows across the House of Bernarda Alba

The distinctive feature of society's modern power is its norms. The pre-arranged disciplines aim at imposing precise norms while it is quite different from pre- modern punishment (its goal was to revenge concerning tortures). This concern puts an emphasis on the primary function of modern disciplinary system which is to correct abnormal behavior. At every point of the play, Bernarda sets up her tyrannize personality by her stick. Regarded as a pre-modern judicial punishment, the stick is served as a torturing tool which imposes change and training on the physical bodies:"(To Magdalena who is starting to cry) Shhh! (She strikesthe floor with her stick. They all leave)(Toward those who have left) Go on, back to your caves and criticize everything you've witnessed! I hope it will be long before you darken my door again"(Bernarda act 1).

Here, the threatening verbal utterance of Bernarda is accompanied by her posture resting upon the stick. Although most of the violent actions- including shooting at Pepe orconstant kicking of stallion- occur outside of the house, Bernarda's threatening ends up in the visible violence:"(Advancing with her stick) spineless, sickly creatures!(She hits her)"

(Bernarda act 1).

Homogeneity is the result of normalization through which the measuring of differences becomes possible. Communicating with outsiders, especially men, is forbidden for the girls; Martirio, Adela and Angustias, who want to change their lives and to be surroundedwith love, are to be condemned:

Angustias:I can see it in her eyes. She's beginning to look like a madwoman.

Martirio: Don't talk about madness.
This is the one place where such words Shouldn'tbe spoken. (Bernarda act 2)

These lines cast a light upon a dichotomy of madness-healthiness. Regarding what Angustias believes, Adela has started to be an outcast since she has decided to depart from obligatory disciplines constituted by Bernarda. Her deviation from the norm is called madness because the internalization of the pre-arranged disciplines is forced upon the rest. To Angustias, health is no longer defined as an absence of sickness but it's a state of conformity. Opposed to what Angustiassuggests, Georges Canguilhem in The Normal and the Pathological declares that:

Normality is the possibility of transcending the norm, which defines the momentary normal, the possibility of tolerating infractions of the habitual norm and instituting new norms in new situations, that becomes the essence of health.(197)

Hence, madness is not defined in terms of its degree of deviation from the institutionalized norm; it could be regarded as an impartial expression of Adela who has no longer been conformed to the pressures of internal forces. While Adela's madness is a product of social structure, its pre- existing categories are unattainable. Her sympathetic attitude towards Librada's daughter- the unmarried one who has had a daughter and no one knows who the father is-underscores her resistance.

Clutching her belly to protect her imaginary child, Adelaprefers to be on the side of the woman who has already transcended the norms. In Nietzsche, Genealogy, History Foucault states that:

In any event, that the body obeys the exclusive laws of physiology, and that it escapes the influence of history, but this too is false. The body is modeled by a great many distinct regimes; it is broken down by the rhythms of work, rests and holidays; it is poisoned by food or values, through eating habits or moral laws; it constructs.(360)

The rhythmic pattern of structural power has been shattered by Adela's protection of motherhood and feminine body and as a result, her first time resistance is being shaped.It is worth mentioning that Lorca reinforces the structure in what the title mainly suggests: The House of Bernarda Alba creates a quarantine model under which the forbidding laws are replaced within a process of normalization. In turn, the norm is distributed and it doesn't separate the passive entities from the rebellious components.

Examination Shadows across the House of Bernarda Alba

The combination of two elements which are hierarchical observation and normalizing judgment, results in the appearance of Examination. Nested within a field of documentation, examination as a mode of confession providesdetailed information about the individuals. Although in the House of BernardaAlba the isolated space of the houseturns the residents in to a case, the significant minor role of Maria Josefa-Bernarda's mother – in the formulation of the norms couldn't be denied. Maria is also a case in the sense of being an object of care and Bernarda's caring of her is always an opportunity for control.

Along with Maria's early presence in the play, the audiences are encountered by an unknown voice without any additional information:

Voice:(from within) Bernarda!
La Poncia: The old woman. Is she locked in?

Servant:Two turns of the key.
La Poncia: You should use the bolt too. She's got fingers like picklocks.
(Bernarda act 1)

Maria's identity is anonymous since she has not been called with any specific name. In respect to La Poncia's description, Maria is portrayed as a caged beast rather than a living person; she is locked and treated as a madwoman.

Under the supreme gaze and control, Maria is constantly located in a fixed place and her slightest movements are supervised.

It is true that the rituals of exclusion are practiced in the House in order to setup an extended model for the great confinement. This confinement is a metaphor of Spanish disciplinary projects, aimed at keeping everything under control.

The image of Maria cut off from all human contacts reveals how the exclusion project functions. Generally speaking, the authority exercised its control according to a double mode of binary division: normal/abnormal or sane/mad. These binary divisions will form a kind of categorization within which Maria is both mad and abnormal; these labels are preceded by her further treatment:

A voice: Bernarda. Let me out!
Bernarda:(in a loud voice)Let her out now!
(The servant enters)
Servant: It was an effort to held her down. She maybe eighty years old but
Yourmother is tough as an oak tree.
Martirio: She is a troublemaker!(Bernarda Act 2)

As it is mentioned, all the mechanisms of structural power are disposed around Maria, who is being recognized as an abnormal individual, to alert her. Despite her recurrent reluctance of being shut down, Bernarda's mother is deprived of an open door:"Let me go out Bernarda" (Bernarda act 1). In her exile enclosure, Maria is caught up in a practice of rejection. Similar to what has already been discussed about Adela's transcendence, Maria is being unmasked by transgressing her statutory identity:"No, I won't be quiet! I don't want to see these single women, foaming at the mouth for marriage, their hearts turning to dust, and I want to go back to my village. Bernarda, I want a man to marry and be happy with"

(Bernarda act 2).

The hermeneutical aspect of examination makes the subject become seen. It is as if an individual were covered within a text and suddenly gains an opportunity to be read aloud. At the very beginning of the play, Maria was absent and hidden and only her voice could be heard. Her individuality was marked by her non-presence and ambiguity. Later, Lorca mentions her name and quotes her sentences directly to introduce her new certain features:

Martirio: Grandmother, where do you think you're going?
Maria Josefa: Are you going to open the door for me? Who are you?
Martirio:What are you doing here?
Maria Josefa: I escaped.(Bernarda act 3)

As it is stated above, Maria wants to escape the cage of observation which creates a mechanism of control. With relation to the earlier account, examination should be investigated along with hierarchical observation and normalizing judgment. Maria's confinement and her longing to escape the structural prison make her a mediating

character- who stands at the side of Adela and against Bernarda. As the objects of control, Maria and Adela subconsciously thrive to find their subjectivism and individuality within the network of structural power. Therefore, Adela puts aside her body by committing suicide in the sophisticated mechanism and transcends the enforced authority whereas Maria is locked up in her room once again with her trivial triumph-which is keeping a lamb(signifying her own child). Being trapped within a vicious circle of despotism, other daughter's confinement as well as Maria Josefa's has been deeply probed and established in Bernarda's final persistence over virginity:"She the youngest of Bernarda Alba's daughters died a virgin. Do you hear? Silence, Silence I say! Silence!"(Bernarda act 3).

CONCLUSION

Lorca's The House of Bernarda Alba is often considered as the tragedy of chastity; however, theFoucauldian study of the play signifies the three elements of disciplinary power which are hierarchical observation, normalizing judgment and examination. In the play, the hierarchical observation is discussed within the framework of Bentham's Panopticon, and its subcategories such as authorial power and gaze are investigated. The normalizing judgment is defined as a feature of modern power which is completely different from pre- modern judicial punishments. To clarify this element, Adela's non conformity has been taken in to account. Finally, examination as a mode of confession with its hermeneutical aspect is reintroduced and Maria's relation to it has been discussed. On the whole, the play is considered as a tragic account ofwomen's misery influenced by the societal tradition in which individual's freedom had been negated.

REFERENCES

1. Beltran, G. (2008).Transverse: Spatial Dynamics in Lorca's La Casa de Bernarda, Alba,print.
2. Canguilhem, G. (1991).The Normal and the Pathological.New York: Zone Books, print.
3. Foucault, M. (1977).Discipline and Punish: The Birth of the Prison. New York: Pantheon, print.
4. Lorca, F.,Gasynne, E. (1996). The House of Bernarda Alba= La Casa de Bernarda Alba. London:Mothuen Drama,print.
5. Paul Rabinow, E. Nikolas, R. (1994)."Nietzsche, Genealogy, History". The Essential Foucault.New York: The New Press, 351-369

RESEARCH ARTICLE

Damping Controller Design Based on ICA Algorithm for BtB HVDC to Improve Power System Stability

H.Shakeri* and N.Azargun

Sama Technical and Vocational Training College, Islamic Azad University, Yasuj Branch, Yasuj, Iran.

*Address for correspondence
H.Shakeri
Sama Technical and Vocational Training College,
Islamic Azad University,
Yasuj Branch, Yasuj, Iran.

ABSTRACT

This paper presents the establishment oflinearised Phillips-Heffron model of a power system installed HVAC parallel-connected with a Back To Back High Voltage Direct Current based voltage source converter (BtB VSC HVDC) The use of the supplementary controllers of a BtB VSC HVDC to damp low frequency oscillations in a weakly connected system is considered. The potential of the BtB VSC HVDC supplementary controllers to enhance the dynamic stability is evaluated using damping function. The problem of supplementary damping controller based VSC-HVDC system is formulated as an optimization problem according to the time domain-based objective function which is solved using imperialist competitive algorithm (ICA). Unique designs of the HVDC supplementary controller based on ICA method are appraised. The impressiveness of the proposed controllers on damping low frequency oscillations is verified through eigenvalue analysis and non-linear time simulation under various disturbance conditions of over a wide range of loading.

Key words: VSC HVDC, Power System Stability, Imperialist Competitive Algorithm, Supplementary Damping Controller.

INTRODUCTION

As power demand grows rapidly and expansion in transmission and generation is restricted with the limited availability of resources and the strict environmental constraints, power systems are today much more loaded than before. This causes the power systems to be operated near their stability limits [1].Modulation of the active power order of an high-voltagedirect current (HVDC) link [1, 2] could be extremelyeffective for damping low-frequency power oscillations,thereby increasing the transfer capacity of an ACtransmission system. Network operators like WesternElectricity Coordinating Council have considered this in1970s to improve their system dynamic performance

[3].Over the past few decades, a lot of research attention wasfocused on identifying ways to maximize the impact ofHVDC modulation control on AC system stability [4–7]. Inthe recent past, with an increasing number of HVDCinstallations around the world, especially in countries withlong-transmission corridors like Brazil, China and India,there has been a renewed interest in this area [8–11]. Evenin smaller countries, such as the UK, the HVDC linkswould increase the stability limits in addition to direct expansion of transmission capacity.

A traditional lead-lag damping controller structure is preferred by the power system utilities because of the ease of on-line tuning and also lack of assurance of the stability by some adaptive or variable structure methods [12,13]. Having several local optimum parameters for a lead-lag controller, using of traditional optimization approach is not suitable for such a problem. Thus, the heuristic methods as solution for finding global optimization are developed [14-16]. Imperialist competitive algorithm (ICA) is a novel population based metaheuristic, which utilize the swarm intelligence generated by the cooperation and competition between the countries in animperialist and has emerged as a useful tool for engineering optimization. This new approach features many advantages: it is simple, flexible, fast and can be coded in few lines. Also, its storage requirement is minimal.

In this paper a novel approach is presented to model parallelAC/DCpower system namelyPhillips-Heffron model based d-q algorithm in order to studying system dynamical stability. In addition, a block diagram representation is formed to analyze the system stability characteristics.Also, damping function algorithm is used to choose damping control signal which has most effect on damping the electromechanical (EM) mode oscillations.The problem of damping controllers design is formulated as an optimization problem to be solved using ICA. The aim of the optimization is to search for the optimum controller parameter settings that maximize the minimum damping ratio of the system.

Configuration of power system

Fig.1shows a SMIB system equipped with a HVDC. The four input control signals to the HVDC are M_r, PH_r, M_i, PH_i where M_r, M_i are the amplitude modulation ratio and PH_r, PH_i are phase angle of the control signals of each VSC respectively.

By applying Park's transformation and neglecting the resistance and transients of the coupling transformers, the HVDC can be modeled:

$$\begin{bmatrix} V_{Ld} \\ V_{Lq} \end{bmatrix} = \begin{bmatrix} 0 & -X_s \\ X_s & 0 \end{bmatrix} \begin{bmatrix} I_{lod} \\ I_{loq} \end{bmatrix} + \begin{bmatrix} \dfrac{M_r V_{dc} \cos(PH_r)}{2} \\ \dfrac{M_r V_{dc} \sin(PH_r)}{2} \end{bmatrix} \tag{1}$$

$$\begin{bmatrix} V_{bd} \\ V_{bq} \end{bmatrix} = \begin{bmatrix} 0 & -X_{sp} \\ X_{sp} & 0 \end{bmatrix} \begin{bmatrix} I_{bopd} \\ I_{bopq} \end{bmatrix} + \begin{bmatrix} \dfrac{M_i V_{dc} \cos(PH_i)}{2} \\ \dfrac{M_i V_{dc} \sin(PH_i)}{2} \end{bmatrix} \tag{2}$$

H.Shakeri and N.Azargun

$$C_{dc} \dot{V}_{dc} = [\frac{M_r}{2}(I_{lod}\cos(PH_r) + I_{loq}\sin(PH_r))$$
$$+ \frac{M_i}{2}(I_{bopd}\cos(PH_i) + I_{bopq}\sin(PH_i))]$$

(3)

Where V_L, V_b, I_{lo} and I_{bo} are the middle bus voltage, infinite bus voltage, flowed current to rectifier and inverter respectively. C_{dc} And V_{dc} are the DC link capacitance and voltage, respectively.

The non-linear model of the SMIB system of Fig.1is:

$$\dot{\delta} = \omega_b \omega$$

(4)

$$\dot{\omega} = \frac{(P_m - P_e - D\omega)}{M}$$

(5)

$$\dot{E}_q^{'} = \frac{(E_{fd} - (x_d - x_d^{'})I_{td} - E_q^{'})}{T_{do}^{'}}$$

(6)

$$\dot{E}_{fd} = \frac{(K_A(V_{ref} - V_t) - E_{fd})}{T_A}$$

(7)

Where: $P_e = V_{td}I_{td} + V_{tq}I_{tq}$, $V_t = \sqrt{V_{td}^2 + V_{tq}^2}$, $V_{td} = x_q I_{tq}$

, $V_{tq} = E_q^{'} - x_d^{'}I_{td}$, $I_{td} = I_{lod} + I_{bd}$, $I_{tq} = I_{loq} + I_{bq}$ where P_m and P_e are the input and output power , respectively ; M and D the inertia constant and damping coefficient , respectively ; ω_b the synchronous speed ; δ and ω the rotor angle and speed, respectively ; $E_q^{'}, E_{fd}$ and V_t the generator internal, field and terminal voltages, respectively; $T_{do}^{'}$ the open circuit field time constant; X_d , $X_d^{'}$ and X_q the d-axis, d-axis transient reactance, and q-axis reactance, respectively; K_A and T_A the exciter gain and time constant, respectively; V_{ref} the reference voltage.

Also, from Fig.1we have:

$$\bar{V}_t = jX_{tl}\bar{I}_{tl} + \bar{V}_l$$

(8)

$$\bar{V}_t = jX_{tl}\bar{I}_{tl} + jX_{lb}\bar{I}_{lb} + \bar{V}_b$$

(9)

H.Shakeri and N.Azargun

$$\bar{I}_{lb} = \bar{I}_{tl} - \frac{\bar{V}_t - jX_{tl}\bar{I}_{tl} - \bar{V}_o}{jX_s} \tag{10}$$

Where $\bar{I}_{tl}$, $\bar{V}_o$, $\bar{I}_{lb}$ and $\bar{V}_b$ are the armature current, rectifier voltage, infinite bus current and voltage respectively. From (8)-(10) we can have:

$$I_{tlq} = \frac{\dfrac{X_{lb}}{X_s}\dfrac{M_r}{2}V_{dc}\cos(PH_r) + V_b\sin(\delta)}{ZX_q + A} \tag{11}$$

$$I_{tld} = \frac{ZE_q^{'} - \dfrac{X_{lb}}{X_s}\dfrac{M_r}{2}V_{dc}\sin(PH_r)}{ZX_d^{'} + A}$$
$$- \frac{-V_b\cos(\delta)}{ZX_d^{'} + A} \tag{12}$$

And for inverter side:

$$I_{bopd} = \frac{V_b\cos(\delta) - \dfrac{M_i}{2}V_{dc}\sin(PH_i)}{X_{sp}} \tag{13}$$

$$I_{bopq} = -\frac{V_b\sin(\delta) - \dfrac{M_i}{2}V_{dc}\cos(PH_i)}{X_{sp}} \tag{14}$$

By linearizing (1)-(7), (11)-(14):

$$\dot{\Delta\delta} = \omega_b\Delta\omega \tag{15}$$

$$\dot{\Delta\omega} = \frac{\left(\Delta P_m - \Delta P_e - D\Delta\omega\right)}{M} \tag{16}$$

H.Shakeri and N.Azargun

$$\dot{\Delta E_q^{'}} = \frac{(\Delta E_{fd} - (x_d - x_d^{'})\Delta I_{td} - \Delta E_q^{'})}{T_{do}^{'}} \tag{17}$$

$$\dot{\Delta E_{fd}} = \frac{(K_A \Delta V_t - \Delta E_{fd})}{T_A} \tag{18}$$

Where:

$$\dot{\Delta V_t} = K_5 \Delta\delta + K_6 \Delta E_q^{'} + K_{Vdc}\Delta V_{dc} + K_{VM_r}\Delta M_r \tag{19}$$
$$+ K_{VPHr}\Delta PH_r$$

$$\Delta P_e = K_1 \Delta\delta + K_2 \Delta E_q^{'} + K_{pdc}\Delta V_{dc} + K_{pMr}\Delta M_r \tag{20}$$
$$+ K_{pPHr}\Delta PH_r$$

$$\Delta E_q = K_3 \Delta E_q^{'} + K_4 \Delta\delta + K_{qPHr}\Delta PH_r +$$
$$K_{qMr}\Delta M_r + K_{qdc}\Delta V_{dc} \tag{21}$$

$$\dot{\Delta V_{dc}} = q_1 \Delta\delta + q_2 \Delta E_q^{'} + q_3 \Delta V_{dc} +$$
$$q_4 \Delta M_r + q_5 \Delta PH_r + q_6 \Delta M_i + q_7 \Delta PH_i \tag{22}$$

Substitute (19)-(22) in (15)-(18) we can obtain the state variable of the power system installed with the BtB VSC HVDC to be as Eq.(23).Where $\Delta M_i, \Delta M_r, \Delta PH_i$ and ΔPH_r are the linearization of the input control signals of the BtB VSC HVDC. The linearized dynamic model of (23) can be shown by Fig.2. In this figure $K_{pu}, K_{qu}, K_{vu}, K_q$ and ΔU are defined below:

$$K_{pu} = [K_{pMr}, K_{pPHr}, 0, 0]^{'}$$

$$K_{qu} = [K_{qMr}, K_{qPHr}, 0, 0]^{'}$$

$$K_{vu} = [K_{VMr}, K_{VPHr}, 0, 0]^{'}$$

$$K_q = [q_4, q_5, q_6, q_7]^{'}$$

$$\Delta U = [\Delta M_r, \Delta PH_r, \Delta M_i, \Delta PH_i]$$

It can be seen that the configuration of the Phillips-Heffron model is exactly the same as that installed with SVC, TCSC, TCPS, UPFC and STATCOM.

Also from (23) it can be seen that there are four choice of input control signals of the BtB VSC HVDC to superimpose on the damping function of the BtB VSC HVDC $\Delta M_i, \Delta M_r, \Delta PH_i$ and ΔPH_r .therefore, in designing the damping controller of the BtB VSC HVDC, besides setting its parameters, the selection of the input control signal of the BtB VSC HVDC to superimpose on the damping function of the BtB VSC HVDC is also important.

$$
\begin{bmatrix} \Delta\dot{\delta} \\ \Delta\dot{\omega} \\ \Delta\dot{E}_q^{'} \\ \Delta\dot{E}_{fd} \\ \Delta\dot{V}_{dc} \end{bmatrix} =
\begin{bmatrix}
0 & \omega_b & 0 & 0 & 0 \\
-\dfrac{K_1}{M} & -\dfrac{D}{M} & -\dfrac{K_2}{M} & 0 & -\dfrac{K_{pdc}}{M} \\
-\dfrac{K_4}{T_{do}^{'}} & 0 & -\dfrac{K_3}{T_{do}^{'}} & \dfrac{1}{T_{do}^{'}} & -\dfrac{K_{qdc}}{M} \\
-\dfrac{K_A T_A}{T_A} & 0 & -\dfrac{K_A K_6}{T_A} & -\dfrac{1}{T_A} & -\dfrac{K_A K_{Vdc}}{T_A} \\
q_1 & 0 & q_2 & 0 & q_3
\end{bmatrix}
\begin{bmatrix} \Delta\delta \\ \Delta\omega \\ \Delta E_q^{'} \\ \Delta E_{fd} \\ \Delta V_{dc} \end{bmatrix}
$$

$$
+
\begin{bmatrix}
0 & 0 & 0 & 0 \\
-\dfrac{K_{pMr}}{M} & -\dfrac{K_{pPHr}}{M} & 0 & 0 \\
-\dfrac{K_{qMr}}{T_{do}^{'}} & -\dfrac{K_{qPHr}}{T_{do}^{'}} & 0 & 0 \\
-\dfrac{K_A K_{VMr}}{T_A} & -\dfrac{K_A K_{VPHr}}{T_A} & 0 & 0 \\
q_4 & q_5 & q_6 & q_7
\end{bmatrix}
\begin{bmatrix} \Delta M_r \\ \Delta PH_r \\ \Delta M_i \\ \Delta PH_i \end{bmatrix}
\tag{23}
$$

imperialist competitive algorithm

The ICA is a new heuristic algorithm for global optimization searches that is based on imperialistic competition[17]. The ICA, similar to other heuristic algorithms such as PSO, GA, etc., starts with an initial population thatis called a country. The initial population is divided into 2 types of colonies and imperialists, which togetherorganize empires. The introduced evolutionary algorithm is constituted by imperialistic competition amongthese empires. During times of competition, the weak empires fall and the strong empires take possession oftheir colonies. Finally, this competition converges to a state in which the colonies have the same cost functionvalue, called the imperialist, and there is only one empire. After all of the colonies are divided among theimperialists and the initial empires are created, these colonies move toward their related imperialist state asan assimilation policy [17]. The movement of a colony toward the imperialist is shown in Figure 1, where d isthe distance between the colonies and the imperialist, and θ and x represent random numbers with uniformdistribution, as given in Eq. (24).

$$
x \approx U(0, \beta \times d), \theta \approx U(-\gamma, \gamma)
\tag{24}
$$

In the above equation, the terms β and γ describe parameters that modify the area that coloniesrandomly search around the imperialist. The total cost of all of the empires can be computed from Eq. (25).More descriptions about the ICA and the pseudocode of the ICA can be found in [17].

$$
T.C.n = Cost(imperialist_n) + \xi_{ica}\{Cost(Colonies\ of\ empire_n)\}
\tag{25}
$$

The ICA, as a new heuristic algorithm, is used in multiple applications, such as PID controller designing

[18], optimal placement of FACTS devices [19], economic load dispatch of power systems [20], power systemstabilization [21], or harmonic elimination in multilevel inverters [22]. In this paper, the ICA is used to obtain the optimal values of the supplementary controller parametersof a BtB HVDC.

To obtain optimal parameters, this paper employs ICA to enhance optimization synthesis and find the global optimum value of fitness function. The objective function (which must be minimized) is defined as follows :

$$f = \sum_{j=1}^{N} \int_{0}^{t} t|\Delta\omega_i| dt$$

(25-1)

Where t is the time range of simulation and N is the total number of operating points for which the optimization is carried out. The design problem can be formulated as the following constrained optimization problem, where the constraints are the controller parameters bounds:

$$Minimize : f$$
$$Subject :$$
$$K_{min} \le K \le K_{max}, T_1^{min} \le T_1 \le T_1^{max}, T_2^{min} \le T_2 \le T_2^{max}$$
$$T_3^{min} \le T_3 \le T_3^{max}, T_4^{min} \le T_4 \le T_4^{max}$$

(25-2)

Typical ranges of the optimized parameters are [0.01–100] for K and [0.01–1] for T_1 , T_2 , T_3 and T_4 . The proposed approach employs ICA algorithm to solve this optimization problem and search for an optimal or near optimal set of controller parameters.

BtB VSC HVDC Damping function

The linearized model of the power system installed with the BtB VDC HVDCcan be expressed by Fig. 3, where H(s) is the transfer function of the HVDC damping controller. From Fig. 4we can obtain the electric torque provided by the HVDC damping controller to the electromechanical oscillation loop of the generator to be:

$$\Delta T_{HVDC} = \frac{K_c(\lambda_0)K_0(\lambda_0)H(\lambda_0)}{1 - K_{IL}(\lambda_0)H(\lambda_0)} \Delta\omega$$

(26)

An ideal UPFC damping controller should contribute a pure positive damping torque to the electromechanical oscillation loop with $\Delta T_{HVDC} = D_{HVDC}\Delta\omega$ that is:

$$D_{HVDC} = \frac{K_c(\lambda_0)K_0(\lambda_0)H(\lambda_0)}{1 - K_{IL}(\lambda_0)H(\lambda_0)}$$

(27)

which results in:

H.Shakeri and N.Azargun

$$D_{IPFC} = \left[K_c(\lambda_0) K_0(\lambda_0) + D_{IPFC} K_{IL}(\lambda_0) \right] H(\lambda_0)$$
$$= F(\lambda_0) H(\lambda_0)$$

(28)

$F(\lambda_0)$ Which is named as the forward path of the BtB VSC HVDC damping controller, has a decisive influence on the effectiveness of the HVDC damping controller.If we assume the set of the operating conditions of the power system is $\Omega(\mu), F(\lambda_0)$ can be denoted as the function of system operating condition μ and input control signal of the HVDC u_k. The criterion of the selection can be:

$$\mu_{selected} = \min_{\mu} F(\lambda_0, \mu, u_k), \mu \in \Omega(\mu)$$

$$u_{selected} = \max_{u_k} F(\lambda_0, \mu_{selected}, u_k)$$

$$u_k \in \{M_r, M_i, PH_r, PH_i\}$$

(29)

$$uselected = \min_{u_k} \{ \max_{\mu} F(\lambda_0, \mu, u_k) - \min_{\mu} F(\lambda_0, \mu, u_k) \}$$

$$u_k \in \{M_r, M_i, PH_r, PH_i\},$$

$$\mu \in \Omega(\mu)$$

(30)

Eq.27 requires that the operating condition, wherethe HVDC damping control is least effective, is selectedfor the design of the controller.

For the efficient operation of the HVDC dampingfunction. The required damping should be provided atminimum control cost.

A good design of damping controller requires thatit provides a steady damping over all the range ofpower system operating conditions.

Furthermore, from eq.26 we can see that the phase compensation method can be used to set the parameters of the HVDC damping controller.

simulation results

Power system information is given in appendix A. constant coefficients in (23) are calculatedaccording information's who given in appendix B.

Fig.5 shows the damping of the oscillation mode over the $\Omega(\mu)$. It can be seen that, at the heavy load operating condition, the oscillation mode is of poorest damping. Therefore this operating condition is selected to design the damping controller.

With $u_k = M_i$ we have $F(\lambda) \approx 0$ over $\Omega(\lambda)$. Therefore, the oscillation mode controllability is not controllable if the input control signal is chosen to be M_i. According to damping function criteria the best inputs for applying damping signal are $\Delta\varphi_r, M_r$.

H.Shakeri and N.Azargun

However, an electrical torque in-phase with the speed deviation is to be produced in order to enhance damping of the system oscillations. It includes gain block, signal-washout block and lead–lag compensator. The parameters of the damping controller are obtained using ICA algorithm. These parameters are as table1.

According to these figures, damping controller based on ICA for phase angle of rectifier damps active power, rotor speed oscillations and load angle better than modulation index of rectifier for loading condition.

CONCLUSION

In this paper, damping function criteria has been employed to evaluate the electromechanical mode controllability to the four VSC HVDC control signals. It has been shown that the electromechanical mode is most powerfully controlled via PH_r for a wide range of loading conditions. Also, ICA has been successfully applied to the robust design of VSC HVDC based damping controllers. The effectiveness of the proposed VSC HVDC controllers for improving transient stability performance of a power system are demonstrated by a weakly connected power system subjected to different severe disturbances.

Appendix A

The test system parameters are:

Machine and Exciter:

$$X_d = 1, X_q = 0.6, X'_d = 0.3, D = 0, M = 8,$$
$$T'_{do} = 5.044, freq = 60, v_{ref} = 1, K_A = 120,$$
$$T_A = 0.015$$

Transmission line and transformer reactance:

$$X_{tl} = 0.15, X_{lb} = 0.6,$$
$$X_{sp} = X_s = 0.15$$

BtB VSC HVDC:

$$V_{dc} = 3, C_{dc} = 1$$

Appendix B

Coefficients are:

$$Z = 1 + \frac{X_{lb}}{X_s}, A = X_{tl} + X_{lb} + \frac{X_{tl}}{X_s}, [A] = A + ZX'_d, [B] = A + ZX_q$$

$$C_1 = \frac{V_b \cos(\delta)}{[B]}, C_2 = -\frac{X_{lb}M_r V_{dc} \sin(PHr)}{2X_s[B]}$$

$$C_3 = \frac{X_{lb}V_{dc} \cos(PHr)}{2X_s[B]}, C_4 = \frac{X_{lb}M_r \cos(PHr)}{2X_s[B]}$$

$$C_5 = \frac{Z}{A}, C_6 = \frac{V_b \sin(\delta)}{[A]}$$

$$C_7 = -\frac{X_{lb}M_r V_{dc} \cos(PHr)}{2X_s[A]}, C8 = -\frac{X_{lb}V_{dc} \sin(PHr)}{2X_s[A]}$$

$$C_9 = -\frac{X_{lb}M_r V_{dc} \cos(PHr)}{2X_s[A]}, C_b = E'_q + (X_q - X'_d)$$

H.Shakeri and N.Azargun

$C_a = (X_q - X'_d)I_{tlq}$, $K_1 = C_bC_1 + C_aC_6$

$K_2 = I_{tlq}(1 + (X_q - X'_d)C_5)$, $K_{pdc} = C_bC_4 + C_aC_9$

$K_{pMr} = C_bC_3 + C_aC_8$, 　$K_{pPHr} = C_bC_2 + C_aC_7$

$X_d - X'_d = J$, $K_3 = 1 + JC_5$, $K_4 = JC_6$, $K_{qPHr} = JC_7$

$K_{qMr} = JC_8$, $K_{qdc} = JC_9$, $L = \dfrac{1}{V_t}$, $K_5 = L(V_{td}X_qC_1 - V_{tq}X'_dC_6)$

$K6 = LVtq(1 - X'_dC_5)$, $K_{Vdc} = L(V_{td}X_qC_4 - V_{tq}X'_dC_9)$

$K_{VMr} = L(V_{td}X_qC_3 - V_{tq}X'_dC_8)$

$K_{VPHr} = L(V_{td}X_qC_2 - V_{tq}X'_dC_7)$, $E = \dfrac{X'_d + X_{tl}}{X_s}$

$G = \dfrac{\sin(PHr)}{X_s}$, $C_{10} = \dfrac{1}{X_s}(-(X'_d + X_{tl})C_5 + 1)$

$C_{11} = -EC_6$, $C_{12} = -(EC_7 + \dfrac{M_rV_{dc}\cos(PHr)}{2X_s})$

$C_{13} = -(EC_8 + \dfrac{GV_{dc}}{2})$, $C_{14} = -(G\dfrac{M_r}{2} + EC_9)$

$W = \dfrac{X_q + X_{tl}}{X_s}$, $C_{15} = -WC_1$

$C_{16} = -(WC_2 + \dfrac{M_rV_{dc}\sin(PHr)}{2X_s})$, $C_{17} = -(WC_4 - \dfrac{M_r\cos(PHr)}{2X_s})$,

$P_1 = -\dfrac{V_b\sin(\delta)}{X_{sp}}$

$C_{18} = -(WC_3 - \dfrac{V_{dc}\cos(PHr)}{2X_s})$, $P_2 = -\dfrac{M_iV_{dc}\cos(PHi)}{2X_{sp}}$

$P_3 = -\dfrac{M_i\sin(PHi)}{2X_{sp}}$, $P_4 = -\dfrac{V_{dc}\sin(PHi)}{2X_{sp}}$

, , $P_5 = -\dfrac{V_b\cos(\delta)}{X_{sp}}$, $P_6 = -\dfrac{M_iV_{dc}\sin(PHi)}{2X_{sp}}$

$P_7 = \dfrac{M_i\cos(PHi)}{2X_{sp}}$, $P8 = \dfrac{V_{dc}\cos(PHi)}{2X_{sp}}$

$P_9 = \dfrac{I_{lod}\cos(PHr) + I_{loq}\sin(PHr)}{2C_{dc}}$

$P10 = \dfrac{I_{bopd}\cos(PHi) + I_{lopq}\sin(PHi)}{2C_{dc}}$

$P_{11} = \dfrac{M_r\cos(PHr)}{2C_{dc}}$, $P_{12} = -\dfrac{M_r\sin(PHr)I_{lod}}{2C_{dc}}$

$P_{13} = \dfrac{M_r\sin(PHr)}{2C_{dc}}$, $P_{14} = \dfrac{M_r\cos(PHr)I_{loq}}{2C_{dc}}$

H.Shakeri and N.Azargun

$$P_{15} = \frac{M_i \cos(PHi)}{2C_{dc}} \, , P_{16} = -\frac{M_i \sin(PHi)I_{bopd}}{2C_{dc}}$$

$$P_{17} = \frac{M_i \sin(PHi)}{2C_{dc}} \, , P_{18} = \frac{M_i \cos(PHi)I_{bopq}}{2C_{dc}}$$

$$P_{124} = P_{12} + P_{14} \, , P_{186} = P_{18} + P_{16}$$

$$q_1 = P_{11}C_{11} + P_{13}C_{15} + P_{15}P_1 + P_{17}P_5$$

$$q_2 = P_{11}C_{10} \, , q_3 = P_{11}C_{14} + P_{13}C_{17} + P_{15}P_3 + P_{17}P_7$$

$$q_4 = P_9 + P_{11}C_{13} + P_{13}C_{18} \, , q_5 = P_{11}C_{12} + P_{13}C_{16} + P_{124}$$

$$q_6 = P_{10} + P_{15}P_4 + P_{17}P_8$$

$$q_7 = P_{15}P_2 + P_{17}P_6 + P_{186}$$

REFERENCES

1. Arrillaga, J., Liu, Y.H., Watson, N.R.: 'Flexible power transmission: theHVDC options' (John Wiley, 2007)
2. Sood, V.K.: 'HVDC and FACTS controllers: applications of staticconverters in power systems' (Kluwer Academic Publishers, Boston;London, 2004)
3. Cresap, R.L., Mittelstadt, W.A., Scott, D.N., Taylor, C.W.: 'Operatingexperience with modulation of the pacific HVDC intertie', IEEETrans. Power Appar. Syst., 1978, PAS-97, (4), pp. 1053–1059
4.]Martin, D.E.,Wong,W.K., Dickmander, D.L., Lee, R.L., Melvold, D.J.:'Increasing WSCC power system performance with modulation controlson the intermountain power project HVDC system', IEEE Trans. PowerDeliv., 1992, 7, (3), pp. 1634–1642
5. Smed, T., Andersson, G.: 'Utilizing HVDC to damp power oscillations',IEEE Trans. Power Deliv., 1993, 8, (2), pp. 620–627
6. Taylor, C.W., Lefebvre, S.: 'HVDC controls for system dynamicperformance', IEEE Trans. Power Syst., 1991, 6, (2), pp. 743–752
7. To, K.W.V., David, A.K., Hammad, A.E.: 'A robust co-ordinatedcontrol scheme for HVDC transmission with parallel ac systems',IEEE Trans. Power Deliv., 1994, 9, (3), pp. 1710–1716
8. Xiao-ming, M., Yao, Z.: 'Application of HVDC modulation in dampingelectromechanical oscillations'. Proc. of IEEE Power EngineeringSociety General Meeting, 2007, pp. 1–6
9. He, J., Lu, C., Wu, X., Li, P., Wu, J.: 'Design and experiment of widearea HVDC supplementary damping controller considering time delay inchina southern power grid', IET Gener. Transm.Distrib., 2009, 3, (1),pp. 17–25
10. Li, P., Wu, X., Lu, C., et al.: 'Implementation of CSG's wide-areadamping control system: overview and experience'. Proc. of IEEE/PES PSCE Power Systems Conf. and Exposition, 2009, pp. 1–9
11. Li, L., Wu, X., Li, P.: 'Coordinated control of multiple HVDC systemsfor damping interarea oscillations in CSG'. Proc. of IEEE PowerAfricaPower Engineering Society Conf. and Exposition in Africa, 2007,pp. 1–7
12. Panda S, Prasad Padhy N. Comparison of particle swarm optimization and genetic algorithm for FACTS based controller design. Appl Soft Comput 2008;8(4):1418–27.
13. Shayeghi H, Shayanfar HA, Jalilzadeh S, Safari A. A PSO based unified power flow controller for damping of power system oscillations. Energy Convers Manage 2009; 50:2583–92.
14. Panda S, Swain SC, Rautray PK, Mallik R, Panda G. Design and analysis of SSSC based supplementary damping controller. Simulat Model PractTheor 2010;18:1199–213.
15. Panda S. Differential evolution algorithm for SSSC-based damping controller design considering time delay. J Franklin Inst2011;348:1903–26.
16. Panda S. Multi-objective non-dominated shorting genetic algorithm-II for excitation and TCSC-based controller design. J ElectrEng 2009;60: 87–94.

17. E. Atashpaz-Gargari, C. Lucas, "Imperialist competitive algorithm: an algorithm for optimization inspired byimperialistic competition", IEEE Congress on Evolutionary Computation, pp. 4661-4667, 2007.

18. E. Atashpaz, F. Hashemzadeh, R. Rajabioun, C. Lucas, "Colonial competitive algorithm: a novel approach forPID controller design in MIMO distillation column process", International Journal of Intelligent Computing andCybernetics, Vol. 1, pp. 337-355, 2008.

19. R. Jahani, "Optimal placement of unified power flow controller in power system using imperialist competitivealgorithm", Middle-East Journal of Scientific Research, Vol. 8, pp. 999-1007, 2011.

20. H. ChahkandiNejad, R. Jahani, "A new approach to economic load dispatch of power system using imperialistcompetitive algorithm", Australian Journal of Basic and Applied Sciences, Vol. 5, pp. 835-843, 2011.

21. E. Bijami, J. AskariMarnani, S. Hosseinnia, "Power system stabilization using model predictive control based onimperialist competitive algorithm", International Journal on Technical and Physical Problems of Engineering, Vol.3, pp. 45-51, 2011.

22. M.H. Etesami, N. Farokhnia, S.H. Fathi, "A method based on imperialist competitive algorithm (ICA), aiming tomitigate harmonics in multilevel inverters", 2nd Power Electronics, Drive Systems and Technologies Conference,pp. 32-37, 2011.
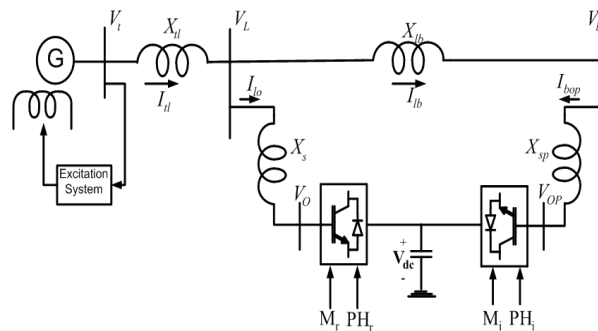
Fig.1.Configuration of case study

H.Shakeri and N.Azargun
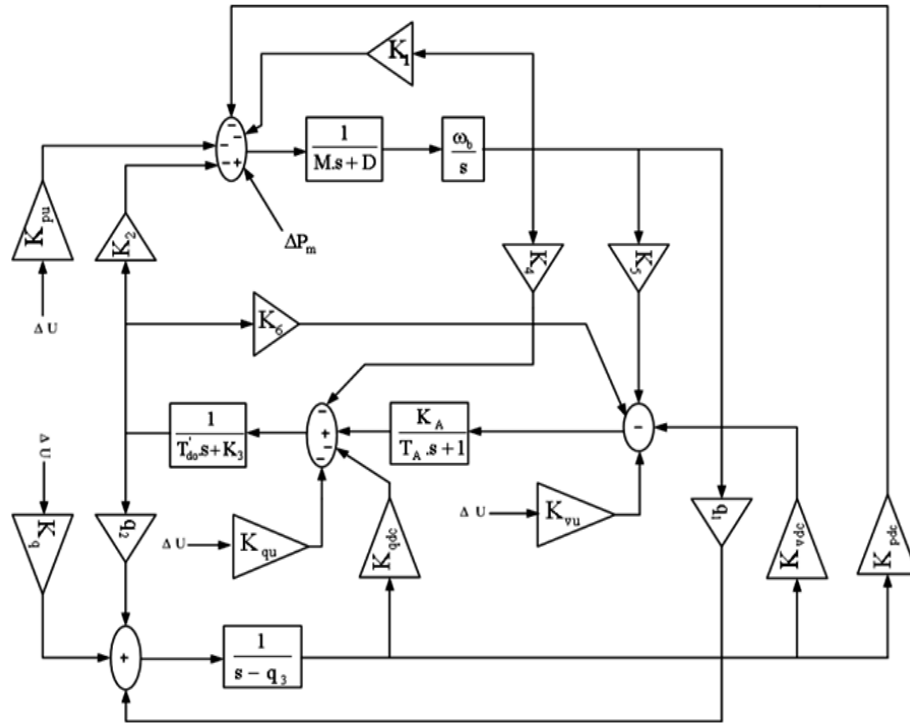
Fig.2.Phillips_Heffron model of power system installed with HVDC
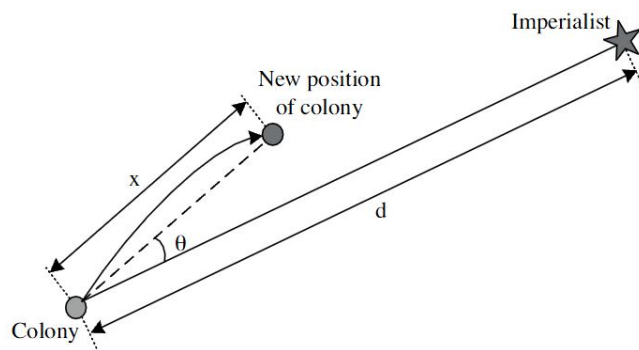
Fig.3.Movement of colonies toward their related imperialist

H.Shakeri and N.Azargun
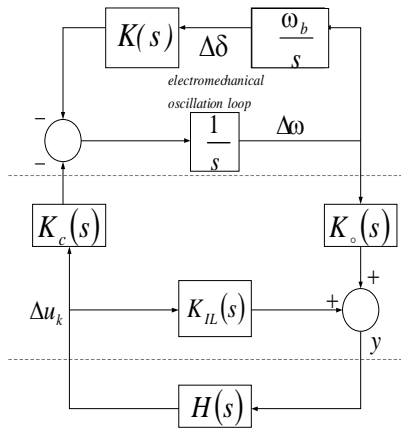
Fig.4.Closed-loop system installed with UPFC dumping controller
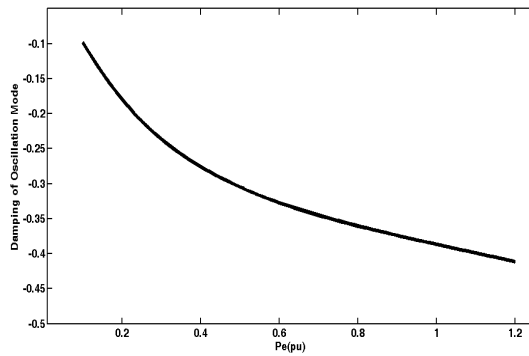
Fig.5 Damping of oscillation mode over the operating condition

Table1 Parameters of supplementary controller designed by ICA		
	M_r	φ_r
k	12.301	48.56
T_1	3.21	0.012
T_2	0.011	0.061
T_3	7.13	0.12
T_4	0.98	0.059

H.Shakeri and N.Azargun
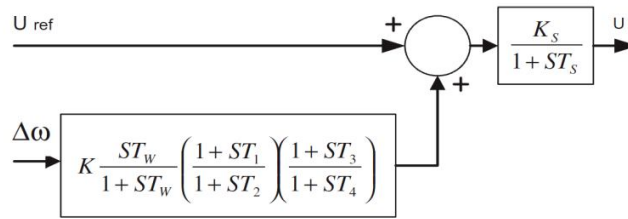
Fig.7BtB HVDC with lead-lag controller

Table2 Synchronous machine condition			
Operating Condition	P_e	Q_e	V_t
λ_1 (Nominal)	0.9	0.1	1
λ_2 (Heavy)	1.3	0.45	1
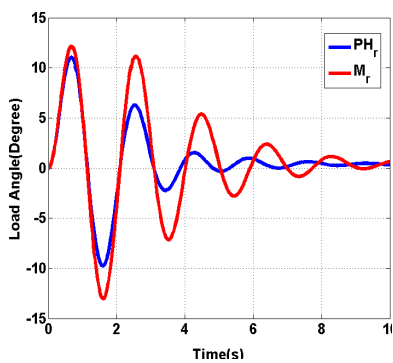
Fig.8Load Angle(λ_1)
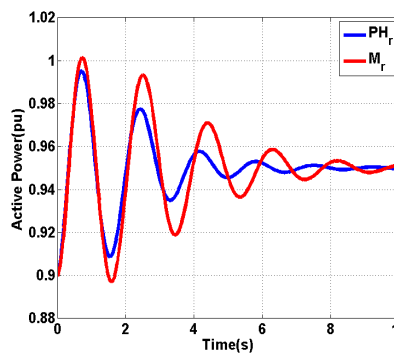
Fig.9Active Power(λ_1)
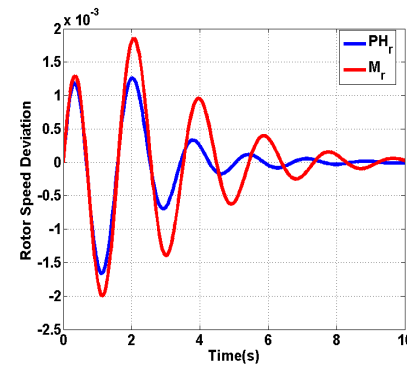
Fig.10Rotor Speed Deviation(λ_1)
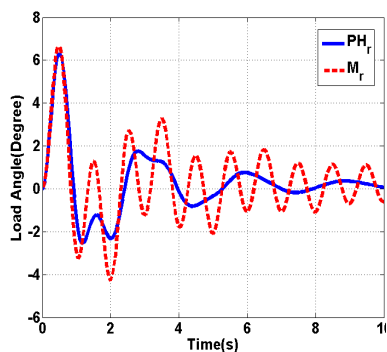
Fig.11Load Angle(λ_2)
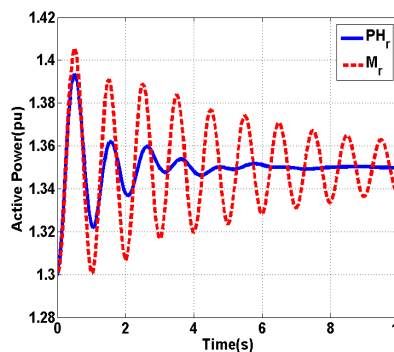
Fig.12Active Power(λ_2)
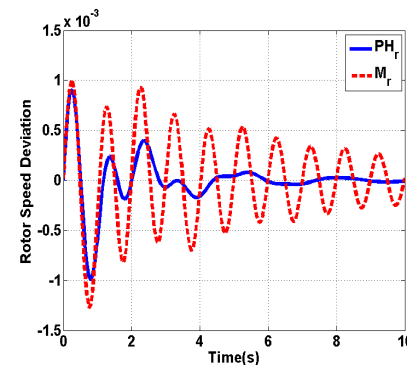
Fig.13Rotor Speed Deviation(λ_2)

RESEARCH ARTICLE

Input–Output Signal Selection for Damping of Power System Oscillations Using HVDC Transmission Systems

H.Shakeri[*] and N.Azargun[*]

*Sama Technical and Vocational Training College, Islamic Azad University, Yasuj Branch, Yasuj, Iran.

[*]**Address for correspondence**
H.Shakeri
Sama Technical and Vocational Training College,
Islamic Azad University,
Yasuj Branch, Yasuj, Iran.

ABSTRACT

This paper presents the establishment of a novel linearized Phillips-Heffron model of a power system installed HVAC parallel-connected with a High Voltage Direct Current based voltage source converter (VSC HVDC). The use of the supplementary controllers of a VSC HVDC to damp low frequency

oscillations in a weakly connected system is proposed.Through an adequate selection of input–output signal pairs, HVDCs can be effectively used to provide electromechanical oscillations damping. In this paper, different analysis techniques considering both controllability and observability measures and input–output interactions are compared and critically examined. Recommendations are drawn to select the best signal available from HVDC to contribute to power oscillations damping.

Keywords: VSC HVDC, Power System Stability, Relative Gain Array (RGA), Singular Value Decomposition (SVD), Supplementary Damping Controller.

INTRODUCTION

High voltage direct current (HVDC) technology has characteristics that make it especially attractive for certain transmission applications.HVDC transmission is widely recognized as being advantageous for long-distance bulk-power delivery, asynchronous interconnections, and long submarine cable crossings[1-3]. The number of HVDC projects committed or under consideration globally has increased in recent years reflecting a renewed interest in this mature technology.Modulation of the active power order of an high-voltage direct current (HVDC) link could be extremely effective for damping low-frequency power oscillations, thereby increasing the transfer capacity of an AC

H.Shakeri and N.Azargun

transmission systemstability phenomena such as power oscillations and transient stability are important in power system stability analysis[4-7]. The power oscillation phenomenon consists of synchronous generator rotors swinging relative to each other[4-5]. Under severe disturbances the first swing may be considerably large and endanger the stability of the system [6-7]. If the first swing is handled and reaches transient stability, there might still be a risk of losing synchronism due to low damping torque or voltage instability [7-12].

Power system which is equipped with parallel AC-DC system is a multivariable system and it is important to choose best input to apply supplementary controller signal to damp oscillations.Different methods to select the best feedback signal to damppower oscillations have been discussed in [8,12–16], but the case for HVDCs has not been yet well covered. Recent research focuses on the best input–output signal pairs employing controllability and observability analyses [13,17]. Other works study the interaction between different controllers for a multiple-input multiple-output (MIMO, multivariable) case and try to determine if a decentralized controller could be considered by using the relative gain array (RGA) [17,18]. In [19], fundamental limitations of control design by using local signals to damp remote oscillations are analyzed, where the interaction between local and remote signals has an important influence.

In this paper an approach is presented to model parallel AC/DC power system namely Phillips-Heffron model based d-q algorithm in order to studying system dynamical stability. In addition, a block diagram representation is formed to analyze the system stability characteristics. By this modeling approach, it is possible to analyze the small-signal stability of the system and low-frequency oscillation phenomena which is caused by external disturbances such as variation of input torque and fault occurring.

Also selection of a suitable signal for applying to a power system is done based on relative gain array (RGA),singular value decomposition (SVD) and Damping Function (DF).

Configuration of power system

Fig.1shows a SMIB system equipped with a HVDC. As it can be seen the infinite bus is supplied byHigh Voltage Alternative Current (HVAC) parallel connected with an VSC HVDC power transmission system. The AC side of each converter is connected to the line through a coupling transformer. The first voltage source converter behaves as a rectifier. It regulates the DC link voltage and maintains the magnitude of the voltage at the connected terminal. The second voltage source converter acts as a controlled voltage source, which controls power flow in VSC HVDC feeder. The four input control signals to the VSC HVDC are $M_r, \varphi_r, M_i, \varphi_i$ where M_r, M_i are the amplitude modulation ratio and φ_r, φ_i are phase angle of the control signals of each VSC respectively.

As it can be seen the infinite bus is supplied byHigh Voltage Alternative Current (HVAC) parallel connected with an VSC HVDC power transmission system. The AC side of each converter is connected to the line through a coupling transformer. The first voltage source converter behaves as a rectifier. It regulates the DC link voltage and maintains the magnitude of the voltage at the connected terminal. The second voltage source converter acts as a controlled voltage source, which controls power flow in VSC HVDC feeder. The four input control signals to the VSC HVDC are $M_r, \varphi_r, M_i, \varphi_i$ where M_r, M_i are the amplitude modulation ratio and φ_r, φ_i are phase angle of the control signals of each VSC respectively.

By applying Park's transformation and neglecting the resistance and transients of the coupling transformers, the VSC HVDC (Fig.1.c) can be modeled (also Fig.1.a,b can be modeled similarly):

$$\begin{bmatrix} V_{td} \\ V_{tq} \end{bmatrix} = \begin{bmatrix} 0 & x_r \\ -x_r & 0 \end{bmatrix} \begin{bmatrix} i_{rd} \\ i_{rq} \end{bmatrix} + \begin{bmatrix} (M_r V_{dcr} \cos(\varphi_r))/2 \\ (M_r V_{dcr} \sin(\varphi_r))/2 \end{bmatrix} \tag{1}$$

H.Shakeri and N.Azargun

$$\begin{bmatrix} V_{bd} \\ V_{bq} \end{bmatrix} - \begin{bmatrix} 0 & x_i \\ -x_i & 0 \end{bmatrix} \begin{bmatrix} I_{id} \\ I_{iq} \end{bmatrix} + \begin{bmatrix} (M_i V_{dci} cos(\varphi_i))/2 \\ (M_i V_{dci} sin(\varphi_i))/2 \end{bmatrix} \tag{2}$$

$$C\dot{V}_{dc} = -(I_1 + I_2) \tag{3}$$

$$L_1(dI_1/dt) = V_{dc} - V_{dcr} - R_1 I_1 \tag{4}$$

$$L_2(dI_2/dt) = V_{dc} - V_{dci} - R_2 I_2 \tag{5}$$

Where V_l, V_b, I_r and I_i are the middle bus voltage, infinite bus voltage, flowed current to rectifier and inverter respectively. C And V_{dc} are the DC link capacitance and voltage, respectively. C_r, C_i, V_{dcr} and V_{dci} are the DC capacitances and voltages of rectifier and inverter respectively.

The non-linear model of the SMIB system of Fig.1is:

$$\dot{\delta} = \omega_b(\omega - 1)$$

$$\dot{\omega} = (P_m - P_e - D\omega)/M \tag{7}$$

$$\dot{E}'_q = (E_{fd} - (x_d - x'_d)I_t - E'_q)/T'_{do} \tag{8}$$

$$\dot{E}_{fd} = (K_A(V_{ref} - V_t + u_{pss}) - E_{fd})/T_A \tag{9}$$

Where

$: P_e = V_{td}I_{td} + V_{tq}I_{tq} \,, V_t = \sqrt{V_{td}^2 + V_{tq}^2} \,, V_{td} = x_q I_{tq} \,, V_{tq} = E'_q - x'_d I_{td} \,, I_{td} = I_{ld} - I_{rd} \,, I_{tq} = I_{lq} - I_{rq}$ where P_m and P_e are the input and output power , respectively ; M and D the inertia constant and damping coefficient , respectively ; ω_b the synchronous speed ; δ and ω the rotor angle and speed, respectively ; E'_q, E_{fd} and V_t the generator internal, field and terminal voltages, respectively; T'_{do} the open circuit field time constant; x_d, x'_d and x_q the d-axis, d-axis transient reactance, and q-axis reactance, respectively; K_A and T_A the exciter gain and time constant, respectively; V_{ref} the reference voltage.

Also, from Fig.1.c we have:

$$\overline{V}_t = jx_t\overline{I}_t + \overline{V}_l \tag{10}$$

$$\overline{V}_t = jx_t\overline{I}_t + jx_l\overline{I}_l + \overline{V}_b \tag{11}$$

$$\overline{I}_l = \overline{I}_t - ((\overline{V}_t - jx_i\overline{I}_t - \overline{V}_r)/jx_r) \tag{12}$$

Where $\overline{I}_t, \overline{V}_r, \overline{I}_l$ and $\overline{V}_b$ are the armature current, rectifier voltage, infinite bus current and voltage respectively. From Eq (10)-(12) we can have:

$$I_{tq} = ((1/2x_r)(x_i M_r V_{dcr} cos(\varphi_r)) + V_b sin(\delta))/(Zx_q + A) \tag{13}$$

$$I_{td} = (ZE'_q - (1/2x_r)x_i M_r V_{dcr} sin(\varphi_r) - V_b cos(\delta))/(Zx'_d + A) \tag{14}$$

H.Shakeri and N.Azargun

And For inverter side:

$$I_{id} = (-V_b \cos(\delta) + 0.5 M_i V_{dci} \sin(\varphi_i))/x_i \tag{15}$$

$$I_{iq} = (V_b \sin(\delta) - 0.5 M_i V_{dci} \cos(\varphi_i))/x_i \tag{16}$$

By linearizing Eq (1)-(7), (13)-(16):

$$\Delta\dot{\delta} = \omega_b \Delta\omega \tag{17}$$

$$\Delta\dot{\omega} = (\Delta P_m - \Delta P_e - D\Delta\omega)/M \tag{18}$$

$$\Delta\dot{E}'_q = (\Delta E_{fd} - (x_d - x'_d)\Delta I_t - \Delta E'_q)/T'_{do} \tag{19}$$

$$\Delta\dot{E}_{fd} = (K_A(\Delta V_t + \Delta u_{pss}) - \Delta E_{fd})/T_A \tag{20}$$

Where:

$$\Delta V_t = K_5\Delta\delta + K_6\Delta E'_q + K_{vdcr}\Delta V_{dcr} + K_{vMr}\Delta M_r + K_{v\varphi r}\Delta\psi_r \tag{21}$$

$$\Delta P_e = K_1\Delta\delta + K_2\Delta E'_q + K_{pdcr}\Delta V_{dc} + K_{pMr}\Delta M_r + K_{p\varphi r}\Delta\psi_r \tag{22}$$

$$\Delta E_q = K_4\Delta\delta + K_3\Delta E'_q + K_{cdcr}\Delta V_{dcr} + K_{qMr}\Delta M_r + K_{q\varphi r}\Delta\varphi_r \tag{23}$$

$$\Delta V_{dcr} - (C_{31}/C_r)\Delta\delta + (C_{32}/C_r)\Delta E'_q + (C_{33}/C_r)\Delta V_{dcr} + (1/C_r)\Delta i_1 + (C_{34}/C_r)\Delta M_r + \tag{24}$$

Substitute Eq(21)-(23) in (17)-(20) we can obtain the state variable of the power system installed with the VSC HVDC to be(state space model):

$$\dot{X} = AX + BU \tag{25}$$

and

$$X = \left[\Delta\delta, \Delta\omega, \Delta E'_q, \Delta E_{fd}, \Delta V_{dcr}, \Delta i_1, \Delta V_{dc}, \Delta I_2, \Delta V_{dci}\right]$$

$$U - \left[\Delta M_r, \Delta\varphi_r, \Delta M_i, \Delta\varphi_i, u_{pss}\right]$$

Where:

$\Delta M_i, \Delta M_r, \Delta\varphi_i, \Delta\varphi_r$ and u_{PSS} are the linearization of the input control signals of the VSC HVDC and PSS output respectively. The linearized dynamic model of Eq.25 can be shown by Fig.2 . In this figure $K_{pu}, K_{qu}, K_{vu}, K_r$ and K_i are defined below:

H.Shakeri and N.Azargun

$$K_{\omega u} = \left[K_{\omega Mr}, K_{\omega\varphi r}, 0,0,0\right],\ K_{pu} = \left[K_{pMr}, K_{p\varphi r}, 0,0,0\right],\ K_{qu} = \left[K_{qMr}, K_{q\varphi r}, 0,0,0\right]$$

$$K_{vu} = \left[K_{vMr}, K_{v\varphi r}, 0,0,0\right],\ K_r = \left[C_{34}/C_r, C_{35}/C_r, 0,0,0\right],\ K_i = \left[0,0, C_{29}/C_i, C_{30}/C_i, 0\right]$$

Also it is possible to demonstrate VSC HVDC Block Diagram for Fig.1.a,bas shown in Fig.3 [22-23-24].

$$A = \begin{bmatrix}
0 & \omega_b & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
-k_1/M & -D/M & -K_2/M & 0 & -K_{pdcr}/M & 0 & 0 & 0 \\
-k_4/T_{do}' & 0 & -k_3/T_{do}' & 1/T_{do}' & -k_{qdcr}/T_{do}' & 0 & 0 & 0 \\
-k_A K_5/T_A & 0 & -k_A K_6/T_A & -1/T_A & -k_A K_{vdcr}/T_A & 0 & 0 \\
C_{31}/C_r & 0 & C_{32}/C_r & 0 & C_{33}/C_r & 1/C_r & 0 & 0 \\
0 & 0 & 0 & 0 & -1/L_1 & -R/L_1 & 1/L_1 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & -1/C & 0 & -1/C & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 1/L_2 & -R_2/L_2 & -1/L_2 \\
C_{27}/C_i & 0 & 0 & 0 & 0 & 0 & 0 & 1/C_i & C_{28}/C_i
\end{bmatrix}$$

$$B = \begin{bmatrix}
0 & 0 & 0 & 0 & 0 \\
-k_{\omega Mr}/M & -k_{\varphi cr}/M & 0 & 0 & 0 \\
-k_{qMr}/T_{do}' & -k_{q\varphi r}/T_{do}' & 0 & 0 & 0 \\
k_A K_{vMr}/T_A & -k_A K_{v\varphi r}/T_A & 0 & 0 & k_A/T_A \\
C_{34}/C_r & C_{35}/C_r & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 \\
0 & 0 & C_{29}/C_i & C_{30}/C_i & 0
\end{bmatrix}$$

It can be seen that the configuration of the Phillips-Heffron model is exactly the same as that installed with UPFC and STATCOM.

Also from Eq.25 it can be seen that there five choice of input control signals of the VSC HVDC to superimpose on the damping function of the VSC HVDC $\Delta M_i, \Delta M_r, \Delta\varphi_i, \Delta\varphi_r$ and u_{PSS} .therefore, in designing the damping controller of the VSC HVDC, besides setting its parameters, the selection of the input control signal of the VSC HVDC to superimpose on the damping function of the VSC HVDC is also important.

input-output coupling, method,interaction and limitations

A significant task in the design of control systems for multivariable plants is the choice of the structure of interconnections between manipulated variables and controlled outputs and also considering interaction between

H.Shakeri and N.Azargun

different channels which couple inputs-outputs, i.e. the control configuration. In this section, method for selecting control structure and measuring channels interaction that enable a desired performance to be achieved, are considered.

Input-output Coupling

Controllability shows how the state variables describing the behavior of a system can be influenced by its inputs. Observability is related with the possibility of determining the states from the outputs. More accurately, the dynamical system $\dot{x} = Ax + Bu$ or the pair (A,B) is said to be state controllable if, for any initial state $x(0) = x_0$ any time $t_1 > 0$ and any final state x_1 there exist an input u(t) such that $x(t_1) = x_1$. Otherwise the system is said to be state uncontrollable. This system also is said observable if, for any $t_1 > 0$, and initial state $x(t_0)$ can be determined from $u(t_1)$ and $y(t_1)$ [25-26].

In damping of power oscillations, it is necessary to determine controllability and observability for specific eigenvalues (electromechanical mode). A very powerful tool commonly used for this purpose is Popov-Belevitch-Hautus(PBH) test which is described as below.

It includes in evaluating the rank of matrices:

$$C(\lambda_k) = [\lambda_k I - A, b_i] \tag{26}$$
$$O(\lambda_k) = [\lambda_k I - A, c_j]^T$$

Which λ_k is the kth eigenvalue of the matrix A, I is the identity matrix, b_i is the column of B corresponding to ith input u_i and c_j is the row of C corresponding to the jth output y_j. The mode λ_k of linear system in state space form is controllable if matrix $C(\lambda_k)$ has full row rank. Similarly, the mode λ_k is observable if $O(\lambda_k)$ is full column rank[25].

The rank of matrices $C(\lambda_k)$ and $O(\lambda_k)$ can be evaluated by their singular values. The singular values is defined as below:

If G is a $m \times n$ complex matrix, then there exist unitary matrices U and V with dimensions of $m \times m$ and $n \times n$, respectively, such that: $G = U\Sigma V^H$

Where

$$\Sigma = \begin{bmatrix} \Sigma_1 & 0 \\ 0 & 0 \end{bmatrix}, \ \Sigma_1 = \mathrm{diag}(\sigma_1, ..., \sigma_r)$$

With $\sigma_1 \geq ... \geq \sigma_r \geq 0$ where $r = \min\{m, n\}$ and $\sigma_1, ..., \sigma_r$ are the singular values of G.

H.Shakeri and N.Azargun

The minimum singular value σ_r represents the distance of the matrix G from all the matrices with a rank of $r-1$ [18]. This property can be used to quantify modal controllability and observability [14, 15]. The matrix H (and J) can be written as $H = [h_1 h_2 h_3 h_4]$ (and $J = [J_1 J_2 J_3 J_4]^T$) where h_i (and J_i)are a column (and row) vector corresponding to the ith input (jth output). The minimum singular value, $\sigma_{\min}$ of the matrix $[\lambda I - A, h_i]$ indicates the capability of the ith input to control the mode associated with the eigenvalue λ. Actually, the higher $\sigma_{\min}$, the higher the controllability of this mode by the input considered. As such, the controllability of the EM mode can be examined with all inputs in order to identify the most effective one to control the mode. The last note can also be rewritten for matrix $[\lambda_k I - A, c_j]^T$ and observabilityof states in outputs. Thus, the choice of input and output signals through the PBH test is done by selecting those with the largest of the minimum singular values of matrices $C(\lambda_k)$ and $O(\lambda_k)$ [25-27].

Input-output Interaction

To measure the degree of coupling or interaction in a system, the idea of relative gain array (RGA) can be employed. The original technique is based upon the open loop steady state gains of the process and is relatively simple to interpret. The relative gain array was first introduced by Bristol[25-27]at steady state as the ratio of open loop and closed loop gains between input j and output i when all output $y_l \neq i$ are perfectly controlled using the inputs $u_h \neq j$.

RGA helps to determine the pair with the highest interaction and to evaluate the possibility of using multivariable controllers. The RGA matrix Λ is defined as:

$$\Lambda(s) = [\eta_{ij}(s)] = G(s) \otimes G(s)^{-T} \tag{27}$$

Where $[\eta_{ij}(s)]$ denotes the element ij of the matrix Λ and the operator $\otimes$ denotes the Hadamard or Schurproduct(element by element product).

The following conclusions can be drawn from the RGA:

$\eta_{ii} = 1$, there is no interaction with other control.

$\eta_{ij} = 0$, manipulated input i does not affect the output j.

$\eta_{ij} = 0.5$, there is a high degree of interaction.

$0.5 < \eta_{ij} < 1$, there is an interaction between the control loops. However, this would be preferable pairing as it would minimize interactions.

$\eta_{ij} > 1$, the interaction reduces the effect gain of the control loop. Higher controller gains are required.

$\eta_{ij} < 0$, care must be taken with negative RGA elements .a negative off-diagonal element indicates that closing the loop will change the sign of effective gain.

H.Shakeri and N.Azargun

Also the ith row sum of the RGA is equal to the squre of the ith the output projection, and the jth column sum of the RGA is equal to the squre of the jth input projection. So RGA is a effective screnning tool for selecting inputs-outputs from G_{ALL} which includes all the candidate inputs and outputs.

Essentialy for the case of many candidate manipulations(inputs) one may consider not using those manipulations corresponding to coulumns in the RGA where the sum of the elements is much smaller than 1. Similarly, for the case of many candidate measured outputs(or controlled outputs) one may consider not using thoese outputs corresponding to rows in the RGA where the sum of the elements is much smaller than1[25].

Damping controller based on neural controller

The damping controllers are designed to produce an electrical torque in phase with the speed deviation. The four control parameters of the HVDC can be modulated in order to produce the damping torque. The speed deviation is considered as the input to the damping controllers.

The structure of HVDC based damping controller is shown in Fig.3-1. It consists of gain, signal washout and phase compensator blocks. The parameters of the damping controller are obtained using the phase compensation technique. The detailed step-by-step procedure for computing the parameters of the damping controllers using phase compensation technique is given below:

1. Computation of natural frequency of oscillation ω_n from the mechanical loop.

$$\omega_n = \sqrt{\frac{K_1 \omega_0}{M}}$$

(28)

2. Computation of at $s = j\omega_n$. Let it be γ.

3. Design of phase lead-lag compensator G_C :

The phase lead-lag compensator G_C is designed to provide the required degree of phase compensation. For 100% phase compensation,

$$\angle G_C(j\omega_n) + \angle GEPA(j\omega_n) = 0$$

(29)

Assuming one lead-lag network, $T_1 = aT_2$ the transfer function of the phase compensator becomes,

$$G_C(s) = \frac{1 + saT_2}{1 + sT_2}$$

(30)

H.Shakeri and N.Azargun

Since the phase angle compensated by the lead-lag network is equal to $-\gamma$, the parameters a and T_2 are computed as,

$$a = \frac{1+\sin(\gamma)}{1-\sin(\gamma)}$$

$$T_2 = \frac{1}{\omega_n \sqrt{a}} \tag{31}$$

4. Computation of optimum gain K_{dc} for desired damping.

This paper an adaptive neural controller is proposed to use in nonlinear model as shown in Fig.3-2. This adaptive neural controller is consisted from two separate neural networks as identifier [14-17] and controller described in following.

Structure of neural identifier is shown in Fig.3-3. This network has four neuron at hidden and one at output layer. f is activation function that is hyperbolic tangent in this paper. It is trained using error back propagation method that described in detail in following. Cost function is defined as:

$$E_{id} = \frac{1}{2}(\Delta\omega - \hat{\Delta\omega})^2 = \frac{1}{2}e_{id}^{\;2} \tag{32}$$

$\Delta\omega$ and $\hat{\Delta\omega}$ are power system (i.e. rotor speed deviation) and neural identifier output, respectively.

$$\frac{\partial E_{id}}{\partial w^{id}_{\;oh}} = \frac{\partial E_{id}}{\partial e_{id}}\frac{\partial e_{id}}{\partial(\hat{\Delta\omega})}\frac{\partial(\hat{\Delta\omega})}{\partial v}\frac{\partial v}{\partial w^{id}_{\;oh}} \tag{33}$$

Where $w^{id}_{\;oh}$ are weights between output and hidden layer. Using equation (33), the sensitive coefficient of output neuron is calculated and output weights are updated according equation (34).

$$w^{id}_{\;ohNew} = w^{id}_{\;ohOld} - \eta\frac{\partial E_{id}}{\partial w^{id}_{\;oh}} \tag{34}$$

Structure of neural controller is shown in Fig.6. This is a feed forward network including four neuron at hidden and one neuron at output layer. Back propagation method used to train this network as described in following. Cost function to training this network is:

$$E_{co} = \frac{1}{2}(0 - \hat{\Delta\omega})^2 = \frac{1}{2}\hat{\Delta\omega}^{\;2} = \frac{1}{2}e_{co}^{\;2} \tag{35}$$

And:

H.Shakeri and N.Azargun

$$\frac{\partial E_{co}}{\partial w^{co}_{oh}} = \frac{\partial E_{co}}{\partial e_{co}} \frac{\partial e_{co}}{\partial(\hat{\Delta\omega})} \frac{\partial(\hat{\Delta\omega})}{\partial v} \frac{\partial v}{\partial w^{co}_{oh}}$$

(36)

V , w^{co}_{oh} are the neural identifier output and the weights between output and hidden layer of neural controller. Using above equations, it is possible to calculate the sensitive coefficient in output neuron of neural controller and correct the middle and output weights of neural controller.

Simulation Results

Power system information is given in appendix A. Constant coefficients are calculated according information which are given in appendix B.

For given information,poles of the VSC HVDC system are:

$$-17.0984 + 6.6503i,\ -17.0984 - 6.6503i,\ -0.1670 + 15.8881i,\ -0.1670 - 15.8881i$$
$$-0.0182 + 3.6842i,\ -0.0182 - 3.6842i,\ 0.7675 + 2.3900i,\ 0.7675 - 2.3900i,\ -1.4115$$

According above,there are two poles with positive real part and power system is unstable. To assess the effectiveness of the proposed stabilizers two different conditions are considered according Table.1.

Testing linear model consists of small changing in mechanical power ($\Delta P_m = 0.05$).

For SVD analysis, P_e ranges from 0.01 to 1.5 Pu and $Q_e = [-0.3, 0, 0.3]$. At each loading condition, the system model is linearized, the EM mode is identified, and the SVD-based controllability measure is implemented. For comparison purposes, the minimum singular value for all inputs at $Q_e = -0.3, 0.0$ and 0.3 Pu is shown in Fig.3, respectively. From these figures, the following can be noticed:

EM mode controllability via is φ_r always higher than that of any other input.

The capabilities of $\varphi_r, u_{PSS}, M_r, \varphi_i$ to control the EM mode is higher than that of M_i.

All control signals have low EM mode controllability in low load condition except φ_r.

The RGA results are shown in Fig.4. It can be result that between VSC HVDC inputs, phase angel of rectifier has good controllability in low frequencies (0-5Hz) rather to other inputs. Thus, this input is selected to apply supplementary controller.

Fig.5,6 show the damping of the oscillation mode over the $\Omega(\mu)$. It can be seen that, at the heavy load operating condition, the oscillation mode is of poorest damping. Therefore this operating condition is selected to design the damping controller.

The results of calculation of the forward path $F(\lambda)$ over $\Omega(\mu)$ as shown by Fig.8. With $u_k = M_i$ we have $F(\lambda) \approx 0$ over $\Omega(\lambda)$.Therefore, the oscillation mode controllability is not controllable if the input control signal is chosen to be M_i. In the following M_i will not be included in the discussion.

H.Shakeri and N.Azargun

According to the criteria of eqn.26, it can be seen that the operating condition to be selected for the design of the HVDC damping controller is $Pe = 0.1 pu$.

Fig.5, indicate $u_k = \varphi_r$ is most effective input control signal. So the criteria of Eq.26 lead to the selection of the input control signal for the UPFC damping controller as $u_k = \varphi_r$.

The results of applying the criteria of Eq.29 are:

With $u_k = \varphi_r$:

$$\frac{\max\limits_{\mu} F(\lambda_0, \mu, u_k) - \min\limits_{\mu} F(\lambda_0, \mu, u_k)}{\min\limits_{\mu} F(\lambda_0, \mu, u_k)} :$$

With $u_k = M_r$:

$$\frac{\max\limits_{\mu} F(\lambda_0, \mu, u_k) - \min\limits_{\mu} F(\lambda_0, \mu, u_k)}{\min\limits_{\mu} F(\lambda_0, \mu, u_k)} =$$

With $u_k = \varphi_i$:

$$\frac{\max\limits_{\mu} F(\lambda_0, \mu, u_k) - \min\limits_{\mu} F(\lambda_0, \mu, u_k)}{\min\limits_{\mu} F(\lambda_0, \mu, u_k)}$$

Therefore, with $u_k = \varphi_r$, the HVDC damping controller provides the smoothest damping to the oscillation mode.

The final result of selection is:

$\mu_{selected} : P_e = 0.1$

$u_k = \varphi_r$

According to Fig.7 in $\mu_{selected}$, magnitude of F is very low. With attention to Eq.26, this reason decrease D_{HVDC} . So we select $\mu : Pe = 0.9 pu$ for damping controller designing.

Phase angle of rectifier, according to above results, is selected to apply supplementary control signal. Phase and neural controller's information are given in appendix A. These controllers are designed for nominal operating

H.Shakeri and N.Azargun

condition. Neural networks weights are selected random from $[0,1]$. Figures 7-8 show the linear power system response in condition λ_1 and λ_2, respectively. According to these figures, neural network damps active power and rotor speed oscillations better than phase compensator controller.

Fig.9 shows the neural controller weights (both neural identifier and Controller) in nominal condition.

CONCLUSION

In this paper, a novel dynamic model is considered and supplementary controller is designed for improve power system stability and oscillation damping. SVD, RGA and DF have been employed to evaluate the EM mode controllability to the four VSC HVDC input. These methods illustrated that the EM mode has best controllability via the fire angle of rectifier. Also, for improving the system stability and damping oscillations, a neural controller is proposed. The simulation results has been carried out by SIMULINK/MATLAB show designed neural controller has the perfectly effect in power system dynamic stability improvement in comparison with phase compensator.

Appendix A

The test system parameters are:

Machine and Exciter:

$$X_d = 1, X_q = 0.6, X'_d = 0.3, D = 0, M = 8,$$
$$T'_{do} = 5.044, freq = 60, v_{ref} = 1, K_A = 120,$$
$$T_A = 0.015$$

Transmission line and transformer reactance:

$$X_{tl} = 0.15, X_{lb} = 0.6,$$
$$X_{sp} = X_s = 0.15$$

BtB VSC HVDC:

$$V_{dc} = 3, C_{dc} = 1$$

Neural controller: two multilayer feed forward neural network with activation function: $a\tanh(bx)$.
Hidden and output layer for identifier includes 4 and 1 neuron respectively with $a = b = 1, Eta = 0.1$.
Hidden and output layer for controller includes 3 and 1 neuron respectively with $a = 20, b = 0.9, Eta = 0.1$.

REFERENCES

1. R. Adapa, "High-wire act: HVDC technology: The state of the art,"IEEE Power Energy Mag. , vol. 10, no. 6, pp. 18–29, Nov. 2012.
2. M. Klein, G. Rogers, and P. Kundur, "A fundamental study of interarea oscillations in power systems," IEEE Trans. Power Syst., vol. 6,no. 3, pp. 914–921, Aug. 1991.
3. R. Sadikovic, "Use of FACTS devices for power flow control and damping of oscillations in power systems," Ph.D. dissertation, ETH Zurich, Zurich, Switzerland, 2006.
4. M. Aboul-Ela, A. Sallam, J. McCalley, and A. Fouad, "Damping controller design for power system oscillations using global signals," IEEE Trans. Power Syst., vol. 11, no. 2, pp. 767–773, May 1996.
5. P. Kundur, N. Balu, and M. Lauby, Power System Stability and Control.New York: McGraw-Hill, 1994, vol. 141. 488 IEEE TRANSACTIONS ON POWER DELIVERY, VOL. 29, NO. 1, FEBRUARY 2014

6. D. Jovcic, L. A. Lamont, and L. Xu, "VSC transmission model for analytical studies," in Proc. IEEE Power Energy Soc. Gen. Meeting, 2003, pp. 1737–1742.

7. J. Pan, R. Nuqui, K. Srivastava, T. Jonsson, P. Holmberg, and Y. Hafner, "AC grid with embedded VSC-HVDC for secure and efficient power delivery," presented at the IEEE Energy 2030, Atlanta, GA, USA, Nov. 2008.

8. B. P. X. Zhang and C. Rehtanz, Flexible AC Transmission Systems: Modelling and Control. Berlin, Germany: Springer-Verlag, 2006.

9. G. Hug-Glanzmann, "Coordinated power flow control to enhance steady-state security in power systems," Ph.D. dissertation, Dept. Inf. Technol. Elect. Eng., ETH Zurich, Zurich, Switzerland, May 2008.

10. C. Rehtanz and K. Sengbusch, "Lastflusssteuerungzursystemstabilisierung," presented at the ETG/BDEW-Tutorial Schutz- und Leittechnik, Fulda, Germany, Nov. 2008.

11. H. Latorre, M. Ghandhari, and L. Söder, "Active and reactive power control of a VSC-HVDC," Elect. Power Syst. Res., vol. 78, pp. 1756–1763, Oct. 2008.

12. Hamdan A. An investigation of the significance of singular value decomposition in power system dynamics.Int J Electr Power Energy Syst1999;21:417–24.

13. Heniche A, Kamwa I. Assessment of two methods to select wide-area signals for power system damping control. IEEE Trans Power Syst 2008;23(2):572–81.

14. Zhang Y, Bose A. Design of wide-area damping controllers for interarea oscillations. IEEE Trans Power Syst 2008;23(3):1136–43.

15. Magaji N, Mustafa M. Optimal location and signal selection of UPFC device for damping oscillation. Int J Electr Power Energy Syst 2011;33(4):1031–42.

16. Rezaei N, Kalantar M, Shayanfar A, Alipouri Y, Safari A. Optimal IPFC signal selection and damping controller design using a novel current injection model in a multi-machine power system.Int J Electr Power Energy Syst2013;44(1):461–70.

17. Li Y, Rehtanz C, Rüberg S, Luo L, Cao Y. Assessment and choice of input signals for multiple HVDC and facts wide-area damping controllers. IEEE Trans Power Syst 2012;27(4):1969–77.

18.] Milanovic´ J, Serrano Duque A. Identification of electromechanical modes andplacement of PSSs using relative gain array. IEEE Trans Power Syst2004;19(1):410–7.

    19. Domínguez-García JL, Bianchi F, Gomis-BellmuntO. Control signal selection for damping oscillations with wind power plants based on fundamental limitations. IEEE Trans Power Syst 2013;28(4):4274–81.
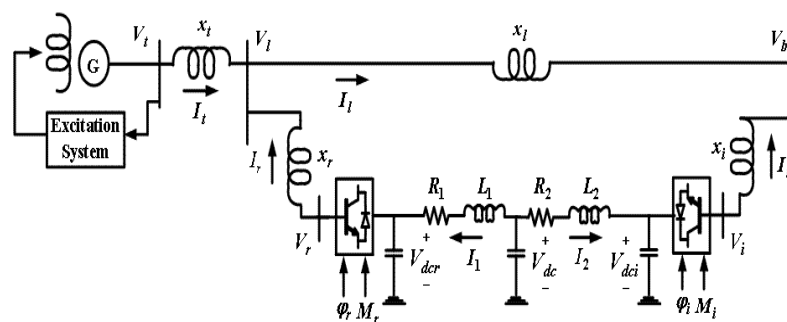
Fig.1.Configuration of case study
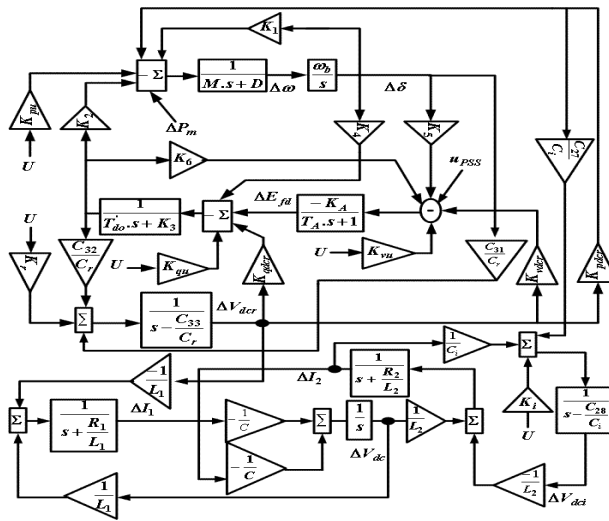
H.Shakeri and N.Azargun

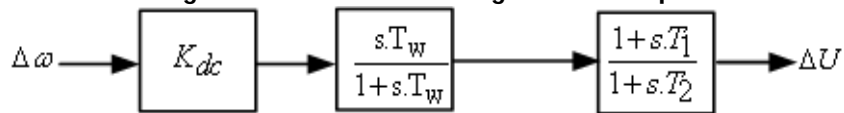**Fig.2 VSC HVDC Block Diagram based Eq.25**

Fig.3-1 Structure of lead-lag controller
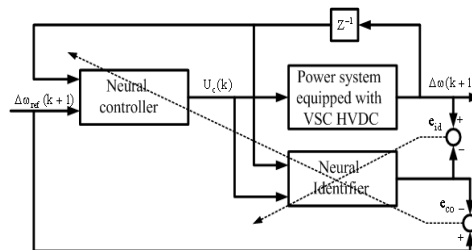

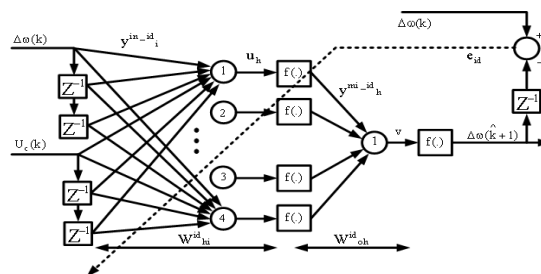**Fig. 3-2 Structure of the online neural controller**

Fig. 3-3 Structure of the online neural identifier
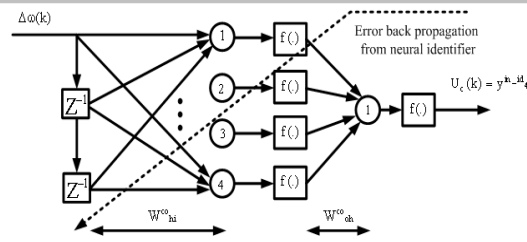
H.Shakeri and N.Azargun

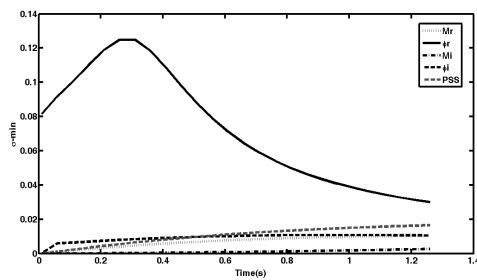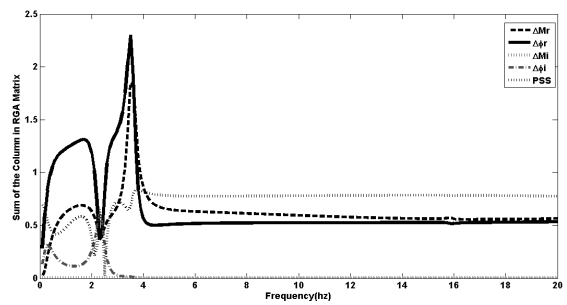**Fig. 3-4 Structure of the online neural controller**

Table.1 Synchronous machine condition

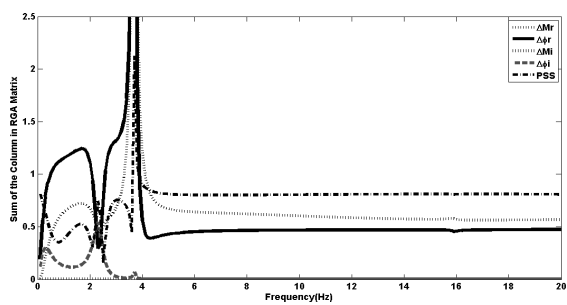| Operating Condition	P_e	Q_e	V_t
λ_1 (Nominal)	1	0.015	1
λ_2 (Heavy)	1.1	0.3	1

(a) $Q_e = 0$
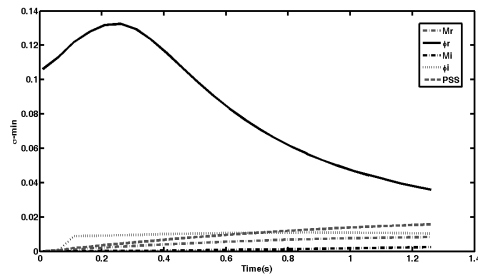

(a)
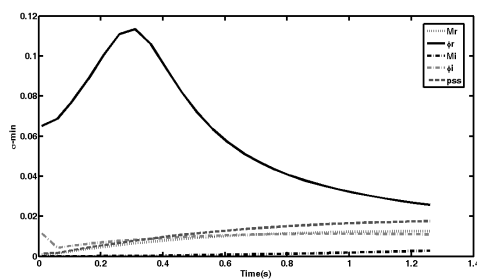
(b) $Q_e = 0.3$

(b)

H.Shakeri and N.Azargun

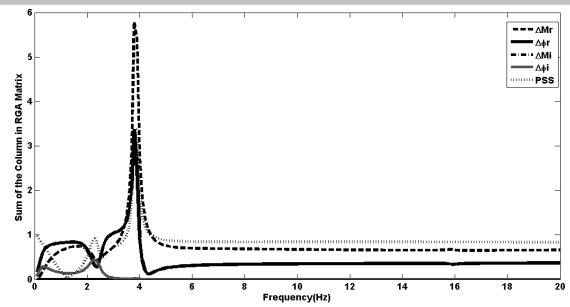$$Q_e = -0.3$$

Fig.3 SVD results for five inputs

(c)

Fig.4 RGA Results
(a) $Pe = 0.9, Qe = -0.4$ (b) $Pe = 1, Qe = 0$
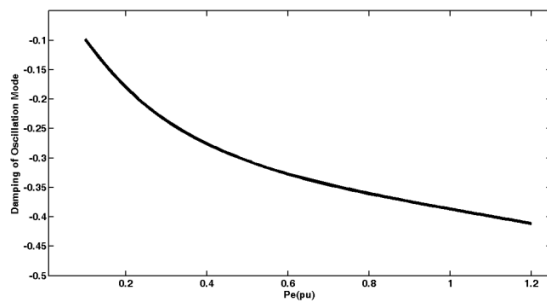(c) $Pe = 1.2, Qe = 0.4$

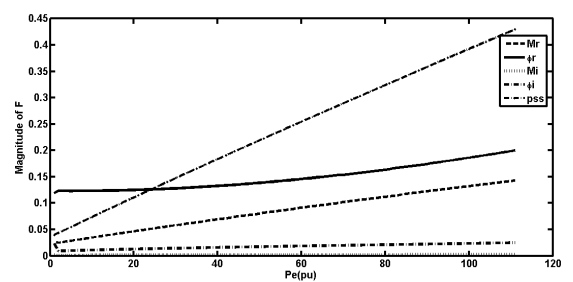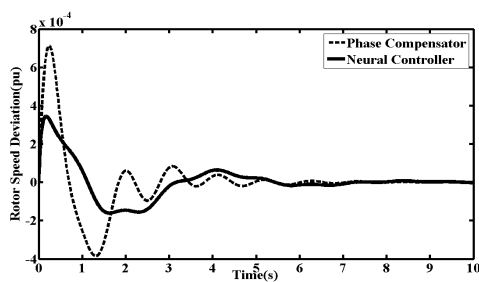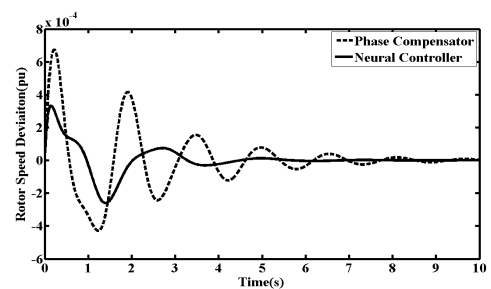**Fig.5 Damping of oscillation mode over the operating condition**

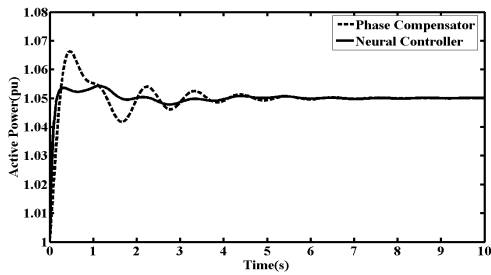**Fig.6 Magnitude of** $F(\lambda)$ **over** $\Omega(\mu)$
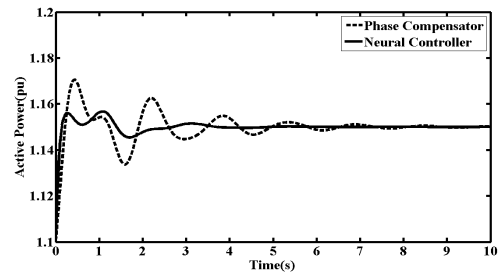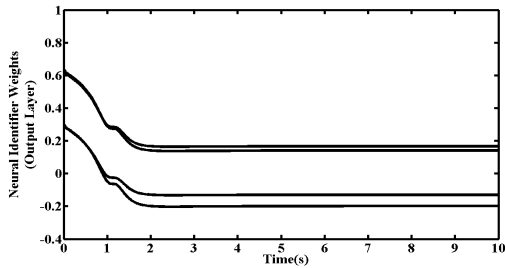

(a)

(a)
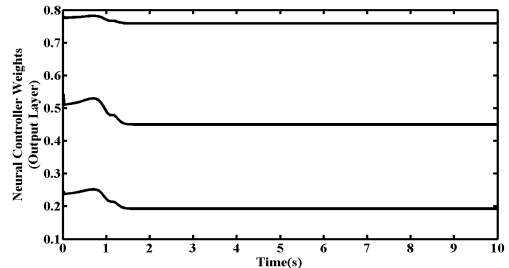
H.Shakeri and N.Azargun

(b)

Fig. 7 (a)Rotor speed deviation
(b)Active power

(b)

Fig. 8 (a)Rotor speed deviation
(b)Active power

(a)

(b)

**Fig. 9 (a)Neural identifier
(b)Neural controller**

RESEARCH ARTICLE

PI-LQR Controller Design for HVDC Transmission Systems

N.Azargun* and H.Shakeri

Sama Technical and Vocational Training College, Islamic Azad University, Yasuj Branch, Yasuj, Iran. .

*Address for correspondence
N.Azargun ,
Sama Technical and Vocational Training College,
Islamic Azad University,
Yasuj Branch, Yasuj, Iran.

ABSTRACT

This paper presents the use of three levels Voltage Source Converter (VSC) in High Voltage Direct Current (HVDC) transmission system for reactive power compensation and voltage stabilization on electric grid network. A new control scheme based on a LQR control is introduced in this paper. Linear quadratic regulator (LQR) is an optimal control method that minimizes the cost function in order to achieve the optimal trade off between the use of control effort, the magnitude and the speed of response. Also it guarantees a stable control system. The controller and the HVDC transmission system were designed with MATLAB/SIMULINK. Simulation results are presented to verify performance of control system.

Key words: LQR control, HVDC system, Voltage Source Converter.

INTRODUCTION

As power demand grows rapidly and expansion in transmission and generation is restricted with the limited availability of resources and the strict environmental constraints, power systems are today much more loaded than before. This causes the power systems to be operated near their stability limits [1,2,3].

Recently HVDC systems have greatly increased. They interconnect large power systems offering numerous technical and economic benefits This interest results from functional characteristics and performance that include for example nonsynchronous interconnection, control of power flow and modulation to increase stability limits[4].

The VSC HVDC system is the most recent HVDC technology. It consists of two VSCs, one operates as a rectifier and the other as an inverter. The two converters are connected either through a DC line. Its main function is to transmit a constant DC power from the rectifier station to the inverter station, with high controllability.

N.Azargun and H.Shakeri

Among various multi-level VSC configurations, the three level Neutral Point Diode Clamped (NPC) converter [4], is the most widely accepted multi-level VSC configuration for utility and high-power industrial applications . Thus, the VSC-based HVDC systems have been mainly proposed or implemented based on the three-level NPC converter[5].

In this paper, a HVDC transmission system based on 3 level VSCs are considered and a LQR controller is designed for controlling loop in rectifier and inverter for improving the controller circuit performance.

Power system modelling

Modeling the scheme VSC HVDC including the power network is as shown in Figure 1. The system parameters are given in Table 1. The VSC HVDC device is included mainly 3-level voltage source converter connected to the host grid network through a coupling transformer. The dc link voltage is provided by the capacitor C which is charged from the AC host network.

Dynamic Equation for VSCs

One convenient way for studying balanced three-phase system (especially in synchronous machine problems) is to convert the three phase voltages and currents into synchronous rotating frame by abc / dq transformation. The benefits of such arrangement are: the control problem is greatly simplified because the system variables become DC values under balanced condition; multiple control variables are decoupled so that the use of classic control method is possible, and even more physical meaning for each control variable can be acquired [6]. Equations (1) to (3) give the mathematical expression of the VSCs shown in Figure 1.

$$\frac{di_d}{dt} = -\frac{R}{L}i_d + \omega i_q + \frac{1}{L}(V_{td} - V_{sd})$$

$$\frac{di_q}{dt} = -\omega i_d - \frac{R}{L}i_q + \frac{1}{L}(V_{tq} - V_{sq}) \tag{2}$$

$$\frac{dV_{dc}}{dt} = -\frac{3(V_{td}i_d + V_{tq}i_q)}{2C_s V_{dc}} - \frac{i_L}{C_s} \tag{3}$$

VSC control circuit

Figure.2 illustrates the actual detailed control block diagram for VSCs (rectifier side) according dynamic equations described in [7]. Of course, reactive and active power are used instead of capacitor and bus voltage in control of inverter side.

linear quadratic regulator

LQR is an optimal control method and is also a pole placement method. This method determines the feedback gain matrix that minimizes the cost function in order to achieve the optimal tradeoff between the use of control effort, the magnitude and the speed of response. In addition, this method guarantees a stable control system [8].

Given a linear system,

$$\dot{x}(t) = Ax(t) + Bu(t)$$
$$y = Cx(t) \tag{4}$$

Where x(t) are the system's states, u(t) is the system input and y(t) is the output. The objective is to design a feedback   u(t) =-Kx(t) such that the cost function (4) can be minimized:

$$J = \int_{0}^{\infty} (x^T Q x + u^T R u)\,dt \tag{5}$$

The weighting matrices Q and R are positive semi-definite. They control how much effort should be put on the controller. The feedback gain K is obtained by getting matrix P first via solving the Riccati equation:

$$A^T P + PA - PBR^{-1}B^T P + Q = 0 \tag{6}$$

Therefore,

$$K = R^{-1}B^T P \tag{7}$$

When the feedback gain K is obtained, the LQR controller can be easily designed to make the states approach zeros optimally.

Writing equations (1) and (2) in the state space format as (5) , the corresponding matrix can be found as:

$$A = \begin{bmatrix} -\dfrac{R}{L} & \omega \\ -\omega & -\dfrac{R}{L} \end{bmatrix}, B = \begin{bmatrix} \dfrac{1}{L} & 0 \\ 0 & \dfrac{1}{L} \end{bmatrix}, C = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

Where the states $\mathbf{x} = \begin{bmatrix} i_d \\ i_q \end{bmatrix}$, the inputs $\mathbf{u} = \begin{bmatrix} v_{td} - v_{sd} \\ v_{tq} - v_{sq} \end{bmatrix}$ and the output $\mathbf{y} = \begin{bmatrix} i_d \\ i_q \end{bmatrix}$

N.Azargun and H.Shakeri

Since the LQR controller is designed to drive the states to zero. This is very restrictive and not suitable for solving tracking system problem. In the VSCs control, line currents are to be followed. Therefore, alteration must be applied to the LQR controller in order to drive the current errors, instead of the currents, to zero. To achieve zero steady state errors, an integrator is inserted in the control loop. And the original system is augmented to include the errors as new system states [6].

$$
\begin{bmatrix} \dot{x}(t) \\ \dot{e}_I(t) \end{bmatrix} = \begin{bmatrix} A & 0 \\ -C & 0 \end{bmatrix} \begin{bmatrix} x(t) \\ e_I(t) \end{bmatrix} + \begin{bmatrix} B \\ 0 \end{bmatrix} u(t) + \begin{bmatrix} 0 \\ I \end{bmatrix} r \tag{8}
$$

In equation (8),

$$
u(t) = -K(t) \begin{bmatrix} x(t) \\ e_I(t) \end{bmatrix} = -\begin{bmatrix} K_x(t) & K_I(t) \end{bmatrix} \begin{bmatrix} x(t) \\ e_I(t) \end{bmatrix} \tag{9}
$$

Rewrite the cost function in format of (10), it shows that the new LQR regulator is aimed in minimize the errors eI .

$$
J = \int_0^t e_I^T(t) e_I(t) + u^T(t) R u(t) dt
$$
$$
= \int_0^t \begin{bmatrix} x^T(t) & e_I^{\ T}(t) \end{bmatrix} \begin{bmatrix} 0 & 0 \\ 0 & I \end{bmatrix} \begin{bmatrix} x(t) \\ e_I(t) \end{bmatrix} + u^T(t) R u(t) dt \tag{10}
$$

Control block diagram of the LQR Current control loop is shown in Fig.3. For more details of this method, readers can refer to [6,7].

Simulation results

The sample study radial power system is subjected to load switching at load bus. The network voltage is $V_g = 0.95pu$ pu and no load is connected at load bus. The simulation is carried out by using the MATLAB/Simulink and power system blockset and the digital simulation results is given as shown in Fig5-15. The following load excursion sequence is tested:

Step1: $t = [0 - 0.3]s$:at this period of time the static synchronous compensator is connected to the power system network without any injection of reactive power. Phase to phase 3 level output voltage of inverter is shown in Fig.4,5.

Fig.6 shows absorbed active power by STATCOM. It is obvious that absorbed active power from network is negligible.

Load voltage is shown in Fig.7. in starting simulation there is no load change so this voltage has been set on 0.95pu.

Fig.8,9 show the injection current by STATCOM in the load side. I_d is the active power component and I_q is the reactive power component of the injected current.

N.Azargun and H.Shakeri

Transferring power including, transmission current components and active and reactive power for both VSC HVDC side are shown in Fig.10-15.

Step 2: $t = 0.3s$: at this time the first inductive load with $P = 0.7\,pu, Q = 0.5\,pu$ (at rated voltage) is added to the ac power system at load bus, therefore more dynamic reactive power compensation is still required. The STATCOM injects reactive power (Fig.9), also VSC HVDC system transferring more active and reactive power to the inverter side (Fig.10-15).

Step 3: $t = [0.5 - 0.8]s$: the first load is now removed from the power system at load bus. The STATCOM inject less reactive power into the ac system. Also, decreasing in transferring power through VSC HVDC is seen.

Step 4: $t = [0.8 - 0.9]s$:at this time another load is added to load bus. Results could be seen in Figures.

CONCLUSION

The paper presents a novel PI/LQR controller for VSC HVDC. These full descriptive digital models are validated for voltage stabilization reactive compensation and dynamically power flow control. The presented simulation results show that VSC HVDC with hybrid PI/LQR strategy acts well than the conventional PI method.

REFERENCES

1. "Input Controllability Measurement for BtB VSC HVDC", Naser Mahdavi Tabatabaei, Naser Taheri, Ramazan Ebrahimi, TPE journal, Vol.1,No4

2. "Damping Function of BtB HVDC based Voltafe Source Converter", Naser Mahdavi Tabatabaei, Naser Taheri, TPE journal, Vol.1,No2

3. "A Damping Neural Controller of VSC HVDC to Enhance Dynamic Stability", Mohammad Banaei, Naser Taheri, European Transaction of Power Electric Journal, July 2010

4. Miguel Villablanca, Julio del Valle, Julio Rojas, Jose Abarca, and Wilson Rojas, "A Modified Back-to-Back HVDC System for 36-Pulse Operation", IEEE Trans, VOL. 15, NO.2, 2000.

5. A.Yazdani,R.Iravani, "Dynamic Model and Control of the NPC-BasedBack-to-Back HVDC SystemIEEE TRANSACTIONS ON POWER DELIVERY, VOL. 21, NO. 1, JANUARY 2006

6. W. Ren, L. Qian, D. Cartes, M. Steurer, "A Multivariable Control Method in STATCOM Application for Performance Improvement", IEEE 0-7803-9208.

7. "Modeling and Simulation of 3-Level STATCOM Using A New Fuzzy/LQR Controller", Naser Mahdavi Tabatabaei, Naser Taheri, Javad Hamidi, IJKST journal, No.2, Vol.1, April 2010

8. J.B. Burl, "Linear Optimal Control: H2 and H∞⊚ Methods", Addison Wesley Longman, Inc. pp. 303-310, 1999.

N.Azargun and H.Shakeri
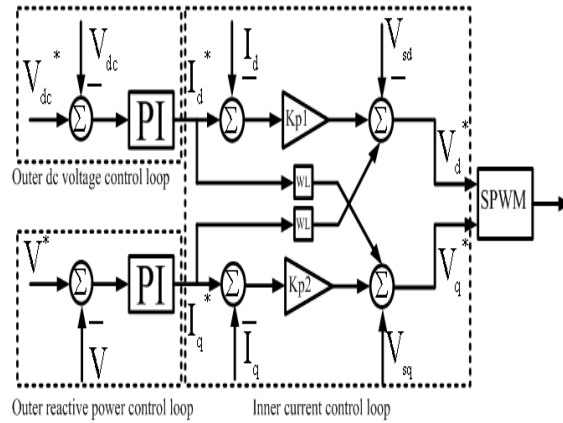
Fig.2 VSC Control Circuit(Rectifier)
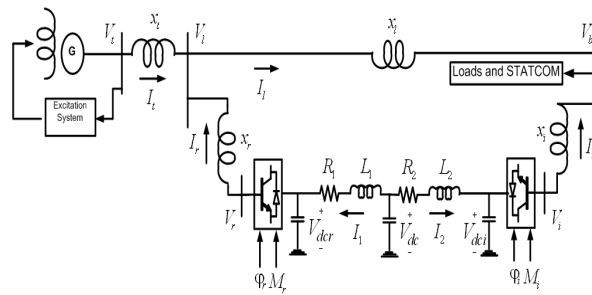
(a)Power System
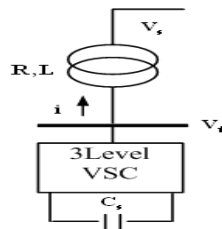
(b)Configuration of VSCs (Rectifier and Inverter)
Fig1.Power System equipped by VSC HVDC

N.Azargun and H.Shakeri
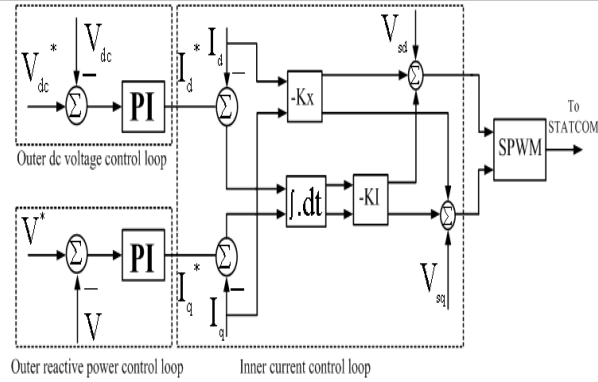
Fig.3 STATCOM pi/LQR Control
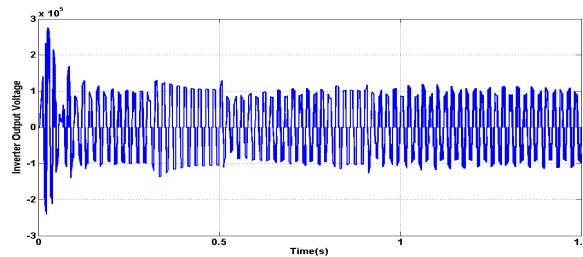
Fig.4
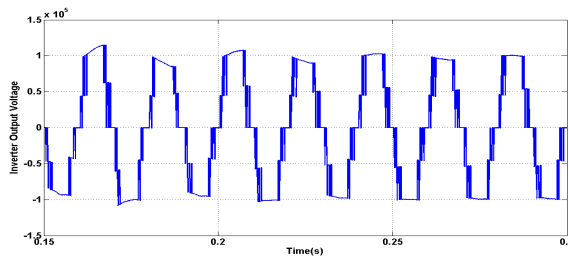
Fig.5
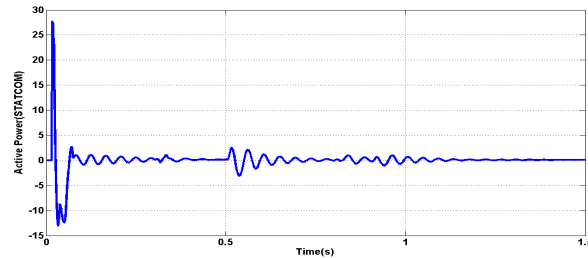
Fig.6
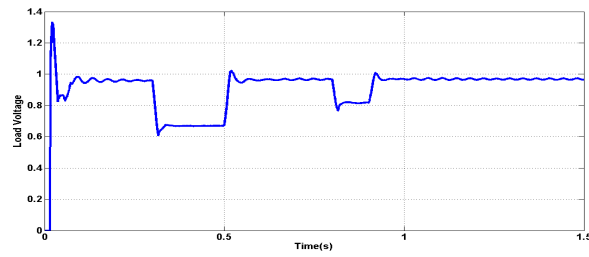
Fig.7
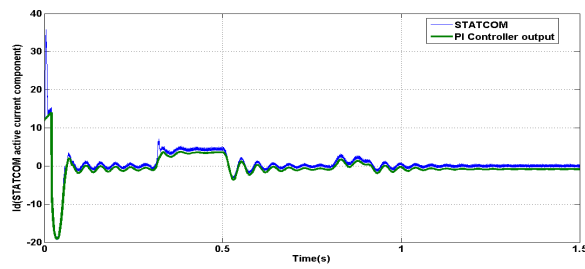
Fig.8
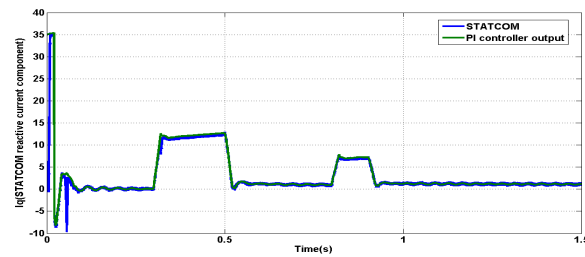
Fig.9
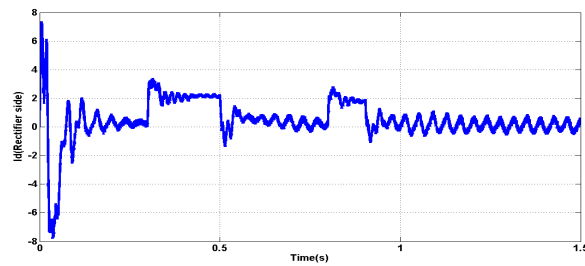
Fig.10
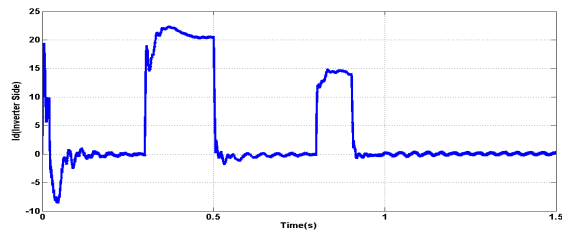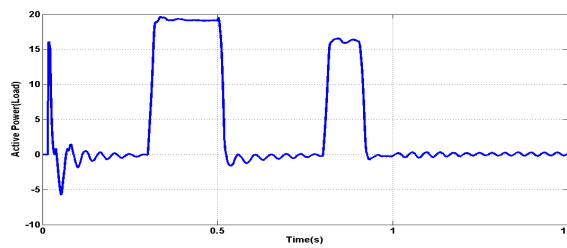
Fig.11

Fig.12

Fig.13

Fig.14

Fig.15

RESEARCH ARTICLE
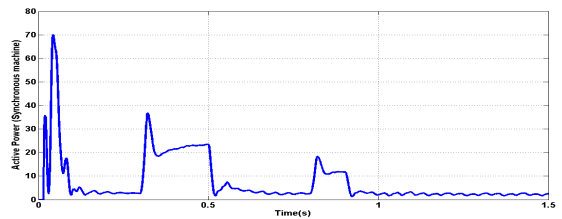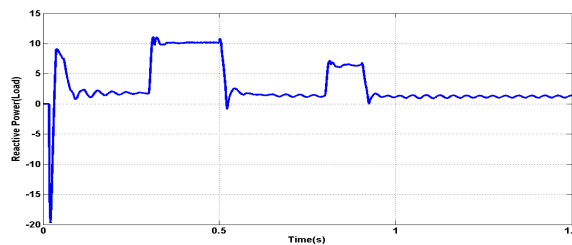
The Principles of Separating Plaintiffs and Defense in Iran's Jus Cipile

Zeynab Soltani[1,2]*, Khadije Moradi[2,3] and Saed Yazdollah Taheri Nasab[2,4]

[1]Department of private law, Ilam science and Reserch Branch, Islamic Azad University, Ilam, Iran.
[2]Department of Figh and Law, Ilam branch, Islamic Azad University, Ilam,Iran.
[3]Depamrtant of Figh and Law, Member of Faculty of Razi University, Kermanshah, Iran.
[4]Depamrtant of Criminal and Crime Law, Member of Faculty of Shahid Chamran University, Ahvaz, Iran.

*Address for correspondence
Zeynab Soltani
Department of private law,
Ilam science and Reserch Branch,
Islamic Azad University,
Ilam, Iran.

ABSTRACT

One of the most important principles of judgment is plaintiffs as well as the rights of defense in the penal, logical files. They are either personal or actual fellows who are on the contrary to each other in the judgment. Regarding this issue, this essay is to examine the principles of separating plaintiffs and defense in Iran's jus cipile. It is a summery on those principles due to complain, the payment of judging and to approve the claim. There are some special roles, for example the clause 197 of civil law defines that the principle of clearance shows if somebody owes other, he should approve it. According to clause 141 of civil law, it is the right of wanted (plaintiff) to claim complaint either in the main claiming or other.

It is in clause 84 of civil law that the plaintiff is allowed to criticize the complaint. One of the most important principles of this study is to refer to the clause 1257: Everybody who has a right should approve it, if the plaintiff defended it he should bring some causes to approve it.

Key words: Claiming, Defense, The Principles Of Separating,

INTRODUCTION

The goal of claiming is to take the civil rights, to tolerate the punishment, hence there are a series of principles and the methods of legislative in which the claiming fellows and the judge should follow them, if they do not, there would be some rights rejected. It is not possible to claim the rights well, it has often happened that the claiming process has done wrong to the unrelated persons or issues, it has lost the chance of setting the claim as well as to waste a great deal of money to cancel the judgment stamp, hence it is necessary to examine the claim, the defense, the features and the necessities, because it solves their problems sooner, in order to achieve the social order.

The Concept of Claiming and the Principles

The concept of claiming

It has originated from an Arabian word; it is the gerund of wanting or want, or action, case, claim in English.

> A: It is interfering in the specific right.
> B: Claiming which means in the special way.
> C: A collection of claiming and defending (Jafari Langroodi, 2011).

In fact, there is no agreement in defining defense among the legislators, but it was recognized that they have three different concepts of claiming: A (the special concept of claiming), it is ability of claiming the rejected right in the judgment, while claiming the rejected right in the judgment, while claiming is logical. For the counter plaintiff, it is ability to defend it. It is in the clause 134 of civil law that "claiming is true right of a fellow and everybody can refer to the honest courts for claiming". Second: the concept of claiming: It means the contrary points or the conflicts in the judgment. It is clear that claiming carries the special concept in the first definition, and it is under the logical process, third meaning is to claim which is not referred to the logical centers, instead, it is based upon following, it is in the clause 142 of civil law that barter, peace, cancelation claim to defend it (Shams, 2006).

The conditions of claiming

While somebody tries to claim his right in the foresaid centers, he and his claiming should carry some features. In other words, legislative should have some features of claiming by which he is able to accept the conditions of claiming. The claiming acceptance does not mean to judge for the plaintiff, because there may be no right for him after examining in the court (Hayati, 2011). These conditions include:A: While plaintiff takes advantage: Advantage means profit, it is on the contrary with damage (Moeein, 2004). The person who claims should justify this fact that the claimed issue carries his advantages, because it is the waste of time if there is no advantage in. It is in the clause 2 of civil law that "there is no court to judge a claim, unless those who take advantages of it (including lawyer, or responsible fellow etc) do it due to the law, but if the person takes advantage of it, the claimed advantages carry some features. In fact, the advantage should be logical and legitimate; it means the claimed advantage of claiming should be supported by law. Therefore, while there is an advantage, it is fairly law, but if there is not logical, it is not claimed. It means if the advantage carries some conditions, the plaintiff cannot justify his advantage either it is personal or direct. If there is some direct advantage, (for example divorce claim) there is a personal, direct advantage for husband.

B: To have a position: It logically means a person supposed to claim or to defend due to other person in the court, he is allowed to follow his claim in the court, logically, while it may not relate to him. Therefore, if a person either claims in the court or defend it personally, it is original and it does not relate to his position. On the other hand, it is while the plaintiff asks for claiming, and there is an actual person, here, the concept of a person who takes advantage, while

he has no position is impossible. If the claiming is done by a logical or actual, non-original person, the court should search the position of the claiming fellow (Hayati, 2011). Therefore, it is duty of court to examine claiming, while the claiming fellow is not original, and it is an actual fellow.

C: The competence of plaintiff

The competence means to have some rights or duties to do them, there are two kinds of property: first, those who have right due to clause 956, it begins while a person is born alive until he dies.

It means Tamato competence in Persian (Imami, 1999), the competence of possession (Katoozian, 2004), the competence of right (Jafari Langroodi, 2011). It is Ahleyat Al Vojoob among Arabian legislators (Safaee, Ghasem Zadeh, 2003). Second, the competence of doing right which is called the competence of Stifa in Persian, it is the property which is given to somebody who possesses right. Arabian legislators called it the property of Al Pada, those who haven't it are abandoned (Ibid, 180).

D: Claiming in the logical time: It is a condition of claiming, while the legislators concern the specific time, when the right comes true, if it is not logically failed, it will stay the same and it has all of the effects even in the generations, but there is in the rare case, while the logical claiming is limited to specific time, it will be failed, if it not logically failed, it will stay the same and it has all of the effects even in the generations, but there is in the rare case while the logical claiming is limited to specific time, it will be failed, if it is not logically referred to, for example in the clause 1160, if the marriage contract is cancelled, and the wife marries again and she bears a baby, this baby belongs to the second husband, unless it is approved on the contrary. In the clause 1162, if the second husband rejects the baby, it is for the most two months that he can announce the birth date, if not, the claiming will be failed. The appearance of clause 1162 carries this concept, if the husband knows about his baby birth after two months, the court should order not to hear the claim, if the wantee has claimed it. It means due to clause 1163, after passing two foresaid months, the role enriches, but Dr Katoozian believes that two foresaid months should be the limit of time, therefore, claiming will be finished after this time, and the complaint will be cancelled in the specific time (Shams, 2006).

E. Non-finished claiming: The persons who have right are able to claim their right once. It means if after claiming of two plaintiffs, the court ordered, the court would reject any claim, therefore, it would be finished, because the claim is not concerned in the judgment (Hajati, 2011).

The concept of defense and the kinds

Concept of defense

Defense means to cancel (Moeein, 2004). It is a term which shows to cancel sth. In fact, defense includes all of ways which predict the contemporary process of cancelling to achieve a goal in claiming (Shams, 2006). While there is defense against somebody, it is clear that the same person react logically to any attack or conflict, the same reaction (reply) of the person is called defense (Vahedi, 2008).

The kinds of defense

Traditionally, defense was the plaintiff's reply in Iran's law, defense was classified into the specific and the contrary claims, the former means the identity of defense by which the wanted one rejects it, in other words, here, it is direct defense against the original right in claiming, in order to approve it after examination. Therefore, defense is summarized in to the rejection of plaintiff's claim, it means the wanted fellow also searches the documents (including formal, or common drafts or degrees which owns of plaintiff), in order to bring them as the evidence.

Zeynab Soltani *et al.*

There is also another kind of defense, which is called challenge, it originates from to cancel, to criticize, to complain (Moecin, 2004). Here, the wanted fellow does not reject the identity of plaintiff's claim, instead he believes that there is no reply to the claim. There is no definition for challenge in Iran's law, but it should be added that the challenge logically means the tools which the wanted fellow uses to avoid the original right of claim, in other words, it is a means which the wanted fellow uses to fight against the claimed right, or to postpone it minus any reply, in order to succeed.

In other words, challenge is the contemporary or constant rejection of rival's right (Shams, 2008). The criticism is a problem by which one of the plaintiffs can claim it in the court (Jafari Langroodi, 2008). In other words, challenge is a means by which attacks the claim, in order to finish it absolutely or contemporary. Therefore, the challenge is the conflict issues which produces of the main claim, in order to make obstacle in judging, to cancel it after mending the problems (Sadezadeh, 2006).

It is in clause 84 of CPR which allows the wanted fellow to challenge the issue in eleven cases; he can criticize and challenge the reply:

> The court is not competent,
> The claim was present before in the same court or other,
> The wanted fellow cancels the claim due to insanity, the logical age, the abandoned properties, crash.
> The claim does not concern the wanted fellow,
> There was somebody else responsible to claim like a lawyer,
> The claim has been previously considered, and the court ordered on it,
> While there is no logical effect on the claim such as endowment
> The claimed issue is not legitimate,
> Claim is not dogmatic, instead it is based on possibilities,
> The plaintiff does not take advantage of claiming,
> The claim is out of logical time.

On the other hand, it is the wanted fellow's defense, in order to decrease the claim and the order (Shams, 2008). On the contrary, it is ability to face the counter point (Badrien, 2012). Legislators have defined the counterclaim in the different ways: "the counterclaim is additional to attar act the third person, it is one way of defending beside challenges which are done by the plaintiff, only if he to the claim (Ibid, 46). It is while two have been considered, it may concerned in other native courts, or out of court property, in order to cancel the main claim. The following conditions are necessary; a: the wanted fellow claims against the plaintiff. Regarding to clause 141 of CPR, it is only wanted fellow who has right against the plaintiff either in the main claim or other cases. Therefore, the claim to attract the third person, the wanted, third fellows, as well as the wanted of counterclaim (the plaintiff of main claim) are responsible to do the counterclaim (Vahedi, 2007). b: It completes the main claim, if the claim was taken as the counterclaim, "their sources are the same, there is logical relations between them and the plaintiff is right for it. The legislator has expressed in the clause 143 that the counterclaim should be dedicated until the end of judging, it supposed that "until" means the wanted fellow of main claim should dedicate claim before the first session. It means, while it is the turn of wanted fellow's defense, he instead does the counterclaim and if it is after the limited time, what is the reaction of court? Regarding the clause 141 of CPR, the legislator allows the court to concern the plaintiff's claim separately. Therefore, the court should not reject the counterclaim which does not relate to the main claim, instead it should be separately considered, especially if the counterclaim is done out of the main claim. They should be considered simultaneously.

It is approved in the clause 103 of CPR, if court consider as the other claim, it can concern both of them. In the words, the collection of clauses 103 and 141 of CPR have approved that they should be simultaneously considered (Vahedi, 2007).

Zeynab Soltani *et al.*

The principles of separating claim and defense

It means, there are some differences between claim and defense, these differences are;

> Due to the followers of claim;
> To dedicate the claim;
> To pay the judgment fee;
> Due to approve the claim

The principles of Separating the followers of claim

The plaintiff considers the claim and the defense are concerned by wanted fellow. In other words, the plaintiff is the first and judge cannot begin it. If there is any crime, there will be penal claim and there are plaintiff and criminal, but if there is not any penal claim, there will be logical claim, while there are wanted and wantee. The wantee is a person who has right which is damage for the other, therefore, wantee may be an actual or logical persons (like a company or non-stational institute). Wantee is the subject of wanting which is called claimer in Farhangestan. The personal claim is specific and the general claim is a person who is on the contrary with main principle (Masjed Saraee, 2011). The counter point of claiming is wanted, who is the object of claiming. The "wanted" originates from the verb "want", and "to present". The word "wanted" is against "wantee" in Farhangestan. The wanted is a person who wan tee claims on him, therefore, the result of judging refers to wantee. The wanted is also actual person (baby, insane or wise) or logical person (like a company or institute) (Shams, 2006). Due to the definitions, wantee can refer to the court to claim his failed right; therefore, if wantee does not claim in the court, the defense won't be meaningful. The claim is aggressive action of a logical or an actual persons who feel, they are right in the society or their rights are failed, but defense is a collection of logical, motivate deeds of an actual or a logical person to answer a claim, here, the claimer tries to approve some claims due to some documents, while the goal of defense is to approve the lack of presented claim against him. Therefore, the claim is right which damages other while he resists it, but defense is the reply of wanted to the claim; it means the claim of wantee leads to the defense of wanted. The claim is an ability to reject a right either claims is true or not.The wanted can defend the claim in order to cancel it absolutely or contemporary (Shams, 2006).

There is a kind of defense in which wanted does the counterclaim in order to defend himself. In the counterclaim, the wantee of counterclaim and the wantee at main claim is the wanted of counterclaim.

The principles of separation due to the claim

These principles are the results of claiming by wantee, but it is not necessary to dedicate the claim while you are defending. It is in the clause 8 and 707 that "the court begins due to claim", therefore, it is necessary to ask the court about judging. This complaint is different from "the request sheet", it is a document of requesting (Shams, 2006). The person who requests judgment is called claimer in the logical texts, the counter follow is claimee, here, it is necessary to ask judging. It is necessary to request in the logical court. It is in the clause 48 of CPR that it is necessary to request the claim in the court, besides; it is also mentioned in the clause 49 that the date of claim is the date of claiming. Therefore, it is the request by which a person request on the other (Claimee). It means, he invites the claimee to the court, to achieve his right. It is in the clause 2 of CPR that there is no court minus requesting the claim. Therefore, the claim as well as the request begins by claimer and wanted should defend himself, if there is no request, the court is abandoned; therefore, there is no order too. But it is not necessary to dedicate the complaint in the defense, it means, the defense goal is against the main claim, and it is not necessary to compose a new request. It is also mentioned in clauses 141 and 18 of CPR.

Here, the claim of peace,and rejection are defined to defend the main claim are not taken as the counter claim, it is not mentioned in the clause 17 (Karimi, 2007). But it is in the counterclaim that while it is taken as defense that needs

Zeynab Soltani *et al.*

the request. It is in the counterclaim that there are two kinds, on one hand, it is defense, and on the other, it is a form of claim which is called the aggressive defense. In other words, the counterclaim is not a combination of defense and attack, it is a claim which needs a request. The mingled wantee and wanted means the wantee of main claim and wanted of counterclaim. Finally, the wantee should dedicate the request, but it is not necessary to request in the defense and wanted attends in the court to defend himself while it is written (Matin Daftari, 2012).

The principles of Separating due to the judgment payment

On the contrary with the public services, judgment and ask for rights need to be paid in Iran. The payment is a section of damages in judging. Including: the expenses of papers to the court, the expense of roles as well as the written, or oral request or complaint, the absence roles, the counter role, the third person, the attraction of third person, the edition claim, the result, judgment, the expense of lawyer, and the executive papers etc are mentioned in the clause 3 as well as some of the governmental incomes in 1373 or other assigned roles such as the rejected stamps or the payment from the source (Ghafari, 2007). The expense of judgment should be paid by wantee, but if he does not succeed, it can be mutilated by request (Shams, 2006). The wantee should pay the expense of judging. Therefore, there is difference between defense and claim, the later needs to be paid. In fact, it is in the clause 53 of executive roles, if there is no stamp attached to the appendixes or there is no expense paid, the court should reject the failures. It was mentioned that the process of judging needs to be paid due to the attached stamp, rejection, but there is no need to be paid in the defense, it is in the clause 515 that "the wantee has right to request his claim in the judgment or separately to return the damages in the case of postponed duties.

The principles of separation due to the approved claim

Who is responsible to approve the judgment? There is world principle that approves the right in the court which is called al Beyat Ala Al Modaa, wantee or claimer can bring the cause in the logical claim. It is in the clause 197 that "the principle of Beraat is done, therefore, if somebody claims a right, it should be approved, it is not necessary to bring the cause to reject the claim of wantee (Katoozian, 2011). It needs to express a cause or swear. It is in the clause 1257, N if somebody claims his right, he should approve it, and the counterclaim should defend it, in order to approve it".

We concludes that it is in the approving level that the approving level that the right necessity is approved, and it is the claimer's duty to approve it logically (Yusef Zaheh, 2012). Finally, it can be said that the approved right depends upon the claimer who speaks on the contrary with principle, therefore, it is claimer's duty to approve his claim in the judgment, in order to change the common condition (Karimi, 2007).

Claim is aggressive which is felt by every actual or logical person in the society whose right is failed. It can be said that claim is aggressive pioneer, while defense is motivating. In the personal claim, all of struggles are to approve the claim by documents, but defender tries to approve the lack of claim against him, therefore, claim is the right which produces damage on the other, but defense is vice versa.

CONCLUSION

As it was said in the previous sections, one of the most important principles of judgment as well as the logical penal files is to claim and to defend. The personal or actual and logical claims are against one or a group of persons. This study supposes the claim as aggressive deed by which every logical or actual person feels his right is destroyed, claiming is aggressive, but defense is motivating. A claimer tries to approve his right by every document, though defender resists it.

Zeynab Soltani *et al.*

It is in CPR that the goal of claim is to achieve the civil rights. Claim needs some conditions in the court, which should be done well, if not, the right will be impossible. In other words, the legislator should assign some conditions including, the claimer's advantages, b: to have a position; c: the claimer's competence; d: to logically claim, e: non-finished claim. On the contrary, defense is assigned in the clause 141 of CPR, it is only wanted who has right to do counterclaim. Therefore, the claim of attracting the third person as well as the counterclaim of wanted should take the right (Vahedi, 2007). Their origins are the same.

Defense can be in the different forms it is in the clause 84 of CPR which allows the claim changes in to challenge in eleven cases. The counterclaim is the condition in which the wanted decreases the punishment against the claimer. It is in the clause 141 of CPR that there is absolute relations between the claims while making decisions are affective, C: it should be done in the limited time, it is in clause 143 that legislator defines the counterclaim. It is in the clause 197 that the principle of cancelling is expressed, if somebody has logical or religious right, it should be approved. It is in the clause 1257 that everybody who has right should approve it and the claimee has right to defend it. It is clear that the legislator does not mean to necessarily want it, instead the claimer who claims on the contrary with original principle, this process is relative, it may be collected in one person.

REFERENCES

1. Imami, S. (1993). The civil law (vol. 1) Tehran: Islamieh press, sixteened.
2. Badrian, F. (2012). Comparative study of counterclaim, Tehran: Negan Bineh press, first ed.
3. Bahrami, B. (2006). The principles of civil judgment 1, scientific and applied, Tehran: Negah Bineh press, tenth ed.
4. Jafari Langroodi, M. (2008). Doomed to Terminology of law, Tehran: library of Ganj Danesh, first ed.
5. Hayati, A. (2011). The principles of civil law 1. Tehran: Bonyad Hoghooghi Mizan, firsted.
6. Shams, A. (2006). The principles of civil law, (developed career). Tehran, Darak press, fourteen ed.
7. Shams, A. (2006). The principles of civil law (developed career). Tehran, Darak press, fourteen ed.
8. Shams, A. (2008). The primary career, Tehran, Darak press, second ed.
9. Sadr, Z., Afshar, M. (2006). The principles of civil, magistrate judgment (three vol.) Jahad Daneshgahi, Tabatabee press ninth ed.
10. Safaee, S., Said, M., Zaheh, Gh. (2003). The person's civil law and abandonment, Tehran, Samt press, ninth ed.
11. Jafari, J. (2007). Civil law principles, Tehran, Payam Noor press, fourth ed.
12. Kattozian, N. (2004). The primary careers of civil law. Tehran, Sahami and Bahman Borna press, ninth ed.
13. Kattozian, N. (2004). The general principles of contracts. Tehran, Sahami and Bahman Borna press, vol. ninth ed.
14. Kattozian, N. (2011). Causes and Approving. Tehran. Mizan press. Siexth ed.
15. Karimi, A. (2007). The principles of civil judgment. Tehran, Majd press, first ed.
16. Karimi, A. (2007). The evidences of approving the claims. Tehran: Mizan press, first ed.
17. Matin Daftari, A. (2012). The principles of civil, magistrate judgment, two volumes, Tehran: Majd press, fourth ed.
18. Vahedi, Gh. (2008). The principles of civil judgment Tehran: Mizan press, fifith ed.
19. Vahedi, Gh. (2010). The principles of civil judgment Tehran: Mizan press, fifith ed.
20. Yossef Rad, M. (2012). The principles of civil judgment, Tehran, Sahami press, second ed.
21. Masjed saraee, H. (2011). The complete translation of Sharh Lameh, Qum: Payam Noor press, fourteen ed.
22. Jafari Langroodi, M. (2011). Terminology of law. Tehrani Ganj Danesh press, twenty thirth press.
23. Moeein, M. (2004). The Persian companion, And 4, Tehran: Amir Kabir press, twenty oneth press.

RESEARCH ARTICLE

Determining the Cost of Registry Services Provided in State Organization for Registration of Deeds and Properties, Lorestan: Presenting a Model as Prerequisite for the Implementation of Operating Budgeting System

Marjan Roshani and Mahmood Hematfar*

[1]Department of Accounting, Borujerd Branch, Islamic Azad University, Borujerd, Iran.

*Address for correspondence
Mahmood Hematfar
Department of Accounting,
Borujerd Branch, Islamic Azad University,
Borujerd, Iran.

ABSTRACT

Nowadays, it is necessary to explore effective and prospective tools and approaches of predicting future performance of organizations and forecasting their resource requirements to clarify state budget system and preventing the imposition of high costs upon the country. Legal requirements oblige all executive agencies to take an action to improve budgeting system from the existing methods to a purposeful and operational method. In this regard, costing based on activities of the new method in measurement and estimating the cost of a product or service is used as introduction and infrastructure of the process of budgeting in the executive agencies. According to the studies conducted in State Organization for Registration of Deeds and Properties of Lorestan Province, this article presents a general model for determining the cost of the activities and services within the system of operating budgeting. Therefore, based on the research questions, this study has developed the following hypotheses. (1) It is essential to calculate the cost of activities to implement performance-based budgeting. (2) The current governmental accounting system is not proper to implement performance-based budgeting system. Implementation of performance-based budgeting system provides the possibility to evaluate the performance of the operating system. This study employs mostly field study approaches and it uses library-based research in some cases. Data gathering tools are observation query, and analysis of documents and interviews; the research statistical society consists of all offices of State Organization for Registration of Deeds and Properties of Lorestan Province. Analysis in this study is carried out through a combination of qualitative and quantitative methods. After analyzing the collected data and designing the model, the first and second hypotheses were accepted. The third hypothesis was investigated with respect to the lack of full implementation of performance-based budgeting system in State Organization for Registration of Deeds

Marjan Roshani and Mahmood Hematfar

and Properties of Lorestan Province; its effects on the performance of administrative apparatuses were not provided. Finally, suggestions for future research will be presented.

Key words: performance-based budgeting, activities, efficiency, effectiveness, the cost of activities;

INTRODUCTION

Nowadays, the condition of organizations has become more complex and unreliable (Kargar Shooraki & Zare, 2009). Due to the complex and changing conditions of decision-making, increasing rate of competition and expectations of service recipients and other beneficiaries, lack of resources, economic and financial crisis, environmental restrictions, social responsibility etc, there is no space for any kind of error and mistake by present organizations in any level and size in either public sector or private sector (Shaban Zadeh, 2011). These items arise the government's multiple attention to the economy, efficiency and effectiveness of government resources or the government's financial management. Encountering this condition not only requires the improvement of budgeting methods and procedures for increased coordination of system but also added a new aspect for deciding on in management and public financial management, or operating and planning budgeting system to review the evaluation of government's management activities (Office of financial resources planning and budget, Studies and Planning Unit of Health Economics, 2005). Hence, adjustment of operating budget has been placed on the government agenda, especially Management and Planning Organization of Iran since 2006 (Mahdavi, 2007). Three main elements in the operating budgeting are considerable: planning, calculation of the cost and performance evaluation. Meanwhile, the correct calculation of the cost of services and activities is important so as it can be considered as introduction and infrastructure of the process of operating budgeting (Torabi Pour & Abolqasem Pour, 2007).

Significance of the Study

Increasing the efficiency and effectiveness of the most important challenges of today's organizations. Operating budgeting system distinguishes between "efficiency" and "effectiveness". Efficiency implies the beneficial use of the desired resources, but effectiveness is related to performance. These two issues will be provided by calculating and managing the cost of activities, services and programs, which were not possible in the traditional method of budgeting (Andrews and Hill, 2003). The establishment of operating budgeting results in the removal of the defects of the existing method of budgeting in State Organization for Registration of Deeds and Properties. In addition, legal requirement including Article 138 and 144 of the Fourth Development Plan, Article 16 of the Law on Civil Service Management, and paragraph 32 of the general policies of the Fifth Development Plan, oblige all state offices all executive agencies to take an action to improve budgeting system from the existing methods to a purposeful and operational method (Andrews and Hill, 2003). Naturally, with the establishment of model proposed in this study performance assessment, knowledge of the actual costs of its activities, the compensation process reengineering costs and increasing efficiency as well as effectiveness will be possible in manners that are more favorable.

Research Method

The main objective of this study is to design and develop a general model for calculation of the cost of activity within the framework of performance-based budgeting in State Organization for Registration of Deeds and Properties of Lorestan Province. Selection of research method depends on the purpose, the nature and subject of the research and its practical possibilities. This study employs mostly field study approaches and it uses library-based research in some cases. In field study, the researcher should collect data from the external environment with reference to people or the environment, and communicating directly with the unit of analysis. Thus, Data gathering tools are observation query, and analysis of documents and interviews.

Marjan Roshani and Mahmood Hematfar

Methods of Data Collection

Since this research aims to design and develop a general model for calculation of the cost of activity within the framework of performance-based budgeting, most of the study was conducted as a field study. The researcher began to collect preliminary data through collecting some evidences from target organization including organizational charts, job descriptions, goals, existing contracts, cost credit agreements and expenses list; then, he categorized expenses based on the nature of expenses through going to the organization and interviews with officials and experts in finance budget, and he classifies them based on the direct and indirect aspects. In the next phase, operational and supporting offices were detected. Afterward, the researcher evaluated principles for allocation of indirect costs. In this regard, opinions of the organization officials and management supporting guidelines were used. In determination of principles of indirect expenses, the researcher pays attention to the fact that the selected principles are regarded as the main cause of costs and there is a high positive correlation between the ground and indirect expenses. There is a need for appropriate criteria for each of the supporting agencies to prorate the costs of supporting agencies to operating agencies. Each of the supporting agencies is studied to determine the principles of operation. After determining the criteria for supporting agencies, programs and activities necessary to achieve organizational goals were identified. In addition to identifying activities, determining measurable indicators for each activity is also an important accomplished affair. Extensive research has been done to collect data about the activities and the size of particular activities carried out by each operational unit. Moreover, separate meetings were held with employees and managers of operational units. After performing the necessary explanations and preparing a list of activities carried out by the unit, the managers of the units were asked to determine the percentages of each of the activities in the related operating offices according to experiences of the past years and taking into account the future intended plans. In other words, they were asked to determine the volume of operations spent by each activity in an operating unit.

Data Analysis

This section presents a general model at first. Then an exclusive model to calculate the cost of activities was designed for State Organization for Registration of Deeds and Properties of Lorestan Province.

Performance-based budgeting adds efficiency and effectiveness to the traditional aspects of budgeting. This system distinguishes between efficiency and effectiveness. In efficiency, beneficial use of resources will be required; it does not merely mean cost savings because cost saving may be detriment to the while efficacy is associated with the performance.

The main goals of performance-based budgeting are the reform of public sector management and increasing the effectiveness of expenditure in this section. In general, performance-based budgeting process can be divided into four parts as follows:

Setting goals and objectives.

Determination of quantitative indicators to estimate the costs and performance of any application.
Estimation of costs of necessary programs to achieve the objectives of the.
The identification of deviations from the budget and control over the budget period.

According to the studies conducted in State Organization for Registration of Deeds and Properties of Lorestan Province, performance-based budgeting process includes the following steps:

Determination of organizational goals and identification of activities and programs needed to achieve the objective.

Assessment of the quantitative targets for each of the programs and activities.
Identification and classification of the state apparatus costs.
Prediction of the amount of money needed to achieve the targets.
Identification of supporting units.
Identification of operational units.
Classification of direct costs and indirect costs in terms of the agencies.
Tracking costs related directly to the offices.
Determination of appropriate standards for allocation of indirect costs based on the standards.
Calculation of the operational units' costs sum after sharing the the costs of supporting units and dividing it into the direct and indirect costs.
Determination of appropriate method of sharing the cost of supporting offices to the operational officers.
Calculation of the support units' costs sum after sharing the the costs of supporting units and dividing it into the direct and indirect costs.
Determination of activities associated with each of the operating units.
Determination of the percentage of activities carried out by each operating office (Determination of activity percentage).
Allocation of costs of each of the operational bodies to related activities based on specified percentages and cost determination of activities and programs.
Determination of the final cost of each unit's activity from quantitative targets
Assessment of the deviation from budget to control costs timely by the management.

Determination of organizational goals and identification of activities and programs needed to achieve the objective.

With regard to macroeconomic policy, each state apparatus determines its long- and short-term goals. The goals determined by a governmental apparatus should be accessible and accurate according to the available resources and detailed analysis.

The targets can be determined according to the following:
The fulfillment rate of people's needs.
To be in line with the general policy of the government.
To have economic, social, cultural and political reasons.
Its importance for the community.

Assessment of the quantitative targets for each of the programs and activities.

When programs and activities needed to achieve the objectives are defined, the quantitative rate of the specified activities and programs should be determined. It means they should explain the number of work-units that are going to be carried out by executive agency for the above period. In determination of quantitative targets, one should be careful to explain the numbers with respect to available resources and their necessity.

Identification and classification of the state apparatus costs

In this step, all expenditures needed to achieve quantitative targets are evaluated. According to surveys conducted in the related organization, these costs can be divided into two categories: direct and indirect costs. Direct costs refer to the costs that are directly traceable to the operational and supporting bodies and indirect costs are not directly traceable to the operational and supporting bodies. The latter is divided between operational and supporting bodies through its proper basis. The instances of this cost, which are the same in all organizations and government agencies except for a few cases, are shown in table 1.

Marjan Roshani and Mahmood Hematfar

However, it should also be noted that which costs listed below are in the class of inevitable personnel costs, and which one is included in the category of other costs.

Prediction of the amount of money needed to achieve the targets

In this stage, all administrative apparatus and units, especially budgetary units, should begin to predict the costs necessary to achieve their intended goals. It should be noted that these costs can be predicted according to the information of past years and programs of future years. Care must be taken in predicting costs and the prediction should not be implemented from total to parts, but it should be carried out based on goals.

Identification of supporting units

Supporting units' main duty ids not doing an activity, but they are designed to support operational offices. The main activities of the executive body do not operate without the supporting units (Table 2).

Identification of operational units

Operational units carry out the main task of organization or government agency and they are usually different in the departments and government agencies.

Classification of costs to direct costs and indirect costs in terms of the agencies

At this point, all specified costs are divided into two groups of direct costs and indirect costs according to supporting and operational offices. Direct costs are traceable directly in the intended offices. Indirect costs are not traceable directly in a specific office and they are divided between different units according to proper standards. Direct-indirect classification of costs in terms of offices and tracing or allocation method are shown in the table 3.

Tracing direct costs to related offices

As said earlier, direct costs such as phone, printing, replication, repair, and fuel of vehicles are traced respectively the units of telecommunication, printing and replication, transportation.

Determination of appropriate standards for allocation of indirect costs based on the standards

In this case, a standard must be selected that have a stronger association with indirect costs; in other words, the standard should be the main cause of costs, and the indirect costs increase with the increase of the above standard. Indirect costs and standards for their allocation are mentioned in table 4.

Calculation of the supporting units' costs sum for each unit

At this stage, all identified fees are traced and prorated to supporting and operational offices; therefore, all intended costs would gather in supporting and operational offices. Now, it is possible to allocate the collected costs in supporting offices to operational offices.

Determination of appropriate method for sharing the cost of supporting offices to the operational officers

Marjan Roshani and Mahmood Hematfar

Since the major activities are carried out by operational officers, all the collected costs in supporting offices in the supporting offices should be prorated to operational offices. Consequently, the cost of the support bodies is zero. To do this, methods of cost allocation are used to transfer costs in supporting offices to operational offices, including:

Direct allocation method
Unilateral allocation method
Bilateral allocation method (mutual)

The most accurate method is the third; but it is not used and not cost effective due to the complex calculations. In this situation, direct or unilateral method is used. Note that if supporting offices are providing service to other supporting offices beyond operational offices, it is better to use the unilateral approach.

Calculation of the operational units' costs sum after allocation of the supporting units' costs and dividing it into the direct and indirect costs

Of course, the allocation standards are predicted so that it determines the exact amount of direct traceable costs in operational offices and the amount of costs having been prorated from supporting offices or prorated indirectly through standards to the operational offices (which form the indirect costs). It also determines the inevitable personnel expenses and other costs.

Determination of related activities to each operational unit

As previously stated, programs and activities are defined for state apparatuses with respect to aims and objectives. In this step, the researcher determines the related activities to each operational unit and the overall perspective of the program. This step is implemented by experienced staff at the operational units, management supervision and deputy.

Determination of the percentage of activities carried out by each operating office (Determination of activity percentage).

As measurement units vary for each of the activities, one cannot use the same base. Hence, it is necessary to determine the percentage of activity carried out by each operational office. For instance, in the accumulated costs in the X operational unit is 100,000 Rials and it is determined that this unit spend 60% of his activities to activity A, 30% to activity B, and 10% to activity C, the cost of activities is as follows:

> Activity A: 100,000 * 0.60 = 60,000
> Activity B: 100,000* 0.30 = 30,000
> Activity C: 100,000* 0.10 = 10,000

It is worth mentioning that activity percentages are determined according to investigations conducted by the management and staff of each operating unit; in this regard, the future information have been considered in addition to the past information (last year).

Allocation of costs of each of the operational bodies to related activities based on specified percentages and cost determination of activities and programs

When activity percentages were determined, one can calculate the final cost of every activity by multiplying the percentages in operation units' costs. It should be mentioned that an operational unit may carry out some activities,

Marjan Roshani and Mahmood Hematfar

or one activity is carried out by some offices. When one activity is carried out by some offices, it should be determined exactly the percentage of each office; when the exact cost of each activity is determined, the amounts of salaries, inevitable wages, and other expenses should be verified exactly. Then, we can calculate the final cost of each program by adding the final cost of each related activity. It is also possible to calculate salaries, inevitable wages, and other expenses.

Determination of the final cost of each unit's activity from quantitative targets

In fact, state apparatuses forecast quantitative objectives for each program and consequently each activity according to the ability and capacity of the target unit. Here, the researcher is going to compute the final cost of each unit by dividing the related expenses of each activity to its quantitative objectives; then, we are able to calculate the final cost of each program by dividing the related expenses of each program to its quantitative objectives. For example, suppose the final cost of Activity (A) is 15000000 Rails, let the units carry out 1000 units of this activity, then the final cost of each unit of the activity equals 15000 according to the predictions.

Presentation of modern for cost of activities carried out by State Organization for Registration of Deeds and Properties of Lorestan Province

This section provides a model for State Organization for Registration of Deeds and Properties of Lorestan Province. First, the costs are classified according to their natural essence; then, the costs are divided in two groups of direct and indirect costs based on the offices. Direct costs are traced to different offices and indirect costs are allocated to different offices according to proper standards. Afterwards, the supporting offices' costs, which are stated in the second column, are allocated to operational offices. After the accumulation of all costs in operational offices, shown in third column, the costs will be allocated to activities with respect to the percentages of performed operations. Consequently, the final cost of activities, and subsequent program costs will be determined (figure 1).

CONCLUSION

According to conducted studies, calculating cost of activities is a prerequisite for operating budgeting and implementation of performance-based budgeting system is a group, organizational, and even state action to reduce costs and save them, develop the country, emphasize the results and effectiveness of resource consumption. The implementation requires fundamental changes in government accounting system to calculate the cost of activities simplifying state operation, increasing efficiency and effectiveness of their operations, and increasing accountability of the government. Organizations establishing a logical connection between their consuming resources and results of ongoing programs are more powerful to improve their operation, document the results of their annual activities, and defend the allocated budget. Obviously, the basis of such a space is almost impossible without having detailed knowledge of the cost of current activities in organizations. Therefore, the execution the budget law requires serious attention and effort to calculate the cost of activities.

Research Recommendations

Holding training and justification classes for managers and employees of different units.
Playing a more active role in responding and resolving ambiguities by the Audit Court.
The establishment of enforcement units outside the Central Administration and Organization.
Providing practical examples of the implementation of cost management in workshops.
Classification of activities, and quantitative and qualitative categorization.
Separating the portion of projects related to the costs from the total credit issued to executive agencies.
Allocation of special credit for projects subject to cost.

Delegating more authority to take advantage of the specialists available in the center.

Justifying lead managers and further communication of involved experts of the headquarters with provincial and district units.

REFERENCES

1. Shaban Zadeh, M. (2011). Presenting a proper model for calculating cost os activities and services in Ministry of Economic Affairs and Finance of Mazandaran. The first national conference on new approaches in state accounting.
2. Mahdavi, A.   (2007). Developing an operating budget for executive agencies of Kerman. First International Conference on operating budgeting.
3. Office of financial resources planning and budget, (2005). Unit of Studies and Planning in Health Economics. Educational package in operating budgeting project, July.
4. Torabi Pour, A., Abolqasem Pour, R. (2007). Activity-based costing: Essential step for operating budgeting in the health sector. The first international conference on operating budgeting.
5. Kargar Shooraki, H., Zare, M. (2009). Cost management problems in provincial the system of budgeting. Second International Conference on operating budgeting, Spring.
6. Andrews, M.,   Hill, H. (2003). The impact of traditional budgeting systems on the effectiveness of performancebased budgeting: a different viewpoint on recent findings, International Journal of Public Administration, Vol. 26 No.2, pp.13555.

Table 1: Classification of costs based on the natural essence

Cost title based on the natural essence	Cost title based on the natural essence
Salary and additional payments	Computer Repair
Overtime	Maintenance of vehicles
End of year gifts	Fuel of vehicles
Education	Printing and replication
Domestic mission	Accessories and consumables
Death and marriage allowances	The cost of administrative reform
Article 41 bonus and Training	Internet costs
Vacation for deprived areas	Public relations costs
Staff uniforms	Accommodation and catering
Cash Assistance	Housing benefit
Contractual services	Costs related to veterans
Food	Phone
Kindergarten Assistance	Gas consumption
State pension contributions	Water consumption
Remuneration for end of service	Electricity costs
Pension	Cost of repair facilities
Pay personnel debts	Debts to other organizations

Marjan Roshani and Mahmood Hematfar

Car Insurance	Reward for top students

Table 2: Supporting units and their allocation basis

Supporting unit	Allocation basis
The Secretariat	Number of Correspondence
Transportation services	Time of using the vehicles
Supplier	The number of requests per unit
Administrative Affairs	Number of employees
Financial Affairs	Number of employees and funding per unit
Legal and Judicial Affairs	Volume of operations
Organization and classification of jobs and training	Number of employees
Public Relations	Number of employees
Security	Number of employees
Department of Statistics	Number of employees
Pantry	Volume of operations
Informatics	Number of employees
Archives	Number of computers
Warehouse	Record Archives
Telecommunications	Application number and volume of the inventory goods in stock
Management Unit	Number of employees

Table 3: classification of costs and methods of tracking or allocation

Cost title based on the natural	Direct	Indirect	methods of tracking or allocation
Salary and additional payments	●		According to the staff of each office, traced to related
Overtime	●		According to the staff of each office, traced to related
End of year gifts	●		According to the staff of each office, traced to related
Education	●		According to the staff using educational services.
Domestic mission	●		According to employees who have gone on mission.
Death and marriage allowances	●		According to employees who have used it.
Article 41 bonus and Training	●		According to employees who have used it.
Vacation for deprived areas	●		According to employees who have used it.
Staff uniforms	●		According to the number of employees in the office.
Cash Assistance	●		According to employees of each office who have
Contractual services	●		To the offices that are subject to the contract.
Food	●		According to the number of employees in the office.

Marjan Roshani and Mahmood Hematfar

Kindergarten Assistance	•		According to employees of each office who have
State pension contributions	•		Traced to non-operational activity of debts and
Remuneration for end of service	•		Traced to non-operational activity of pension.
Pay personnel debts	•		Traced to non-operational activity of debts and
Car Insurance	•		Traced to vehicles unit
Reward for top students	•		According to employees of each office who have
Computer Repair	•		Computer unit
Maintenance of vehicles	•		Vehicles unit
Fuel of vehicles	•		Vehicles unit
Printing and replication	•		Printing and replication unit
Accessories and consumables	•		Traced according to documents held in stock
The cost of administrative reform	•		Administrative and supporting unit
Internet costs	•		Computer unit
Public relations costs	•		Public relations
Accommodation and catering	•		Public relations
Housing benefit	•		According to employees of each office who have
Costs related to veterans	•		Units in which the employees have used the service.
Phone	•		Telecommunications unit
Gas consumption	•		Allocated to offices based on the infrastructure
Water consumption	•		Allocated to offices based on the number of
Electricity costs	•		Allocated to offices based on the infrastructure
Cost of repair facilities	•		Allocated to offices based on the infrastructure
Debts to other organizations	•		Traced to non-operational activity of debts and

Table 4. Indirect costs and standards for their allocation

Row	Indirect costs	Allocation Standard
1	The price of water	Number of employees
2	Power costs	Square meter
3	The cost of gas	Square meter
4	Indirect Calls	Number of employees in units that have not a direct line
5	The cost of repairs and installations	Square meter
6	Building insurance costs	Square meter

Marjan Roshani and Mahmood Hematfar
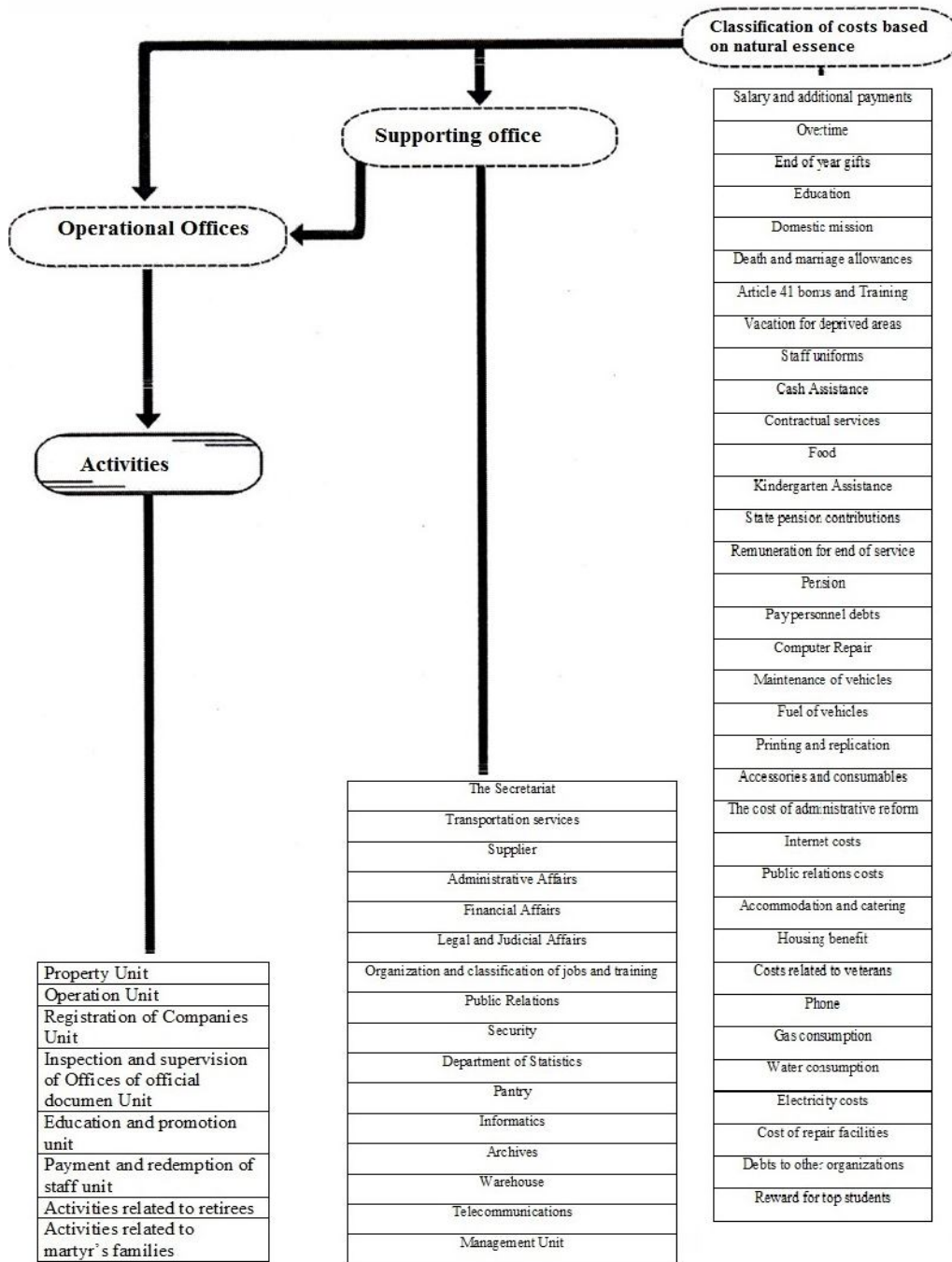
Figure 1: general model for calculating the cost of activities carried out by state of organization for registration of Deeds and properties of Lorestan province

RESEARCH ARTICLE

The Effect of Job Satisfaction, Organizational Commitment and Attachment on Deposits among Employees of Agricultural Bank, Tehran

Reza Shabannejad*, Maryam Banaee and Mohammad Ghafari Fard

Department of Management, Buinzahra Branch, Islamic Azad University, Buinzahra, Iran.
Corresponding Author Mail: shabannejad@yahoo.com.

***Address for correspondence**
Dr. Reza Shabannejad
Department of Management,
Buinzahra Branch, Islamic Azad University,
Buinzahra, Iran.
E-mail: shabannejad@yahoo.com.

ABSTRACT

The purpose of this survey is to investigate the factors effective on customer deposits in the Agricultural Bank in 2014. The studied group included 1050 employees and managers of branches of the Agricultural Bank in Tehran. The sample size (285) was estimated using random stratified sampling by Krejcie and Morgan (1970) table. The used material was a questionnaire. Cronbach's alpha was used to determine the reliability of the questionnaire; the estimated coefficient was 0.879, which is acceptable. Validity of the questionnaire was confirmed by the experts. Data analysis was performed using SPSS software. In this study, correlation tests and multiple regression were used. The results of correlation tests related to the overall correlation of customer deposits in Agricultural Bank branches in Tehran showed that intrinsic job satisfaction, organizational commitment and organizational attachment (0.668, 0.651 and 0.542, respectively) had the greatest effect on customer deposits of the Agricultural Bank Branches in Tehran. The results showed that both intrinsic and extrinsic job satisfactions have been inserted into the regression equation in two steps. It should be noted that intrinsic job satisfaction (0.638) had the higher effect on prediction of dependent variable (customer deposit) than other independent variables.

Keywords: deposit-taking, customers, Agricultural Bank, job satisfaction, organizational commitment, job attachment

INTRODUCTION

By monetized economy resulting in separation of depositors and investors, means are required to transfer funds from individuals with surplus to those who are faced with a deficit. In fact, financial markets (such as stocks and bonds market) and financial institutions (such as banks and financial institutions) as the main component of financial system are responsible to transfer funds of those people who have surplus to people who experience deficit. In other words, they are financial instruments for transforming savings into investment and financial intermediaries (Monef & Mansouri, 2010).

In most financial markets, banks have played an important role in acceleration of the economic cycle through a regular flow of financial resources for development projects, development of production and employment, and completion of unfinished projects. Banks are profit-making enterprises which provide a large part of their resources from deposits of depositors; thus, depositors deciding on their portfolio can have a great influence on the bank deposits.

In the new banking system, customers have different motivations to deposit their funds into banks. Therefore, the banks need to find solutions to attract resources and retain their customers in the current competitive market which is associated with privatization of many state-owned banks. In fact, several factors influence the attraction of monetary resources of banks and financial institutions. It is essential to identify and evaluate the relationship of these factors to the success of banks in mobilizing financial resources.

The results of a study conducted in one of the Iranian banks to identify needs and factors effective on customer satisfaction showed that behavior of employees and how they deal with customers, accountability, profit and facilities, quality of service, location and quality of remittances can be explained. Therefore, employees who interact with customers need certain behavioral characteristics such as availability, problem solving, ability to overcome their adverse emotions, and good manner (Aref-kashafi, 1999). Human capital is the main component of the Bank; this group of human capital is responsible for critical and sensitive tasks. Therefore, they are in certain psychological state. Different factors influence their needs, motivations and human attitudes which cause positive or negative actions in the employees (Khodayarifard, 2009). Therefore, this study finds out whether job satisfaction, organizational commitment and attachment of employees can influence customer deposits in Agricultural Bank.

Literature Review

Managers of organizations have found that the most important factor of competitive advantage is human resources. Organizational behavior studies emphasize on work-related attitudes. Most of these studies are in relation to three attitudes regarding organizational commitment, job satisfaction and job attachment (Robbins, 2006; Bagheri & Tavalaei, 2010). These cases are explained below.

Job Satisfaction

Job satisfaction refers to positive feelings and attitudes of people towards their jobs. When a person is said to have high job satisfaction, this means that he really likes his job and feels good about his job. The results of studies show that employees with higher job satisfaction are physically and mentally in good condition (George, et al., 1999). In addition, job satisfaction is a sense of satisfaction with job which is related to potentials, success, reasonable needs, job achievement, successful experiences and organizational environment (Deadowen, 2013). Job satisfaction is an important factor in job achievement, a factor which increases the efficiency and the sense of personal satisfaction (Shafi-Abadi, 2002).

Reza Shabannejad *et al.*

Equality theory was first proposed by Adams. According to Adams, people always want to be treated fairly. In other words, equality is to believe that one is treated unfairly in comparison with others. According to this theory, the comparison of equality is based on the ratio of input to output. The input is things that a person brings such as educational level, experience, diligence and loyalty to the organization and output is things that a person receives, including salary, public relations, recognition and inner reward for things he brings. Employees first compare the way by which the organization treats them compared to others. By this assessment, one understands a sense of fair or unfair treatment (Luthans, 1995).

According to Adams, job dissatisfaction occurs when one's individual output is compared to inputs and the output is compared to others' individual inputs. Therefore, equality implies that: 1) the inputs and outputs change; 2) they are cognitively distorted; 3) others' inputs and outputs change (Homan, 2002).

Expectation theory is based on interpretations of Vroom (1964) of organizational science. Expectation theory refers to the problems raised in the Enjoyment school introduced in 1930s and used for work motivation. This theory states that people look at different jobs available to them (for example, getting the job versus not getting the job) and choose a career which, as they suppose, most likely results in favorite rewards. He presented two models: one for predicting certain choices, such as what words are preferred or how much effort will be made, and the other for prediction of individual attitudes towards his job. The combination of expectation and value determines what a person will choose. Vroom believes that attitudes of people towards doing things depend on the value they give to the results of their efforts (positive or negative), multiplied by their trust to the fact that, in practice, their efforts will lead to success in achieving organizational goals (Kentz, 1994).

Effective Factors on Job Satisfaction

According to these theories, there are generally three important dimensions of job satisfaction: 1) Job satisfaction is an emotional response to a situation or occupation; 2) Job satisfaction is often associated with the fulfillment of needs and expectations; 3) Job satisfaction is derived from several interrelated attitudes (Khodayarifard, 2009).

Smith et al suggested five career dimensions including the nature of the job, wages, promotion opportunities, managers and colleagues. These dimensions are the most important aspects of job to which people show a positive response. Job satisfaction refers to one's general and emotional orientation to his career role. This concept is different from one's satisfaction with distinct aspects of job. In fact, job satisfaction as a general attitude towards the job is a general concept, although this concept is not contrary to the fact that this attitude is also multidimensional. The assumption is that individuals are able to modify specific aspects of job satisfaction versus aspects of dissatisfaction, and reach a combined attitude of job, as a whole (Smith et al., 1969). According to Feldman (1995), the most important sources of job satisfaction are: 1) working conditions and wages resulting from engineering studies of scientific management industry; 2) working group and leadership influenced by the human relations movement; 3) the job itself and work opportunities considering the nature of the job.

Organizational Commitment

Organizational commitment is divided into various types, such as ideological commitment, national commitment, self-oriented commitment, team commitment and organizational commitment (AlHusseini, 2001).

Organizational commitment refers to people linking the organization by a strong belief, acceptance of goals and organizational values (affective commitment), tendency to make efforts for the organization (continuance commitment), and a strong desire to stay in the organization (normative commitment).

Porter et al (1974) defined organizational commitment as the capability for self-recognition and the ability to engage in a particular organization. They also distinguish three main characteristics for organizational commitment: 1) a strong belief in and acceptance of the values and goals of the organization; 2) tendency to show considerable efforts in the organization; 3) The desire to maintain membership in the organization. Meyer and Allen (1991) showed three dimensions of organizational commitment including affective, normative and continuous commitments. Affective commitment is the emotional attachment of employee to the organization, identification of the organization and involvement in the organization. Employees with high emotional commitment continue working in the organization. Normative commitment is the feeling of obligation or commitment on continuing in the organization. Employees with high normative commitment feel that they should remain in the organization. Continuous commitment is related to the awareness of the costs associated with leaving the organization. Initial contact of employees with the organization based on a continuous commitment means that they need to work (Meyer and Allen, 1991). Organizational commitment is a key factor leading to the financial success and competitive advantage (Mowday, 1998). Moreover, Baruch (1998) found that high organizational commitment could improve employee ethics and increase loyalty to the organization.

Work experience variables which are associated with organizational commitment are shown by three studies to be considerably related to organizational commitment. Moreover, Buchanan (1974) concluded that the sense of personal importance to the organization is associated with organizational commitment. That is, their organizational commitment increases when employees feel that they are needed for the mission and vision of the organization. Other important factor related to work experiences is how employees feel about positive attitudes of coworkers toward the organization. That is, the positive attitudes of colleagues will be effective on one's commitment. Only two studies have sought to explore the relationship between commitment and leadership style; both studies found that commitment is associated with a task-oriented leadership. The second study showed that the commitment is associated with humane considerations of the leader (Bagheri & Tavalaei, 2010).

Job Attachment

Lodahl and Kejner (1965) defined the term job attachment as internalization of value of goodness and importance of the work in personal values.

Job attachment refers to the current job description and tends to be a function of the extent to which work can satisfy the individual current needs (Kanogo, 1982).

Job attachment is dependent on personal traits and the nature of tasks. Among the diverse perspectives of job attachment, the most realistic one is a function of personality and organizational environment (Fasianco, 2012). Job attachment refers to the degree to which one is psychologically fascinated, involved and related to his current job. Job attachment refers to psychological identification with the job or to the degree to which the job is the identity of the person. Organizations need employees who are consistent with the values and organizational goals, strongly motivated and committed, tending to maintain the organizational membership and working beyond their normal duties (Alersouan, 2012).

Effective Factors on Job Attachment

Job attachment is intimately related to job satisfaction and motivation. Usually, job attachment is more important than job satisfaction. Job attachment is dependent on personal characteristics and the nature of the job. The most important personal characteristics of job attachment are age, need to grow and belief to the traditional work ethic. Perhaps due to greater responsibilities and challenges and enough opportunity to meet their growth needs, older workers are usually more attached to their jobs. Older workers also tend to be more committed to the value of hard work. The growth needs are important in job attachment; as a result, job characteristics which satisfy growth needs

Reza Shabannejad *et al.*

are strongly related to job attachment. These characteristics include excitation, authority, variety, task identity, feedback and participation. Social factors can also influence the job attachment. Employees who work in groups have reported higher job attachment than employees who work alone. Participation in decision-making, to the extent that staff support organizational goals, is associated with job attachment. Sense of achievement and progress in employment also increases the level of job attachment (Madani, 2004).

The other situational factors such as job design, organizational and psychological climate and management style also have a significant effect on job attachment. Job design seems to have stronger effects on job attachment of people who tend to satisfy higher-level psychological needs.

Dorosti (1998) examined the factors influencing deposit taking using – banking method after implementation of interest-free banking operations during 1996-1988. He showed that interest rates on deposits were not effective on deposit taking in the banking system; however, the role of other factors such as high job knowledge, trust and confidence in depositors is positive in taking deposits. He concluded that the banking system had little success in taking long-term deposits. By evaluating inflation rate and interest paid on long-term deposits, it was clear that the paid interest is typically less than inflation and low interest rate is the main reason for depositors to withdraw their funds and use in the unorganized money market, despite the risks.

Using a three-dimensional model of Meyer and Allen on the relationship between organizational commitment and performance of Mashhad Municipality, Hossein-Zadeh (2004) indicated a direct relationship between performance and affective commitment, continuance commitment and obligational commitment.

Considering factors effective on customer satisfaction and the importance of each parameter, Kazemzade and Bashiri (2005) presented a method for extraction of critical parameters. Four identified critical parameters include how the services are provided, quality of services, location of service delivery and customer support. The consideration of critical parameters using the proper methods is followed by increased customer satisfaction.

Fathian et al (2009) conducted a field study to find a relationship between modern banking services and customer satisfaction. The results showed that the e-banking services are functional requirements of customers. They also concluded that the relationship between development of these services and customer satisfaction is a direct linear.

Ronaghi and Faizi (2011) developed indicators to assess work ethics of employees and to analyze the relationship between business ethics, customer trust and customer satisfaction and loyalty. The results showed a positive relationship between business ethics and customer trust and satisfaction which lead to customer loyalty.

Morovvati et al (2013) identified the factors effective on deposit taking in the Saderat Bank of Yazd. Their results showed that two factors, dealing with customers and the interest rate on deposits, had the greatest effect on taking deposits.

Metawa and Almossawi (1998) evaluated the customers of Bahraini Islamic banks. The results indicate that dealing with customers has a considerable effect on customer satisfaction and attracting funds for the redeposit.

Liu and Hung (2006) studied the long-term profitability of banks in Taiwan; they concluded that banking services are the most important factors in profitability of bank branches. In addition, they reported that employees are the most important and most fundamental factor to achieve increased profitability.

Abhiman et al (2009) studied some branches of the major state banks of India. They considered factors such as human capital, education, environment, location, advertising, government regulation and reduced state interference as

Reza Shabannejad *et al.*

factors effective on taking deposits. They believed that the most important and influential factor of deposit taking is human capital.

Petty and Charles (2008) studied how sellers perceived ethics and ethics of employers and their behaviors as a consumer and the relationships between these observations and job satisfaction of sellers. The results showed a positive relationship between perceived ethics by employees and ethics of employers and job satisfaction.

Akpara and Vien (2008) examined the effect of work ethics on job satisfaction and organizational commitment in Nigeria. The results indicated a significant relationship between organizational work ethics, organizational commitment and job satisfaction.

METHODOLOGY

This descriptive-analytic study used documentary and field methodologies to collect the required information. The studied group included personnel and managers of the Agricultural Bank branches in Tehran (N=1050). Considering that different branches of Agricultural Bank in Tehran are independent of each other, this study used a random stratified sampling. It has been described in the following. Based on a stratified random sampling, the members were divided into several non-overlapping groups called as class. In this study, the classes included the various branches of the Agricultural Bank in Tehran, which, for convenience, were divided into four areas including North, South, East and West. By determining the classes, the next step was to determine the number of samples assigned to each class using proportional assignment, i.e. proportional to population of each class. At the end, the target subjects were randomly selected among the subjects of each class in proportion to its population. The sample size (285) was estimated using Krejcie and Morgan (1970) table.

The main material was a researcher-made questionnaire whose validity (formal) was approved by university professors and experts after necessary modifications. To evaluate the reliability of the questionnaire, a pilot study was conducted outside the scope of the study by 30 questionnaires. Cronbach's alpha (0.89) calculated by the software SPSS represents the high reliability of the material. It should be noted that the variables were scored in a five-point Likert scale (very low=1, low=2, average=3, high=4 and very high=5). In addition, this study used a questionnaire consisting of three parts, organizational commitment, job satisfaction and job attachment. Note that:

> a standard questionnaire of Meyer and Allen (1991) was used to measure the organizational commitment;

> a standard questionnaire of Fild and Ruth (1951) was used to measure job satisfaction;

> a standard questionnaire of Lodahl and Kenjer (1968) was used to measure job attachment.

Finally, correlation tests and multivariate regression analysis were used to test hypotheses. The software used in this study was SPSS$_{v19}$.

RESULTS

Descriptive Results: The sample was consisted of 34.7% female and 65.3% male. The age of respondents ranged from 21 to 58 years (36.1 on average). The samples included 8.1% with diploma, 20.4% with associate degree, 49.5% with BA degree, 17.2% with MA degree and 4.9% with a doctoral degree. The experience of samples was 16.27 years on average (mean deviation = 9.82). It should be noted that the longest and the shortest experiences in the Agricultural Bank were 28 years and 2 years, respectively. In the studied sample, the groups of 10-15 years of experience (7%) and less than 5 years (9.8%) were the least frequent and the groups of 15-20 years (43.2%) was the most frequent.

Organizational Commitment

This section assesses the overall level of organizational commitment of the subjects. As shown in Table 2, 35.5% of the subjects had low and very low levels of organizational commitment. In addition, 25.6% had the average level of organizational commitment and 39% had high and very high organizational commitment. Generally, the organizational commitment is at an average level (mean = 3.15, SD = 1.15).

In general, there are two types of job satisfaction, extrinsic job satisfaction influenced by individual factors and environmental factors, and intrinsic job satisfaction resulting from organizational factors and the nature of the work. As shown in Table 3, 27% of subjects had low and very low levels of intrinsic job satisfaction and 26% had low and very low levels of extrinsic job satisfaction. Accordingly, 38.9% and 24.9% had average levels of extrinsic job satisfaction and intrinsic job satisfaction, respectively. In addition, 35.1% and 48.1% had high and very high levels of extrinsic and intrinsic job satisfactions, respectively.

As shown in Table 4, 37.2% of the subjects had low and very low levels of job attachment. In addition, 29.1% had the average levels of job attachment and about 33.7% had high and very high levels of job attachment. Generally, job attachment is at an average level (mean = 2.96 and SD = 1.07).

Analytical Results

The results of correlation between variables on customer deposits show that (Table 5) intrinsic job satisfaction, organizational commitment and organizational attachment (correlation coefficient: 0.668, 0.651 and 0.542, respectively) had the highest correlation with customer deposits.

Ability of Variables to Predict Customer Deposits

The present study used step-wise multivariate regression test to determine the ability of the independent variables in prediction of customer deposits in Agricultural Bank branches in Tehran. As shown in Table 6, the intrinsic and extrinsic job satisfactions were inserted into the regression equation in two steps. Considering the R^2 value, these parameters are able to predict 8.1% customer deposits. In addition, variance inflation factor (VIF) was used to determine the collinearity between independent variables. There will be no collinearity if $1 < x < 5$. As the VIF test results show (Table 6), there is no collinearity between the independent variables.

Considering the multivariate regression model, the following equation can estimate the social sustainability in the studied area.

$$Y = -0.485 + 0.63x_1 + 0.418x_2$$

Obviously, the intrinsic job satisfaction (0.638) has the higher effect in predicting the dependent variable (customer deposits) than other independent variables.

CONCLUSIONS AND RECOMMENDATIONS

Currently, organization and management scientists argue that the most valuable capital is the human capital which directly influences failure or success of an organization. Thus, attempt to develop commitment, satisfaction and loyalty of employees is so important that managers need to be aware of it. Committed people stick to the values and goals of the organization (attachment) and play their roles more actively and they are less likely to leave the organization and take new job opportunities (job satisfaction). Thus, the purpose of this study is to investigate the

Reza Shabannejad *et al.*

effect of job satisfaction, organizational commitment and attachment of employees on customer deposits in Agricultural Bank branches of Tehran.

The results showed a significant positive relationship between job satisfaction (intrinsic and extrinsic) and customer deposits (r_s =0.208; Sig =0.035; r_s = 0.239; Sig =0.03). In this regard, increase in job satisfaction (intrinsic and extrinsic) increases customer deposits; conversely, a decrease in the level of each variable decreases the other variable. Employees and managers with higher job satisfaction are focused on their jobs and they use their energy for better fulfillment of their responsibilities. On the other hand, attraction of customers and customer satisfaction are considered as factors of dynamics and sustainability of an organization. Due to the competition of banks and businesses to attract customers, qualified and efficient human capital is the most important part of organizational goals. The obtained result is consistent with Abbey (2003).

The results showed a significant positive relationship between organizational commitment and customer deposits (r_s =0.508; Sig =0.03). In this regard, the increase in organizational commitment increases customer deposits and, conversely, a decrease in the level of each variable decreases other variables. In this regard, organizational commitment is an attitude toward loyalty to the organization; it is an ongoing process through which members show their interest in the organization and its continuous improvement. Therefore, tasks and duties would not be agonizing and customers will feel good about these people. These results are consistent with Hossein-Zadeh (2005), Behbudi (2000) and Bagheri and Tavalaei (2010).

The results showed a significant positive relationship between job attachment and customer deposits at 95% confidence level (r_s =0.167; Sig =0.04). Therefore, the assumption that there is a correlation is confirmed and the null hypothesis is rejected. In this regard, the increase in job attachment increases customer deposits and, conversely, a decrease in the level of each variable decreases other variables. A person is attached to his work when that work is an important part of his life and it is influenced by the overall status of the job, colleagues, company, etc. On the other hand, an important part of the life of a person with low job attachment is outside the scope of his work, and his job is not considered as an important part of his psychological life. He is more interested in other aspects of life; his self-conception which forms his identity is not under influence of the type and quality of his work. These results are consistent with Hossein-Zadeh (2004), Behbudi (2000) and Habibi (2006).

The results suggest that the staff actively participate in planning and decision-making within the organization. In fact, the director of the organization should encourage the staff to participate actively. It also suggested that senior managers and directors of the organization encourage low-level managers to involve in critical decision-making process, because their involvement in setting strategies influences the job satisfaction, organizational commitment, and organizational attachment.

REFERENCES

1. Abhiman, D,. Subhash, C. R. & Ashok, N (2009). Labor-use efficiency in Indian banking: A branch-level analysis. Journal of Omega, 37: 411-425.
2. Alersoansan, F. (2012) .The role of emotional intelligence and personality variables on attitudes toward organizational change. Journal of Managerial Psychology، Vol. 19، No. 2، pp. 88-110.
3. AlHusseini, S. H., 2001. organizational growth. tehran: Baharieh.
4. Aref-kashafi, H. A., 1999. management and human factors in service-provider organizations. Tadbir, Issue 92, pp. 49-59.
5. Bagheri, M. & Tavalaei, R., 2010. effect of organizational committment on organizational performance. Police Human Development, 7(30), pp. 73-96.
6. Baruch, Y. (1998). The rise and fall of organizational commitment. Human Systems Management, 17: 135-143.

7. Deadown, S.D. (2013) .Personality attitude and leader influences on divergent thinking and creativity in organizations. European Journal of Innovation Management, 7(3): 187-204.

8. Dorosti, M. B., 1998. the factors effective on deposit-taking in Iran during a decade of implementing interest-free banking operation, s.l.: s.n.

9. Eby، T. Lillian. & Cosper، J. Wendy. & Lockwood. Anyie. & Bordeaux، & Brinle،Andi. (2003). monograph work & family research in IO/ content Analysis & review of the literature (1980-2002). Journal of Vocational Behavior.66،124-19

10. Fasianco, F. (2012). Social Research Methods Qualitative and Quantitative Approaches, Boston: Allen and Bacan, p:231.

11. Fathian , M., shafia, M. & Shahrestani, M., 2009. effect of e-banking on increased customer satisfaction. tehran, s.n.

12. Feldman, D. C., (1995). Organizational behavior. Edt, New York MC Graw. Hill.

13. George, M. J., Jones, R. & Grass, 1999. Understanding and direction of organizational behavior. s.l.:s.n.

14. Homan, H. A., 2002. standardized scale of job satisfaction. tehran: Public Administration institution.

15. Kazemzade , R. & Bashiri, M., 2005. critical parameters of increased customer satisfaction. Journal of Behavior, Issue 11, pp. 71-78.

16. Kentz, H., 1994. management basics. s.l.:public administration institution.

17. Khodayarifard, M., 2009. job satisfaction of employees and customer satisfaction in Saderat Bank; a psychological intervention to promote satisfaction, s.l.: Saderat Bank.

18. Liu Yong-Chin & Hung Jung-Hua, (2006). Services and the long-term profitability in Taiwan's banks. Global Finance Journal, 17:177-191.

19. Luthans, A., 1995. organizational behavior management. tehran: banking institution.

20. Madani, H., 2004. prioritization of factors effective on organizational commitment among employees, s.l.: s.n.

21. Metawa, S. A & Almossawi, M (1998). Banking behavior of Islamic bank customers: perspectives and implications. International Journal of Bank Marketing, 16: 299- 313.

22. Meyer, J. P., & Allen, N. J. (1991). A three-component conceptualization of organizational commitment. Human Resource Management Review, 1, pp: 61-89.

23. Monef, A. A. & Mansouri, N., 2010. the factors effective on banking deposits (focusing on bond interest rate). knowledge and development, 17(34), pp. 69-90.

24. Morovvati, A., Golshan, A. & Khaninzade, 2013. identification of factors effective on deposit taking using fuzzy VIKOR. improved management, 7(2), pp. 143-163.

25. Mowday, R. T. (1998). Reflections on the study and relevance of organizational commitment. Human Resource Management Review, 8: 387- 401.

26. Porter, L. W., Steers, R. M., Mowday, R. T., & Boulian, P. V. (1974). Organizational commitment, job satisfaction, and turnover among psychiatric technicians. Journal of Applied Psychology, 59(5): 603-609.

27. Robbins, A., 2006. organizational behavior, concepts, theories and applications. 9th ed. tehran: office of cultural studies.

28. Ronaghi, M. H. & Faizi, J., 2011. ethics model of employees in private banks of Iran. ethics in sciences and technology, Issue 2, pp. 40-46.

29. Shafi-Abadi, A., 2002. Theories of career guidance and career counseling. tehran: roshd.

30. Smith, P. C. et al. (1969). User's manual for the descriptive index (JDI). Bowwling green state university. Bowling green, Ohio.

Reza Shabannejad *et al.*

Table 15: the classes and samples selected from classes

	Supervisor branch	No. members	Selected sample
1	North	323	88
2	South	300	82
3	West	200	54
4	East	227	61
5	Total	1050	285

Source: research findings

Table 16: istribution of organizational commitment

Organizational Commitment	Distribution	%	Mean*	Standard deviation
Very low	11	3.9	3.15	1.15
low	90	31.6		
Average	73	25.6		
High	65	22.8		
very high	46	16.1		
Total	285	100		

Source: findings * Scale: 1: Very low; 2: Low; 3: Average; 4: High; 5: very high

Table 17: distribution of job satisfaction

Level	Extrinsic job satisfaction		Intrinsic job satisfaction		Core index and dispersion (extrinsic job satisfaction)	Core index and dispersion (intrinsic job satisfaction)
	Distribution	%	Distribution	%		
Very low	21	7.4	25	8.8	mean* $= 3.07$ Standard deviation $=1$	mean* $= 3.2$ Standard deviation $= 1.1$
low	53	18.6	52	18.2		
Average	111	38.9	71	24.9		
High	83	29.1	114	40		
very high	17	6	23	8.1		
Total	285	100	285	100		

Source: findings * Scale: 1: Very low 2: Low 3: Average 4: High 5: very high

Reza Shabannejad *et al.*

Table 18: distribution of job attachment

Organizational Commitment	Distribution	%	Mean*	Standard deviation
Very low	21	4.7	2.96	1.07
low	58	29.8		
Average	83	29.1		
High	74	26		
very high	22	7.7		
Total	285	100		

Source: findings * Scale: 1: Very low 2: Low 3: Average 4: High 5: very high

Table 19: Analysis of total effects of variables in the model of factors effective on customer deposits

Variables	Organizational attachment	Organizational commitment	Extrinsic job satisfaction	Intrinsic job satisfaction	Deposits
Organizational attachment	-	0.832	0.359	0.53	0.542
Organizational commitment		-	0.431	0.637	0.615
Extrinsic job satisfaction			-		0.445
Intrinsic job satisfaction				-	0.668

Source: findings

Table 20: multivariate regression to determine variables predicting customer deposit

Variable	B	β	t-test	sig	VIF	Tolerance
Constant coefficient	-0.485	-	-5.81	0.000	-	-
Intrinsic job satisfaction X_1	0.635	0.638	25.04	0.000	1.41	0.707
Extrinsic job satisfaction x_2	0.457	0.418	16.38	0.000	1.41	0.707
R=0.87 (Adjusted) R^2=0.871 R=0.933 sig=0.000 F=948.66						

Source: findings

RESEARCH ARTICLE

Consequences of Burnout in Paramedical Society using an Integrated Fuzzy Multicriteria Decision Making Model

Ashraf Sancholi[1] and Salarzehi Habib Allah[2]*

[1]Department of Industrial Engineering, Faculty of Engineering, Zahedan Branch, Islamic Azad University, Zahedan, Iran; Zahedan university of Medical sciences, Zahedan, Iran
[2]Department of Public Administration, University of Sistan and Baluchestan, Zahedan, Iran.

*Address for correspondence
Salarzehi Habib Allah
Department of Public Administration,
University of Sistan and Baluchestan,
Zahedan, Iran.
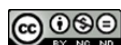
ABSTRACT

Various branches of medical profession as one of the most stressful jobs can influence the mental health of practitioners followed by patients. Among the various medical specialties, factors such as increased workload, older patients, emergency in some specialties such as surgery and anesthesia, and dealing with incurable and chronic patients, such as radiotherapy and oncology seem to play a role in causing psychological stress and subsequent burnout. Burnout can involve numerous mental, physical and emotional symptoms. This paper identifies and prioritizes the consequences of burnout in paramedical society. To achieve this goal, consequences of burnout are identified using literature, experts and specialists. To prioritize the consequences of burnout, a hybrid model based on fuzzy DEMATEL and fuzzy ANP is proposed. The fuzzy DEMATEL is used to extract the relationships between consequences of burnout. The outputs of fuzzy DEMATEL are used to form a super-matrix in fuzzy ANP. The output of fuzzy ANP is net weights of burnout consequences. Based on the calculated net weights, finally, the factors of burnout are prioritized in the paramedical society.

Key words: Burnout, factors of Burnout, fuzzy DEMATEL, fuzzy ANP, prioritization

Ashraf Sancholi and Salarzehi Habib Allah

INTRODUCTION

According to studies carried out, the staffs in the health sector are the first candidates for burnout. According to researchers, this is due to the daily exposure to stress and lack of positive conditions in workplace. Hence, doctors, nurses, teachers, counselors, psychologists, social workers, police officers and employees of health services are people at a risk of burnout (Fan et al., 2014).

Paramedics, dealing with a wide range of illnesses and life-threatening risks to patients, daily encounter many patients who expect their conclusive healing. The staff in the health sector, including general practitioners (GPs), specialists, nurses and healthcare workers seems to experience higher levels of burnout than other professions due to exposure to multiple stressors including emotional, physical, interpersonal and managerial stress. These stressors include high working pressure, low social support, exposure to violence and threats in the workplace, the night shift, high work demands, poor working organization, hard work and uncertainty, decision-making in critical situations based on inadequate information and dealing with the consequences of this decision-making.

Burnout was first introduced by Freudenberger (1975). Now, the emergence and development of the concept owes Freudenberger in New York and Maslach et al (1982) in California. Freudenberger defines burnout as a state of exhaustion or failure caused by self-devotion, lifestyle or relationships which lead to unwanted result. Almost all experts relate the burnout to occupational stress. In 1990, Chernis defined burnout syndrome as a reduction in work motivation, response to severe conflicts, dissatisfaction, psychological withdrawal, and emotional exhaustion. According to Maslach and Jackson (1981), burnout is the result of reduced compatibility due to stressors and physical and emotional exhaustion syndrome. This syndrome leads to negative self-concept, negative attitude toward work and lack of the feelings of communication with others. These symptoms may lead to a variety of mental and physical diseases.

Currently, it has been important to consider burnout in health workers. Due to the fact that health care professionals are closely related to the health and safety of people, their problems are an important concern of governments and health care officials and society (MacPhee et al, 2006). The symptoms of this syndrome are evident when one's abilities are not sufficient for working demands. Burnout has three dimensions: emotional exhaustion, depersonalization and reduced sense of personal accomplishment (Ofordile, 2010). Burnout is one of the major inevitable outcomes of job stress. Burnout will continue as long as the stress continues (Losa et al., 2010). It has been found that the risk of burnout is very high among health care workers (Piko, 2006). It is clear that paramedics are not excluded in this regard.

Garrosa et al (2008) investigated the relationship between burnout and demographic variables among the psychologists working in psychiatric clinics. The results reported high levels of emotional exhaustion and depersonalization in more than one-third of sample size.

Losa et al (2010) investigated the factors effective on health, stress and burnout. The results showed that factors such as work relationships, lack of competent management, high workload and lack of performance contingent rewards lead to burnout and turnover. Wu et al (2007) showed that three-quarters of doctors cope with symptoms of burnout including emotional exhaustion, depersonalization and reduced sense of personal accomplishment in their first year of practice. A majority of these physicians reported the improper economic conditions as a reason for their problems.

Taei et al (2009) evaluated the distribution of burnout syndrome among GPs in Kerman. The results showed that emotional exhaustion and depersonalization were higher in male practitioners than in females.

Ashraf Sancholi and Salarzehi Habib Allah

Essex and Scott (2008) reported that female practitioners experienced higher burnout than their male peers in USA. Most patients of female GPs suffered psychological problems such as depression, eating disorders and anxiety. They also reported lower dominance on the workplace compared to their male peers.

Atef et al (2005) compared burnout in general surgeons and specialists in Isfahan. The results indicated that the mean score of burnout was significantly higher in general surgeons than in internists. In addition, the mean scores of emotional exhaustion and lack of a sense of personal accomplishment were higher in general surgeons than in internists. They found no difference between mean scores of depersonalization in general surgeons and internists; however, the mean scores of depersonalization were high in both groups, which indicate high pressure and workload and stressful job.

Campbell reported two-thirds of surgeons with high levels of emotional exhaustion, 13% with high levels of depersonalization, and 4% with low levels of personal accomplishment. In a study in Turkey, the most important predictor of burnout and job satisfaction depended on vacation trips and general ownership of public facilities (Ozyurt et al., 2009). In Denmark, a significant correlation was found between non-participation in Continuing Medical Education (CME) and double risk of burnout (Brondt et al., 2008).

Soleimannejad et al (2011) determined the relationship between coping styles and stress, depression and mental health among practitioners in Urmia. The results showed a significant and inverse relationship between coping styles and stress and burnout among physicians. Burnout, mental health and coping styles and stress are not different in physicians in terms of their sex.

Montazergheyb (2011) examined the relationship between burnout and personality types among teachers and principals in elementary schools in District 3 of Tehran. Her results showed a significant relationship between Holland personality types and components of burnout. Burnout was lower in social type and higher in realist, conventional and impetuosity types. No relationship was found between artistic type and burnout.

According to Campbell et al (2001), depersonalization is a distinctive characteristic; role-job conflict leads to emotional exhaustion and depersonalization. Furthermore, the higher work experience and more hours of work in a week reduce a sense of declined personal accomplishment. Sheesley considers burnout as a result of reactions to the nature of job, related tasks and responsibilities. Furthermore, burnout causes several mental, emotional and physical symptoms, including:

A) Physical symptoms include loss of energy, chronic fatigue, weakness, increased vulnerability to diseases, back pain, multiple somatic complaints and sleep disorders.

B) Emotional symptoms include helplessness, hopelessness, increased stress and conflict in home, increased negative nervous states such as restlessness, anger, irritability and loss of positive emotional states, such as sincerity, humility and politeness.

C) Mental symptoms include dissatisfaction and negative attitudes toward jobs, lives and ultimately the withdrawal behaviors (absenteeism and escaping from work) (Rashidi, et al., 2009).

These consequences have been experienced in paramedical society as well. Therefore, this study presents a hybrid fuzzy DEMATEL model and fuzzy ANP to prioritize the consequences of burnout in paramedical society. Rest of the paper is organized as follows. In the second section, the proposed model is discussed. In the third section, consequences of burnout identified in the literature are prioritized using the suggested model.

Ashraf Sancholi and Salarzehi Habib Allah

The Proposed Model

The proposed method for prioritizing the consequences of burnout is based on the integration of two methods of multi-criteria decision. In general, main steps of the proposed method can be cited as follows:

Fuzzy dematel

The fuzzy DEMATEL method is used for extracting relations of main criteria (the main consequences of burnout) and sub-criteria (secondary consequences of burnout). The outputs of this step are used to form a super-matrix in fuzzy ANP.

Fuzzy ANP

At this step, paired comparisons considering the relationships between criteria and sub-criteria are used to form a super matrix. By a series of computational steps, the net weight of criteria and sub-criteria is determined. The output is the net weight, based on which factors and consequences of burnout are prioritized.

Fuzzy DEMATEL

DEMATEL (Decision Making Trial And Evaluation) is a comprehensive method to develop and analyze the causal model of complex problems (Wei and Yu, 2007). In management and social problems, DEMATEL can be used to organize the mutual effects of many factors effective on a particular problem (Tseng et al., 2009).

The steps of fuzzy DEMATEL are completely based on its absolute state, with a difference that in this case, applying fuzzy values requires defuzzification calculations (Lin and Wu, 2008). To use fuzzy DEMATEL, following steps are taken:

Step 1: Formation of Fuzzy Direct Relationship Matrix

In order to assess the internal relationships between factors, experts were asked to make paired comparisons between factors in terms of the effect of row factor i on the column factor j. To eliminate the uncertainties in the estimates made by humans, the scale used in the absolute state was changed and the fuzzy language scale was used. In various studies, different degrees of effect are stated by five linguistic words (very high, high, low, very low and no effect). Fuzzy positive numbers corresponding to these words used in this study were adapted from Wei and Yu (2007). These numbers can be seen in the table below.

By collecting the expert views on the effect of criteria and sub-criteria on each other, they were integrated using the arithmetic mean. The output is fuzzy direct relationships ($\tilde{z}$) based on integrated expert views (Yang et al., 2008).

Step 2: Defuzzification of the Fuzzy Direct Relationship Matrix

To obtain the interrelationships of the factors, the direct relationships needed to be defuzzified and become absolute. Therefore, CFCS consisting of five stages was used. Let $z_{ij} = (l_{ij}, m_{ij}, r_{ij})$ be the fuzzy triangular element of this fuzzy matrix, $\tilde{Z}$, representing a fuzzy evaluation of the effectiveness of criterion i on the j-th criterion. To defuzzify the integrated expert views based on CFCS, four stages (A, B, C, D) are taken (Opricovic & Tzeng, 2003):

Ashraf Sancholi and Salarzehi Habib Allah

A) Forming a Normalized Direct Relationship Matrix (Matrix $\tilde{X}$)

To normalize the direct relationship matrix, CFCS developed by Opricovic and Tzeng (2003) was used. The following relations were used to form the normalized direct relationship matrix.

$$xl_{ij} = (l_{ij} - minl_{ij})/\Delta_{min}^{max}, \tag{1}$$

$$xm_{ij} = (m_{ij} - minl_{ij})/\Delta_{min}^{max} \tag{2}$$

$$xr_{ij} = (r_{ij} - minl_{ij})/\Delta_{min}^{max}, \tag{3}$$

where, $\Delta_{min}^{max} - max\ r_{ij} - minl_{ij}$.

B) Calculating the Normal Values on the Left (ls) and Right (rs)

$$xls_{ij} = xm_{ij}/(1 + xm_{ij} - xl_{ij}) \tag{4}$$

$$xrs_{ij} = xr_{ij}/(1 + xr_{ij} - xm_{ij}). \tag{5}$$

C) Calculating the Net Absolute Normal Value

$$x_{ij} - \left[xls_{ij}(1 - xls_{ij}) + xrs_{ij}xrs_{ij}\right]/[1 - xls_{ij} + xrs_{ij}]. \tag{6}$$

D) Calculating the Absolute Values

$$z_{ij} = min\ l_{ij} + x_{ij}\Delta_{min}^{max}. \tag{7}$$

The elements Z_{ij} represent the degree of the effect of factor i on factor j.

Step 3: Normalization of the Non-Fuzzy Direct Relationship Matrix

By the following relations, direct relationship matrix Z can be normalized (Yu et al., 2008).

$$X - s.Z \tag{8}$$

$$s - min\{1/max_{1\leq i\leq n} \sum_{j=1}^{n} z_{ij}, 1/max_{1\leq i\leq n} \sum_{i=1}^{n} z_{ij}\}, \ i,j - 1,2,...,n \tag{9}$$

Step 4: Formation of the Total Relationship Matrix

Ashraf Sancholi and Salarzehi Habib Allah

By calculating the normalized direct relationship matrix, X, the total relationship matrix, T, was calculated by the following relation, where I is the identity matrix (Tzeng et al. 2007).

$$T = X(I - X)^{-1}$$ (10)

It is noteworthy that the normalized matrix T can also be used as an estimate of the internal weight between criteria and sub-criteria in the ANP model. In order to find the interrelationships between criteria and sub-criteria, the normalized matrix T was used. Therefore, the outputs of this section were used as input to the second step.

Fuzzy ANP

Analytic network process (ANP) not only considers a hierarchical structure, but also it models the problem using a feedback system. A feedback system can be shown by a network in which nodes represent sides or components. Absolute ANP consists of four main steps, including (Ghodsipour, 2005):

A) Modelling of the Problem

The problem needs to be clearly stated and analyzed to a logical system, say, a network. The structure can be obtained by decision makers through methods such as brainstorming or other methods.

B) Paired Comparisons and Priority Vectors

In ANP, as in analytical hierarchy process (AHP), decision elements of segments are compared in pairs for their importance in controlling the criterion. The segments are also compared in pairs for their effect on the target. Decision-makers, in the form of a series of paired comparisons, are asked about the effect of two elements or two segments on the upstream criteria.

Let interrelationships exist between decision elements of a segment; using paired comparisons and obtaining the eigenvector of each element, the effect of other elements needs to be shown on that element. The relative importance can be obtained using a relative scale; for example, a scale of 1 to 9, 1 representing relatively equal importance of two elements and 9 representing the highest importance of an element (row) relative to the other (column) (Mehregan, 2004).

In a paired comparison matrix, the value of the opposite side is reversed, i.e., $a_{ij} = \dfrac{1}{a_{ij}}$ while a_{ij} represents the relative importance of i-th element compared to the j-th element. In ANP, as in AHP, paired comparisons are made in the form of a matrix. Local priority vector is obtained by an estimate of the relative importance of elements (or sections) by solving the following equation:

$$\lambda_{\max} W = A W$$

where, A is the matrix of paired comparisons, W is the eigenvector and the largest eigenvalue of the matrix A. It is noteworthy that Saaty (1980) presented several algorithms for approximation of W (Saaty, 2005).

Formation of Super-Matrix

The concept of super-matrix is similar to Markov chain. Super-matrix is able to limit the coefficients to calculate the priorities resulting from integration of effects of an element on other elements. The matrix approach presented by Saaty and Takizawa (1986) can be used to deal with interdependencies of elements of a system when a network, regardless of the target, merely consists of two clusters, criteria and options. To obtain the total priorities of a system by mutual effects, as Saaty and Takizawa suggested, local priority vectors are inserted into specific columns of a matrix, called super-matrix. A super-matrix is in fact a segmented matrix in which a segment represents the relationship between two groups (segments or clusters) in a system.

Let a decision system have C_k decision elements, $K = 1,2,...,n$, and any K have M_k shown by $e_{k1}, e_{k2},...., e_{km}$. Local priority vectors, obtained from the second step and grouped according to the influence of the other segment, are placed in their proper position in super-matrix, as shown in the following.

$$W = \begin{pmatrix} W_{11} & W_{12} & \cdots & W_{1n} \\ W_{21} & W_{22} & \cdots & W_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ W_{n1} & W_{n2} & \cdots & W_{nn} \end{pmatrix}$$

Figure 22: super-matrix of a network

$$W_n = \begin{pmatrix} 0 & 0 & 0 \\ W_{21} & 0 & 0 \\ 0 & W_{32} & I \end{pmatrix}$$

where, W_{21} is the target effect vector on the criterion, W_{32} is the effect matrix of criterion on each option and I denotes the identity matrix; zeros indicate that independent elements are not influenced (Saaty, 2005).

There is usually interdependence between clusters of a network; therefore, 1 columns of a matrix will be more than one column. Note that, the normalized matrix T can be used as an estimate of the internal weight between criteria and sub-criteria of super-matrix.

Net Weigh of Options to Determine the Best Option

If a super matrix contains only the relevant segments, additional calculations are required to achieve the total priorities of options. The net preferences of each option are obtained by (Saaty, 2005):

$$\lim_{k \to \infty} (W_n)^{2k+1}$$

where, W_n is the super matrix and k is an arbitrarily large number. To raise a super matrix leads to convergence and constant weights. In this case, the net weights of sub-criteria are determined; eventually, the biggest priority can be selected as the best option.

In this study, fuzzy ANP is used to determine the net weight of criteria and sub-criteria (main and secondary consequences of burnout).

The steps in the previous section are for calculations of non-fuzzy ANP. In the real world, many decisions involve ambiguous human expressions. In order to integrate the experiences, beliefs and ideas of a decision maker, it is better to convert the linguistic estimate to fuzzy numbers. Fuzzy ANP, better than the traditional ANP, can simulate the decision-making process of human mind. Hence, tangible common items were used in fuzzy ANP paired comparisons questionnaire rather than the deterministic ratios common in traditional ANP. The scale used in this study is the 9-item fuzzy scale developed by Tesfamariam and Sadiq (2006), which gives more freedom to the experts when making paired comparisons. By collecting the expert responses in 9-item scale in the form of linguistic items, it is necessary to measure the responses by a scale capable of analysis, because mathematical operations are unlikely for qualitative linguistic variables. Therefore, the linguistic variables need to be converted to fuzzy scales.

By defuzzifying the integrated fuzzy paired comparisons matrix, the local weight is obtained from the defuzzified matrix by (Yang et al., 2008):

$$W_i = \frac{\left(\prod_{j=1}^{n} a_{ij}\right)^{1/n}}{\sum_{i=1}^{n}\left(\prod_{j=1}^{n} a_{ij}\right)^{1/n}} \quad , i,j = 1,2,\dots,n \tag{17}$$

RESULTS

In this section, the results are reported to prioritize the consequences of burnout in paramedical society. The consequences of burnout were identified in the paramedical society based on literature and expert views, as listed in the table below. In the following, the results of fuzzy DEMATEL and ANP are presented to prioritize the consequences of burnout.

Results of Fuzzy DEMATEL

As noted earlier, the relationships between criteria as well as the relationships between sub-criteria are discussed in fuzzy DEMATEL. Using expert views, this method evaluates the effect of burnout consequences on each other for the paramedical society.

Fuzzy relationships matrix, which was the integrated views of 13 experts for criteria, was calculated by the arithmetic mean (Yang et al., 2008). The integrated fuzzy relationship matrix is presented in the following table.

To determine the internal weight of criteria, the third to fifth steps of fuzzy DEMATEL were performed. For this purpose, the direct relationship matrix or Z matrix, presented in the table above, was used. Using the values in Table 1 and relations (8) to (10), the direct relationships matrix was normalized to achieve the total relationship matrix. As noted earlier, the normalized values of direct relationships matrix can be used as an estimate of internal weight between criteria in super matrix ANP. The normalized value of T matrix obtained by dividing each column value by sum of that column is shown in the table below.

Ashraf Sancholi and Salarzehi Habib Allah

Results of ANP

For ANP calculations, the super-matrix is formed using three categories of information:

A) The internal weight of main criteria; the normalized T matrix formed by fuzzy direct relationships is related to main criteria.

B) The internal weight of any sub-criterion; the normalized T matrix formed by fuzzy direct relationships is related to sub-criteria.

C) The local weights resulting from paired comparisons between criteria and sub-criteria.

The data relating to (a) and (b) are the outputs of fuzzy DEMATEL, reported in Section (3.1) after the calculation. In the following, the local weights obtained from fuzzy paired comparisons matrix are calculated.

Calculation of the Local Weights for Criteria and Sub-criteria

By collecting the expert views in the form of linguistic variables presented in Table 2, the fuzzy paired comparisons matrix was formed for individual expert views. By forming the paired comparisons matrix on criteria for any single expert, the expert views were integrated based on geometric mean to achieve a fuzzy integrated paired comparison matrix for the criteria. The following table shows the fuzzy paired comparisons matrix formed by integrating 13 expert views regarding the main criteria.

By integrating the expert views and forming the integrated fuzzy paired comparisons matrix, the matrix was defuzzified. Defuzzification was performed by Opricovic and Tzeng (2003) method, described in relations (1) to (7). Using relation (17), local weights were extracted from the matrix. Local weights obtained for the main criteria are reported in the last column of the table below.

Similarly, the above calculations can be performed for each set of sub-criteria. The following tables show the defuzzified paired comparisons matrix and local weights for each group of sub-criteria.

Formation of Super Matrix and Calculation of the Net Weights

The Super matrix was formed in this step and the net weights of criteria and sub-criteria related to prioritized consequences of burnout were calculated. To form super-matrix, the normalized T matrix was used to determine the interrelationships of criteria and sub-criteria. The ill-conditioned matrix was formed by the local weights obtained from paired comparisons between criteria and sub-criteria. This matrix was normalized by the sum of the values of column, as the matrix T. For convergence, each criterion or sub-criterion of the normalized super matrix was raised to the power of 2k + 1, where k is an arbitrary number. Convergent or limited matrix indicating the net weights is presented below.

The net weight of criteria and sub-criteria can be extracted from the limited super matrix. Elements of each row of the limited super matrix are equal, because this matrix is converged. Therefore, values of each row show the net weight of criteria or the relevant sub-criteria. These weights are reported in the table below. Obviously, the sum of net weights of criteria or sub-criteria is not equal to one. However, the sum of each column of the limited super matrix, of which the net weights are extracted, is equal to one.

Ashraf Sancholi and Salarzehi Habib Allah

As specified in the table above, net weights of psychological consequences, followed by physical and emotional consequences, were higher. The following figure shows the importance of criteria for consequences of burnout in the paramedical society.

In addition, the results presented in Table 16 show that dissatisfaction and negative attitudes toward self, job and life and withdrawal behaviors (absenteeism and escaping from work) are attributed higher weights for consequences of burnout in paramedical society. Based on the results presented in the table, the sub-criteria of burnout can be listed respectively, as follows:

Dissatisfaction and negative attitudes toward self, job and life
Withdrawal behaviors (absenteeism and escaping from work)
Increased negative nervous moods such as restlessness, nervousness, irritability
Reduced energy
Helplessness and Hopelessness
Decreased positive emotional states such as sincerity, humility and politeness
Increased tension and conflict at home
Numerous physical complaints such as back pain
Chronic fatigue and weakness
Sleep Disorder
Increased vulnerability to diseases

CONCLUSIONS

This study first identified the consequences of burnout in paramedical society. For this purpose, a list of consequences was extracted from literature. Using views of experts in paramedical society, the consequences were classified into three main categories. By determining the main consequences, sub-criteria of main consequences were also extracted. A total of 15 sub-criteria related to consequences of burnout were considered. In order to prioritize the identified consequences, multi-criteria decision techniques were used. Since the criteria and sub-criteria relating to the consequences of burnout influence on each other, fuzzy DEMATEL was used for identifying and considering the interdependencies between criteria and sub-criteria. To identify interdependencies, the questionnaires and expert views on the effect of criteria and sub-criteria were used. Moreover, ANP was used to determine the importance of these factors. Using the paired comparisons, the relative importance of criteria and sub-criteria was determined. The results of this method on the identified consequences indicate that psychological consequences have higher priority than other consequences of burnout in the paramedical society.

REFERENCES

1. Atef, L., Rooh-Alamin, M., Nouri, A. & Molavi, H., 2005. the level of burnout and job satisfaction among general and specialist surgens in Isfahan. knowledge and research in psychology, Issue 29, pp. 151-129.
2. Brondt A, Sokolowski I, Olesen FV, Edsted P. (2008). Continuing medical education and burnout among Danish GPs. Br J Gen Pract;58(546):15-19.
3. Campbell Da, Sonnad SS, Eckhauser FE, Campbell KK, Greenfield LJ. (2001). Burnout among American surgeons. Surgery; 130: 696-702.
4. Essex B, Scott LB. (2008). Chronic stress and associated coping strategies among volunteers EMS personnel. Prehospital Emergency Care; 12(1): 69-75.
5. Fan D, Cui L, Zhang MM, Zhu CJ, Härtel CEJ, Nyland C (2014) Influence of high performance work systems on employee subjective well-being and job burnout: empirical evidence from the Chinese healthcare sector. The International Journal of Human Resource Management 25 (7):931-950.

Ashraf Sancholi and Salarzehi Habib Allah

6. Garrosa E, Moreno-Jimenez B, Liang Y, Gonzalez JL. (2008). The relationship between sociodemographic variables, job stressors, burnout, and hardy personality in nurses: an exploratory study. Int J Nurs Stud; 45(3): 418-427.

7. Ghodsipour, S.-h., 2005. Analytic hirarchy netwrok. 4th ed. tehran: publications of amirkabir university.

8. Lin, C., Wu, W., (2008) "A causal analytical method for group decision-making under fuzzy environment," Expert Systems with Applications, 34, 205-213.

9. Losa Iglesias ME, De Bengoa Vallejo RB, Savadores Fuentes P. (2010). The relationship between experiential avoidance and burnout syndrome in critical care nurses: a cross- sectional questionnaire survey. Int J Nurs Stud;47(1): 30-37.

10. MacPhee M, Ellid J, Sanchez A. (2006). Nurse staffing and patient safety. Cannadian Nurse; 102(8):18-23.

11. Maslach C. (1982). Burnout: The cost of caring. New Jersey: Prentice-Hall.

12. Maslach, Christina. Michael, P. Leiter. (2008). Early Predictors of Job Burnout and Engagement. Journal of Applied Psychology.

13. Mehregan, M., 2004. advanced operational research. 1st ed. tehran: book of university.

14. Montazergheyb, T., 2011. the relationship between components of burnout and personality types of John Holand among elementary teachers. job and organizational counsulting, Issue 10, pp. 92-104.

15. Ofordile C., (2010). Burnout amoung human services providers in Nigeria. Sustainable human development review Int Multidisciplin Acad Res J; 2(2): 5-14.

16. Opricovic, S., Tzeng, G., (2003) "Defuzzification within a multicriteria decision model," International Journal of Uncertainty, Fuzziness and Knowledge-Based Systems, 11, 635-652.

17. Ozyurt A, Hayran O, Sur-QJm H. (2009). Predictors of burnout and job satisfaction among Turkish physicians Q J Med; 99(3):161-9.

18. Piko BF. (2006). Burnout, role conflict, job satisfaction and psychosocial health among Hungarian health care staff: a questionnaire survey. Int J Nurs Stud; 43: 311–318.

19. Rashidi, M.-M., Teymourinasab, A. & Ahrami, M., 2009. consequences of burnout syndrom in research centers and solutions. management and human resources in oil industry, 3(6), pp. 47-65.

20. Saaty T.L. (2005). Theory and Applications of the Analytic Network Process Decision Making with Benefits, Opportunities, Costs and Risks. RWS Publications, Pittsburgh, PA.

21. Soleimannejad, A., Hamdami, P. & Soudi, H., 2011. the relationship between copying styles and burnout and mental health. journal of Urumie University, Issue 2, pp. 226-236.

22. Taei, M., Safizade, H. & Divsalar, K., 2009. distribution of burnout syndrome among general practitioners. journal of Kerman university of medical sciences, Issue 17, pp. 268-276.

23. Tseng, M. (2009). "Using the extension of DEMATEL to integrate hotel service quality perceptions into a cause–effect model in uncertainty." Expert Systems with Applications, 36(5), PP. 9015-9023.

24. Wei, W. W. and Yu, T. L. (2007). "Developing global managers' competencies using the fuzzy DEMATEL method." Expert System Application, 32(2), PP. 499-507.

25. Yang L., Maskus K., (2008) Intellectual property rights, technology transfer and exports in Developing countries, Journal of Development Economics, 90(2), 231-236.

26. Similarly, the listed calculations can be performed for sub-criteria to calculate their internal weight. The following tables present the calculations for sub-criteria.

27. The 3×9 matrix obtained in the step 2 of fuzzy DEMATEL was defuzzified. The table below shows the absolute values (direct relationship matrix or matrix Z).

Table 21: Linguistic variables and corresponding fuzzy numbers

Values of linguistic scales	triangular fuzzy numbers
Very high (VH)	(0.75,1.0,1.0)
High (H)	(0.5,0.75,1)
Low (L)	(0.25,0.5,0.75)
Very low (VL)	(0,0.25,0.5)
No effect (NO)	(0,0,0.25)

Table 22: Converting linguistic variables to triangular fuzzy numbers (Wei and Yu, 2007)

Linguistic variable	Triangular fuzzy number
Same	(1,1,1)
Slightly more important	(2,3,4)
More important	(4,5,6)
Very important	(6,7,8)
Strictly more important	(8,9,9)
Intermediate values between the two levels	$(X + 1، X، X − 1)$
Mutual triangular numbers	$(1/(X − 1)، 1/X، 1/(X + 1))$
	(1.9,1.9,1.8)

Table 23: The consequences of burnout in paramedical society

	consequences of burnout (criteria)	consequences of burnout (sub-criteria)
1	**Physical consequences (C1)**	Reduced energy (C11)
		Chronic fatigue and weakness (C12)
		Increased vulnerability to diseases (C13)
		Numerous physical complaints such as back pain (C14)
		Sleep Disorder (C15)
2	**Emotional consequences (C2)**	Helplessness and hopelessness (C21)
		Increased tension and conflict at home (C22)
		Increased negative nervous moods such as restlessness, nervousness, irritability (C23)
		Decrease in positive emotional states such as sincerity, humility and politeness (C24)

Ashraf Sancholi and Salarzehi Habib Allah

3	**Psychological consequences (C3)**	dissatisfaction and negative attitudes toward self, jobs and life (C31)
		Withdrawal behaviors (absenteeism and escaping from work) (C32)

Table 24: Fuzzy direct relationships matrix based on 13 expert views

	Physical consequences			**Emotional consequences**			**Psychological consequences**		
Physical consequences	0.25	0.00	0.00	0.52	0.29	0.19	0.52	0.29	0.19
Emotional consequences	0.52	0.31	0.19	0.25	0.00	0.00	0.56	0.33	0.21
Psychological consequences	0.62	0.40	0.27	0.54	0.33	0.23	0.25	0.00	0.00

Table 25: Absolute values (direct relationship matrix or matrix Z)

Effect	Psychological consequences	Emotional consequences	Physical consequences
Physical consequences	0.04	0.32	0.32
Emotional consequences	0.33	0.04	0.35
Psychological consequences	0.41	0.35	0.04

Table 26: The internal weight of criteria from of the total relationship matrix

Effect	Physical consequences	Emotional consequences	Psychological consequences
Physical consequences	0.30	0.32	0.32
Emotional consequences	0.34	0.31	0.34
Psychological consequence	0.37	0.36	0.34

Table 27: The internal weight of sub-criteria (physical consequences)

	C11	C12	C13	C14	C15
C11	0.20	0.22	0.21	0.22	0.22
C12	0.19	0.18	0.20	0.19	0.19
C13	0.22	0.22	0.20	0.22	0.22
C14	0.21	0.20	0.20	0.19	0.21
C15	0.18	0.18	0.18	0.18	0.17

Ashraf Sancholi and Salarzehi Habib Allah

Table 28: the internal weight of sub-criteria (physical consequences)

	C21	C22	C23	C24
C21	0.24	0.27	0.27	0.27
C22	0.25	0.23	0.26	0.26
C23	0.26	0.25	0.23	0.25
C24	0.25	0.25	0.24	0.22

Table 29: The internal weight of sub-criteria (psychological consequences)

	C31	C32
C31	0.50	0.54
C32	0.50	0.46

Table 30: fuzzy paired comparisons matrix by integrating 13 expert views on criteria

		C1			C2			C3	
C1	1	1	1	1.67	1.99	2.34	0.56	0.67	0.78
C2	0.43	0.50	0.60	1	1	1	0.97	1.15	1.40
C3	1.28	1.50	1.77	0.71	0.87	1.03	1	1	1

Table 31: defuzzified paired comparison matrix for criteria, local weights

	C1	C2	C3	Local weight
C1	1	1.973	0.673	0.362
C2	0.506	1	1.172	0.277
C3	1.507	0.874	1	0.361

Table 32: defuzzified paired comparisons matrix of physical consequences, and local weights

	C11	C12	C13	C14	C15	Local weight
C11	1	2.250	1.340	1.050	1.057	0.250
C12	0.442	1	1.125	1.757	1.293	0.202
C13	0.759	0.908	1	0.706	0.737	0.160
C14	0.975	0.575	1.434	1	0.994	0.188
C15	0.964	0.791	1.370	1.030	1	0.200

Ashraf Sancholi and Salarzehi Habib Allah

Table 33: defuzzified paired comparisons matrix of emotional consequences, and local weights

	C21	C22	C23	C24	Local weight
C21	1	1.303	0.825	0.673	0.227
C22	0.777	1	0.642	1.308	0.222
C23	1.238	1.564	1	1.313	0.311
C24	1.504	0.777	0.770	1	0.240

Table 34: defuzzified paired comparisons matrix of psychological consequences, and local weights

	C31	C32	Local weight
C31	1	1.512	0.601
C32	0.666	1	0.399

Table 35: Limited Supermatrix

	C1	C2	C3	C11	C12	C13	C14	C15	C21	C22	C23	C24	C31	C32	Goal
C1	0.1128	0.1128	0.1128	0.1128	0.1128	0.1128	0.1128	0.1128	0.1128	0.1128	0.1128	0.1128	0.1128	0.1128	0.1128
C2	0.1012	0.1012	0.1012	0.1012	0.1012	0.1012	0.1012	0.1012	0.1012	0.1012	0.1012	0.1012	0.1012	0.1012	0.1012
C3	0.1193	0.1193	0.1193	0.1193	0.1193	0.1193	0.1193	0.1193	0.1193	0.1193	0.1193	0.1193	0.1193	0.1193	0.1193
C11	0.0261	0.0261	0.0261	0.0261	0.0261	0.0261	0.0261	0.0261	0.0261	0.0261	0.0261	0.0261	0.0261	0.0261	0.0261
C12	0.0220	0.0220	0.0220	0.0220	0.0220	0.0220	0.0220	0.0220	0.0220	0.0220	0.0220	0.0220	0.0220	0.0220	0.0220
C13	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213
C14	0.0220	0.0220	0.0220	0.0220	0.0220	0.0220	0.0220	0.0220	0.0220	0.0220	0.0220	0.0220	0.0220	0.0220	0.0220
C15	0.0214	0.0214	0.0214	0.0214	0.0214	0.0214	0.0214	0.0214	0.0214	0.0214	0.0214	0.0214	0.0214	0.0214	0.0214
C21	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247
C22	0.0239	0.0239	0.0239	0.0239	0.0239	0.0239	0.0239	0.0239	0.0239	0.0239	0.0239	0.0239	0.0239	0.0239	0.0239
C23	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283
C24	0.0243	0.0243	0.0243	0.0243	0.0243	0.0243	0.0243	0.0243	0.0243	0.0243	0.0243	0.0243	0.0243	0.0243	0.0243
C31	0.0668	0.0668	0.0668	0.0668	0.0668	0.0668	0.0668	0.0668	0.0668	0.0668	0.0668	0.0668	0.0668	0.0668	0.0668
C32	0.0525	0.0525	0.0525	0.0525	0.0525	0.0525	0.0525	0.0525	0.0525	0.0525	0.0525	0.0525	0.0525	0.0525	0.0525
Goal	0.3334	0.3334	0.3334	0.3334	0.3334	0.3334	0.3334	0.3334	0.3334	0.3334	0.3334	0.3334	0.3334	0.3334	0.3334

Table 36: The net weight of criteria and sub-criteria for prioritizing consequences of burnout

	Consequences of burnout (criteria)	net weight of criteria (priority)	Consequences of burnout (sub-criteria)	The net weight of sub-criteria
1	**Physical consequences (C1)**	0.1128 (2)	Reduced energy (C11)	0.0261
			Chronic fatigue and weakness (C12)	0.0220
			Increased vulnerability to diseases (C13)	0.0213

Ashraf Sancholi and Salarzehi Habib Allah

|				
			Numerous physical complaints and back pain (C14)	0.0220
			Sleep Disorder (C15)	0.0214
2	**Emotional consequences (C2)**	0.1012 (3)	Helplessness and hopelessness (C21)	0.0247
			Increased tension and conflict at home (C22)	0.0239
			Increased negative nervous moods such as restlessness, nervousness, irritability (C23)	0.0283
			Decrease in positive emotional states such as sincerity, humility and politeness (C24)	0.0243
3	**Psychological consequences (C3)**	0.1193 (1)	dissatisfaction and negative attitudes toward self, job and life (C31)	0.0668
			Withdrawal behaviors (absenteeism and escaping from work) (C32)	0.0525
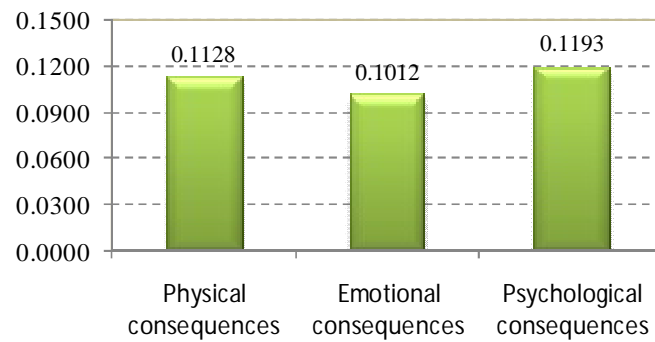
Figure 23: The net weight of criteria for consequences of burnout

Traces of Symbolism and Surrealism in the Works of Ibn Arabi

Faraz Tajalli Nasr*, Seyyed Ebrahim Dibaji and Firooz Harirchi

Department of Arabic Language and Literature, Science and Research Branch, Islamic Azad University, Tehran, Iran. .

*Address for correspondence
Faraz Tajalli Nasr
Department of Arabic Language and Literature,
Science and Research Branch,
Islamic Azad University,
Tehran, Iran.

ABSTRACT

Symbolism was largely a reaction against naturalism and positivism, styles that deal with objective reality and attempt to represent reality in its gritty particularity and elevate the humble and the ordinary over the ideal while symbolism seeks for a new form of hidden reality. In their religious and mystical beliefs, they considered all parts of universe as signs for God, and man of God could reach the maker by synthesis. Among their significant characteristics are dreaming, imagination and super reality. Their beliefs were so firm that their world was gloomy and sad. They argued that the world is a mystery understandable by imagination. Contrary to positivists and realists, symbolists encouraged dream and fancy; they claimed that writing would begin when the author separates him from the conventional reality. Having been generally influenced by metaphysical and ideal philosophies, they asserted that they would make connections with the inner objects in super reality. This issue was emerged in surrealism at the first years of twentieth century as one of the results of Freud's psychoanalysis and concentration on inner feelings, imaginations, inner images and fancy. The crisis of reality, which had begun by symbolism and showed the fact that they were seeking a hidden reality beyond ordinary one, was gradually transformed to a sense of isolation; the sense was later intensified in surrealist authors to an extent that the sense became an inevitable part of an artist's soul. However, the feeling has never stopped by now, and encounters many encourages to resist against the existence of one reality. In a word, surrealism is psychological dealing with literature. In other words, literature plus the psychological issues.The same as symbolism, this school deals with super reality. It describes the reality in our unconsciousness and emerges only in dreams, imaginations and works of art. In both schools, observes the objects and realities through his material eye, but the objects and realities are interpreted by the inner and spiritual eye.

Faraz Tajalli Nasr *et al.*

Dreams and interpreting dreams have great importance in the two schools. The surreal artist portrays and objectifies the strange mental pictures and creates entities that do not exist in the real life. Muhiuddin Ibn Arabi had begun to describe his subjects in such a way that he walks unconsciously in the path to follow these two schools; his literary pieces are made so that they are movements following the symbolism and surrealism. Ibn Arabi argues that men have two statuses: dream and wake; the perception carries out through senses in wake, but the perception in dream is achieved by a common sense. Dream is a tool that transits people from the stage of observing the tangible objects to purgatory stage. Therefore, when a person falls asleep, he begins to perceive through the inner senses and the inner eye observes the realm of imaginations, which is the most completed world because the meanings are visualized in this world, all non-shaped entities takes a shape, accordingly the person who falls asleep can imagine and manipulate the objects in any way he likes. In this manner, dreams are highlighted in the framework of symbolism and surrealism in the works of Ibn Arabi.

Key words: Symbolism, Surrealism, Imagination, secrets, Ibn Arabi.

Symbolism

Symbolism was largely a reaction against naturalism and positivism, styles that deal with objective reality and attempt to represent reality in its gritty particularity and elevate the humble and the ordinary over the ideal while symbolism seeks for a new form of hidden reality.

Symbolism as a movement has officially began by Charles Baudelaire's book The Flowers of Evil in 1857. He believed that reality is hidden from the public eyes; it is manifested in the shape of some signs and references observing only by the poets. Reality is nothing but appearances, behind the appearances exist only the the world of poet's imaginations and inner feelings or the ideal world that the poet demands. Wallace Stevens talks about metaphor that is similar to symbol, as metaphor is something with which we can hide from the reality, and the reality is vulgar repeated names. Baudelaire looks at the word as a temple, a natural phenomenon whose live pillars are trees. In all things, there is a symbolic sense and spiritual realities are linked to each object.

In 190, Wolinski asserts that Symbolism is the merger of two divine and tangible worlds in artistic realization. In his book titled Symbolism, Chadwick argues that Symbolism can be considered as the art of thoughts and feelings; it tries to motivate the feeling and thoughts f readers through implications to their quality and the use of different undescribed symbols, not through obvious simile of the feelings and thoughts into objective descriptions. In an article about symbolism, Edmund Wilson discusses that symbols in Symbolism are very different from their conventional meanings. The conventional meaning of symbol reveals when one says that a cross is the symbol for Christianity, or some stars and bands are the symbol for America. The meaning of symbol in symbolism is even different from classic figures like Dante. For scholars like Dante, symbol is fixed, traditional, logical and clear, but in Symbolism, the symbol and its relations are created by the artist to express a certain idea in his mind. The symbols for ideas are usually hiding their own references rather than clarifying them. A symbolist text indicates a subject by giving references in an obscure manner, either using single symbols or compound symbols that are ironies for a described noun in rhetorics. One may explain it as a hidden reality that has no name; therefore, one can close it through explanations and implications.

Faraz Tajalli Nasr *et al.*

Surrealism

In a word, surrealism is psychological dealing with literature. In other words, literature plus the psychological issues. The word 'surrealist' was first coined by Guillaume Apollinaire. In French, "Sur" means over and beyond; the original meaning of 'real' infact is 'related to objects' because the origin of 'real' in Latin is 'res', meaning thing and object, while the meaning of fact refers to truth of an object. In sum, Surrealism means beyond realism, and one can say that it want to go for a realism that exist in unconscious part of mind, and will be revealed only in fancy, dream and artistic work. Symbolists seek for hidden realities and Surrealists are the production of new psychoanalysis in twentieth century. Nevertheless, we should not assume that Surrealism just talks about super realities because it is the fusion of reality and super reality. It can be said that the author sees an object through his material eye but he interprets the object through his inner and superior eye. André Breton has published Manifestoes of Surrealism in 1924; he believes that Surrealism is the automatic behavior of one's mind, it is the free, spontaneous, and unbind expression and explanation of thoughts. Automatic writing is to write spontaneously, fast and without any stop, and even to disregard punctuations. For Surrealist, literature must be ad hoc, or in classical expression: literature should be based on innovation, not a procedure. Surrealists of attributed a great importance to dreams; since they believed that one should merge dreams and realities in order to best explain 'superior reality,' some of them have been introduced as the enemy of rationality. Berton considers clarity as the greatest enemy of revelation. Surrealists confirm Plato's opinions about the efficient (moving) cause, it argues that the moving cause in poetry is not poet, but is inspiration and revelation. They assert that imagination must not be artificial, but it must be spontaneous and natural. However, Surrealism was emerged as a result of new psychoanalysis, in other words, the ideas of Freud about issues such as unconsciousness, dream, madness, myth and imagination.

Dream from the Perspective of Ibn Arabi

Ibn Arabi's mystical worldview contains imagination; he establishes the world of his thoughts based on an imaginary world. He portrays the objects that do not exist. He believes that beyond rationality and its logical regulations, human perception takes the advantages of a hidden force, which motivates the imaginary world. Its activitis are always in correlation with tangible shapes because fancy maintains figures that have tangible shapes, or a combination of tangible shapes, made by visual abilities to present an instance for ideas that have no existence in reality and are sensible for audience. Human beings envisage Divine Names in their hearts and imaginations in such a way to say that they see them in reality; in this way, they realize the figure of this imaginations. He believes that the world of imaginations accepts the spiritual figures, and in this regard, the humans' ability to visualize objects, which is considered in the realm of the tangibles, will be transformed into the favorable ground for fancy. So that the visualization power takes some aspects of different creatures and makes strange figures that have no concrete reference in outer world, therefore, visualization power is prior to the imaginary power, and it chooses what to take from the imaginary world. Fancy needs senses, but it does not visualizes all sensory data given to it. It is noteworthy to say that for Ibn Arabi all imaginations are right.

In Ibn Arabi's system of thoughts, spiritual esoteric matters such sleep and dreaming are important as much as ordinary and outward issues, and they are connected directly to one's knowledge of the realm of imagination. While imagination has significant functions in his mysticism, Ibn Arabi builds his world of thoughts based on an imaginary world. He not only does not consider imagination vain and absurd but also assigns a superior reality to fancy. The discussion relates directly to his famous theory, the unity of existence, because he divides the existence into five divine presences: (1) ontological-existential (dhati), (2) experiential (hissi), (3) conceptual (khayali), (4) intellectual ('aqli), and (5) metaphorical (shabahi or majazi). In his book about Ibn Arabi, Gheisari maintains that the same as most of mystics, he has separated the ontological-existential presence, which is called the unseen unseen, the absolute unseen or the phoenix of west, from other presences. Accordingly, the position of uniqueness (Ahadiat), which is the detailed rise of uniqueness, is regarded by Ibn Arabi as the first presence that is calledthe presence of knowledge, the world of right knowledge, detailed existence and the fixed stage of superiority.

Ibn Arabi believes that imaginary presence is the intermediary between concrete and abstract worlds. Beyond the absolute ideal realm that is an intermediate, he refers to a modal ideal realm that is human visualization ability tha leads individuals to the former realm because all material objects have an ideal form in the ideal world. The ideal, or ideas, is used to describe the world because it is an idea, ideal instances of God's knowledge. Since sleep and dream occur at the world of imaginations, in order to acquire a good understanding of dreams and the ultimate aspirations of Ibn Arabi in dream, it is necessary to describe the realm of realities, or extended world, before explaining the world of imaginations, types of sleeps and their interpretations. In his interpretation of the holy verse, " یاعبادی الذی آمنوا إنّ ارضی واسعه فأیّای فاعبدون", "My servants who believe! Surely, my earth is extended, therefore. Me alone should you serve", he claims that the 'extended' world is the imaginary world. This is a world constructed by delicate and intangible materials, in other words, when the rationality is transformed to its ideal shape. That is why mystics enter the world by their soul and leave their material covers in the sensual desolated world of all materials. The extended world is the world of perfection and completion that reflects all material and tangible affairs of a wise person; it is the position where all dreams are realized, and all souls are looking forward to see the ultimate Judgment made by God.

In Ibn Arabi's thought, the extension of imaginary world begins from primary transition (the first of all transitions) and ends at human soul (descent arc) by passing the world of absolute ideas (discontinuous fancy including clement and ignorance spirits). All beings, except God, are living in this circle; all possible circles have imaginary and included existence. Therefore, the changing and declining creatures are nothing but a manifestation of the fixed and unmoving Being, which has an impossible and unrecognizable identity. The idea is expressed in a heavenly verse in these words, "Wonderful Originator of the heavens and the earth, and when He decrees an affair, He only says to it, Be, so there it is." Ibn Arabi knows all the realm of imaginations as true, while he does assert that some objects of imaginations are true and some of them are false; for him, there is a large difference between imaginary world and objects of imagination.

Symbols and Symbolic Language of Ibn Arabi in Divine Names

Symbolic language and symbolic expression is a conventional trend an inevitable method in all mystics including Ibn Arabi. Because they believe that first, facts of the existence are not recognizable in an ordinary mood and through the common methods of recognition like reason and senses, but the will be acquired through creativity, insight and intuition. Second, the mystics are not able to express the acquired realities of the intuition and insight in ordinary and conventional languages; in other words, the conventional and arbitrary system of signs, called language, has not the potentiality to reflect the infinite truths of life. Therefore, the mystic should turn to a symbolic language in which the words and utterances have meanings beyond the ordinary language. Symbolic language is consistent with cognitive facts, and even more appropriate for explaining them. According to mystics, phenomena of the universe are symbols and reflections of divine facts, and therefore they are symbols of God; in the same manner, symbolic expressions have referents beyond their apparent referents.

Symbolic language exists between two poles, one is the unseen world, and the other is the world of senses and materials. Mystical texts are full of mysteries that enables the seeker to pass the abstract world and toward truth. Symbols carry divine meanings as well as covering the meaning. On the one hand, symbols and codes are the best position to contain intuitive realities and concepts; on the other hand, because they have references beyond the apparent meanings, they are hard to be understood by common people. Ibn Arabi's mystical language and school is full of this type of complex expressions and words. Some Iranian scholars scholars such as Kamaluddin Abdul Razzaq Kashani, Shaikh Mahmoud shabestary, Sayn-Din Ali tarkeh, Syed Haider Amoli and Abd al-Rahman Jami heve tried to describe symbols and expressions in the texts of Ibn Arabi. Some prominent persons consider synonymy, contrast and polysemic as essential elements in the enigmatic language of divine names and attributes of God. Students of Ibn Arabi school, for instance Azizuddin Nasafi who born in 700 and fostered by Saaduddin Hamaviyeh cites from Sadr Sadr al-Din al-Qunawi, "O my friend that may god makes you great, be aware that God's names and attributes are synonym; it means, both have one meaning. Shaikh Saaduddin Hamaviyeh (a student of

Shaikh Najmoddin Kobra) claims, "Names in the Quran and Hadith are not synonymous, and it is not appropriate to have the same meanings. A wise men never use two words for expressing one thing, but he may use one word to express several meanings. Although it seems that this group of exponents was obliged to regard the adjectives synonymous to the nouns and indicate the Divine Names are the attributes of God, they segregate them in their description of each Name. In new linguistics, it is not reasonable to use adjectives in the position of a noun in a specific discourse. Frank Robert Palmer, the American semiologist, argues that a real synonymy relation does not exist between words, and no two words have exactly one meaning. Of course, it seems far that two synonym words continue their life in a language.

Ibn Arabi understands and interprets the meanings of words the same as Arabic native who is the audience of Qur'an, not in the position of an expert in a field of science. He respects all words of Qur'an and hadith and believes that none of the words have occur accidentally; God and the prophet do not use language unless in its exact and precise usage. We cannot replace one expression with another one and claim that the real purpose is the second one. Even it is not possible to alter the words to an archetype and interpret it in a more appropriate sense because the interpretation is equal to avoiding the exact meaning and devaluation of the literal meaning.

Surrealism and Imagination in the Thoughts of Ibn Arabi

Surrealism relies on the autonomy of creative instinct and bases on the indoctrination of unconscious mind and free association of meanings. The imaginary picture comes from the hidden expressions of unconsciousness though the way of automatic writing. Beethoven had recognized that there is a constant expression of inner instincts in people so that needs only attention to be recorded. In this case, it makes sense that the ordinary speeches in daily habits are only covers to the innermost and most sincere suppressed thoughts.

Dreaming and imagination are two important features of Symbolism in Ibn Arabi's works; in his religious and mystical system of thoughts, he considers all beings a symbol for God, not God itself. This means that all entities and materials are the signs of one true Reality, which is Understandable just through symbols and signs. According to symbolists, the entire universe is a mystery that may be discovered by intuition. In general, they were influenced by metaphysical and idealist philosophy. They even portray the Platonic ideal and opinions so that it motivates them to express the unseen hidden reality in plain words, which resulted in personal and individualistic illustration of their inner feelings. Their language is similar to the language of dream and is called ambiguous language. The ambiguity is a consequence of using Arabic language to an extent that one may be convinced that the speakers of unaware of the ambiguity and the exact meaning; of course it is possible to say that the ambiguity is a natural feature of Arabic.

In order to proves and discuss that imagination is the most extended presence, Ibn Arabi says that God, who does not accept shapes, is manifested in shape forms in imagination presence. Therefore, the presence accepts all objects whose manifestations are considered impossible. In other words, only imagination is able to occurre and accepts the shape of Right. We will not be surprised to see an object in two contradictory places in the realm of imagination; while reason does not accept the happening, imagination do accepts all impossible and nonrational affairs.

With all these, imagination is the criterion of knowledge. As Ibn Arabic asserts, individuals who does not know imagination and its stages are misled. Knowledge is the imaginary discovery fulfilled by Gos's special servants. One of the features of the discovery is the recognition about the fact that tangible objects are nothing but a reflection of the imaginary and visualized world. Although the material eye can see some attributes of an object, but their real characteristics are different from the seen characteristics. The nature of imagination is not changeable, moving, and apparent in various forms and reflections; it indicates an understandable fact about God and other beings that says all beings, except God, are declining. As Ibn Arabi maintains, even the whole world is an imagination in its nature since it is manifestation and reflection of an upper reality and nothing except imagination has been invested by the creator. Describing imagination, Ibn Arabi asserts that it is a light, not like the lights. The appearances are conceived

by this light. Imagination is not absurd, bu it is right, and absurdity has no entrance into the imagination. It accepts all understandable entities in its own way, so, it makes no mistake. False deeds are consequenses of rationality or judgement, and imagination does not judge affairs. It transforms entities to its own material and do not accept them in the form seen by material eyes, while the visual ability is the source of both types of understanding. The secret is that a man conceives both concrete and abstract objects at the same time in the realm of imagination. Since the concrete geneses have not multiple forms in a specific time, the do not observed in different places in the specific time; therefore, Ibn Arabi claims that covering imagination with senses is the strange doubt.

Imagery and Visualization in the Thoughts of Ibn Arabi

Nowadays, the word image is translated to "صوره" in Arabic. The most ancient speech about imagery is found in in the book of famous Arab scholar Jahiz al Basri Al-Hayvan. He uses the term "image" to explain poetry, and claims, "Poetry is a way of weaving and some sort Image." Qudama ibn Ja'far has used the term as "shape" in contrast to sense, "the meanings of a poem are considered as subject matter, and the poem is like a shape because any art needs a shape to have the ability to accept the effects of pictures." In his title Literary Devices, Abu Hilal Al-Askari defines the term as figure and body, and believes that simile of the face is included in similes.

In the proses, Muhiuddin Ibn Arabi does not tend to go for sensory display of his own intuitive experience and uses imagery less to express his inner perceptions. His language is an abstract and non-intuitive language full of unimaginable terms. He uses abstract nouns more than substantive meanings to describe his thoughts and feelings. Muhiuddin was accustomed to interpretation, and showed no tendency to visualize objects. More than being one who tries to incarnate an object, he is an interpreter who tires to question fixed symbols. Although his prose takes the advantages of abstract and non-imaginary language, his poetry exploits sensory images to present a symbol. He was preoccupied with interpretation and explanation of imaginary pictures in his symbolic poems. In the book The Interpreter of Yearnings, he refuses to accept all charges about the absurdity and ambiguity of his codes and symbols, and asserts, "They are not illusions, and they are secrets. They are secrets of my heart and any one who seeks for knowledge. They are the description of heavenly worlds and sacred places. If one likes to discover the meaning behind the covers, he must resign the appearances and moves toward the core."

The idea, description and expplanation of mystical secrets of Ibn Arabi had influenced the works of scholars such as Yahya Bakharzi, Fakhruddin Iraqi, Shaikh Mahmoud Shabestary and Shams Maghrebi during the history.

Ibn Arabi seals with a mysterious world that the expression of its facts requires making a discourse completely unfamiliar to common people, and individuals who cannot percept the experience, they will not Understand the facts.

SUM UP AND CONCLUSION

Beyond the subjects of imagery and images, Islamic scholars have metaphysical perspectives. The issues, as some people maintains, neither is confine to the sphere of Sharia nor is a parochial religious interpretation of the facts. Idolatry was often carved and painted visual styles to offer its purposes, but monotheism confirms not only to traverse idolatry but also to discover the nature of beings and the essence of abstract objects. Fundamental and central interpretation and expression of monotheism from the the discovery is an abstract interpretation being offered by writing and alphabet. Alphabetic style is abstractive; it is the reflection of objects not existing in the real world, but they exist in the unseen world.

God is the illustrator, and shape is a force leading man toward tangible and material objects, which results in astray and distance from divine affairs. In addition, talking about lack of shape is the emphasis on differences between

Faraz Tajalli Nasr *et al.*

Islam and idolatry. Gos has portrayed all beings and donates them a specific shape and form, despite their differences and multiplicity. An object has both apparent abstract shape and spiritual hidden form at the same time. Contrary to what is believed, forms of objects do not include merely the appearances of them, but it includes the unseen aspect of the objects, or the truth and meaning as well. In this manner, when we are visualizing the superficial aspect of the object, we are making mistakes and false judgements. To avoid the false judgment, we must imagine the object, in other words, we must interpret its signifier and signified; and then, we can imagine the objects based on the presented images. Visualization of an object in the first sense is equal to its imagining. Here, the hidden meaning is covered. When the observation of an object is enough for an individual, he cannot see its reality; and at last, if the observation of repeated appearances is enough for us, we will not be able to imagine and contemplate on the world and its phenomena. If one follows his acquisition by the material eye, he will perceive only the material aspect; and what we see is not the reality of observed object or phenomenon. The outer shape exists in a realm having no potentiality to establish a compromise between the object and its shape. However, although we are able to make a copy of a flower, the copied version is never similar to the original version.

Mysticism binds dream with reality, it means that it compromises between contradictory poles; for instance, nigh is not the opposite of day, but it is the manifestation, or other form, of the night. In Surrealism, writing is not a tool, but it is an existential activity of men and linguistic manifestation. Writing is the extension of existence in terms of psychological and spiritual aspects; here, one can assert that writing is the object itself. The question rising here does not ask about the degree of artistic beauty, but it asks about the degree of implied meanings, connotations and discoveries. The writng asks questions not only about literature but also about the meaning of existence and human beings. At the same time, it uncovers the hidden world in human beings, his madness in trying to link with the world and wanderings of delirium and confusion. Surrealist authorship is a journey toward an unknown place in the realms of ambiguities and complexities; in human beings, it is displayed as a pervasive and general affair, and does not limit to some sort aesthetic theory and the expression of feelings and emotions. This kind of writing searches for wisdom and salvation, and depends on everything leading a man to out of himself and propelling him to a higher position. Writing in surrealism and symbolism in the first place is freedom from constraints and social surveillance or from certain rules imposed by the real material world that prevents enjoying our life and the freedom in the life. This type of writing oscillates between reality and dream through the bridge of desire and motivation. It is noteworthy to remind that the function of surrealism relies on the impossible affairs for sciences. Ibn Arabi's mysticism and his efforts in writing surreal texts are not only an acquisition of new aesthetic phenomenon but also the discovery of new secrets in the universe and in human beings, which both are attributed to knowledge. Mysticism of Ibn Arabi had grown in the age of traditional and Islamic sciences development; as well, surrealism had developed in the great scientific revolution of physics and mathematics. In any case, mysticism can open new horizons of life in the framework of Arabic-Islamic tradition in such a way that science cannot bring about the horizons, while surrealism plays the same role in Western cultures. The ending lines of the article are going to be devoted to psychoanalysis as an instance of the mentioned sciences. Psychological analysis has established principles that help in better and more reasonable interpretation of mystical texts. Psychological analysis gives scientific legitimacy to mysticism and Surrealism as two important source of knowledge, and considers the outcomes of the sources as a valid document for epistemological studies.

REFERENCES

1. Ainol Ghozat Hamadani. Superior Facts. Trans. Tadayon Najaf Abadi, Mahdi, Tehran: University Press, 2000.
2. Baghdadi, Abu Faraj. The Criticism of Poetry, Egypt, 1932.
3. Bigsbey, C.V.A. Dada and Surrealism. Trans. Afshar Hasan. Third print, Markaz Publications, 2000.
4. Chadwich, Charles. Symbolism. Trans. Sahabi, Mahdi, Tehran: Markaz publications.
5. Dast Gheib, Abdo Ali. A Review on Akhavan. Tehran: Morvarid, 1993.

Faraz Tajalli Nasr *et al.*

6. Ghanimi Helal, Muhammad. Comparative Literature. Trans. Ayatollah Zade Shirazi, Morteza, Amir Kabir Press, 1994.

7. Haghighi, Manoochehr, Literary schools. Tehran: avayenoor publication, 1993.

8. Harland Richard. Literary Theory from Plato to Barthes: An Introductory History. Trans. Jourkesh, Shapour, Cheshmeh publication, 2006.

9. Honarmandi, Hasan. From Romanticism to Surrealism. Amir Kabir, 1957.

10. Hosseini, Seid Reza. Literary Schools. Tehran: Nile & Negah publications, inth print. 1987.

11. Ibn Arabi, Muhiuddin. Sacred Imaginations in Right Intuition. Trans. Sane′ Pour, Maryam, Elm publications, first print, 2006.

12. Ibn Arabi, Muhiuddin. The Meccan Openings. Tans. Muhammad Khajavi, Mola Publication, Tehran, 2002.

13. Jahiz, Amr ibn Bahr. Al-Hayvan. Beirut: Daral Ketab al-Elmia, Volume 7, n.d.

14. Mitra. Realism and Anti-realism in Literature, third print, Nile publications, 1966.

15. Servat, Mansour. An Introduction to Literary Schools. Sokhan Publication, 2006.

16. Shamisa, Sirous. Literary Forms. Fourth edition, Mitra, 2004.

RESEARCH ARTICLE

Optimal Identification and Control of Novel Chaotic System Using Genetic Algorithm

Seyed Ebrahim Siahbalaei and Mahmood Ghanbari*

Department of Electrical Engineering, AliAbad Katoul Branch, Islamic Azad University, AliAbad Katoul, Iran.

***Address for correspondence**
Mahmood Ghanbari
Department of Electrical Engineering,
AliAbad Katoul Branch,
Islamic Azad University,
AliAbad Katoul, Iran.
Fax: +98 1732158891
E-mail: mmm_gh_53@yahoo.com

ABSTRACT

In this paper, an optimal adaptive controller is used to control and estimation of the novel three-dimensional autonomous chaotic system with a single cubic nonlinearity. In the recent work, adaptive control laws are designed to stabilize the new chaotic system with unknown parameters to its unstable equilibrium point at the origin. Six constant parameters are utilized in control strategy. In this paper, single objective and multi objectives genetic algorithm is used to find the optimal values of control parameters. The results show that by optimizing the control parameters using single objective method, the error settling time decreases significantly and efficiency of control increases butit increases the control effort. To find the optimal strategy without increasing the control input, multi objectives genetic algorithm method is implied and it is shown that utilizing this method leads to shorter control and estimation time without increasing the control input.

Keywords: Multi Objective; Genetic Algorithm, Adaptive Control.

INTRODUCTION

The First scientist who showed the chaotic motion was Lorenz. Lorenz system shows very complex and complicate dynamical behavior, as two-scroll butterfly-shaped chaotic attractor [1]. After Lorenz, Chen introduced another chaotic system which was not equivalent to the Lorenz system [2,3]. Later, Lü and Chen found another chaotic

Seyed Ebrahim Siahbalaei and Mahmood Ghanbari

system [4], which represents the transition between the Lorenz and Chen attractors.Later, by utilizing computer searching, Sprott found 19 simple chaotic systems with lower than three equilibrium points [5–7].

It is worthy to note that some autonomous chaotic systems have three equilibrium points: one stable saddle point and two unstable points (for example, the Lorenz system [1], the Chen system [2], and the L system [4]).

The other 3D chaotic systems such as the original Rossler system [8], DLS [9,10] and Burke–Shaw system [11], have two unstable saddle-foci.

Yang and Chen found a novel chaotic system with three fixed points: one saddle and two stable fixed points [12].Recently, Yang et al. [13] and Pehlivan et al. [14] introduced and analyzed the new three dimension chaotic systems with six terms including only two quadratic terms in a form very similar to the Lorenz, Chen, L, and Yang–Chen systems, but they have two very different fixed points: two stable node-foci.

The chaos has many advantage and disadvantage effects on engineering field. Thus,there has been increasing interest in identifying chaotic dynamics in engineering applications, where some attention has been found on creating chaos via simple physical systems, such as electronic circuits [15–20].

Chaos potential real-world applications [21] in various chaos-based technologies and information systems such as secure data transformation [22–29] have attracted electronic engineersto produce chaotic attractors.

Recently new chaotic system with unknown parameters is introduced and adaptive control is used to control and synchronization of this novel system [30]. Six control parameters are introduced in this paper which are set as constant as 3. In This paper we will use to obtain optimal values of these parameters in a way that the last square control and synchronization error be minimum.

Mathematical Model

The new chaotic system is described by the following autonomous nonlinear system of differential equations [30]:

$$\dot{x}_1 = ax_1 - x_1$$
$$\dot{x}_2 = -bx_1 - x_3 \qquad\qquad (1)$$
$$\dot{x}_3 = cx_3 + x_1 x_2{}^2 - x_1$$

where x_1, x_2, x_3 are the states and a, b, c are constant, positive, parameters of the system. The new system (1) has totally seven terms on the right-hand side with a cubic nonlinearity.

Typical values of the parameters are: a=1, b=0.46, c=0.46.

Bifurcation diagram is plotted in Fig. 1. As shown in this figure, system has chaotic vibration for a>1.phase plane of the system for mentioned values of parameters is plotted in fig. 2. as shown in this figure, the system response doesn't lies on periodic stable orbit and has a chaotic motion in phase plane.

Lyapunov exponents of the system as a function of time and parameter a are plotted in Fig. 4 and Fig. 5 respectively.

As seen in these figures, the largest Lyapunov exponent is positive which verifies the chaotic response of the system.

Seyed Ebrahim Siahbalaei and Mahmood Ghanbari

To control and synchronization of this novel system, adaptive control was used in which control inputs are as [30]:

$$u_1(t) = -\hat{a}x_2 + x_1 - k_1 x_1$$
$$u_2(t) = -\hat{b}x_1 + x_3 - k_2 x_2 \tag{2}$$
$$u_3(t) = -\hat{c}x_3 + x_1 x_2 + x_1 - k_3 x_3$$

where $\hat{a}$, $\hat{b}$ and $\hat{c}$ are estimation of unknown parameters with following update law:

$$\dot{\hat{a}} = x_1 x_2 + k_4 e_a$$
$$\dot{\hat{b}} = -x_1 x_2 + k_5 e_b \tag{3}$$
$$\dot{\hat{c}} = x_3^{\,2} + k_6 e_c$$

Lyapunov approach was used to derive control and update law, where $k_1, k_2 .... k_6$ are control parameters which were set to $k_i = 3$ in [30].

To optimal design of this controller Genetic Algorithm will be used here.

Optimization

Single Objective Optimization

To find the optimal values of parameters k_1, to k_6 we use Single objective Genetic Algorithm.

Brief overview of how a genetic algorithm works is described below:

Generate Initial Population: a number of individuals (the population) are randomly initialized.

Evaluate Objective Function:The objective function is then evaluated for these individuals, producing the first generation of genomes.

Checking the Optimization Criteria: The criteria of optimization are checked in this state.

Generate new Population:If the optimization criteria are not met, the creation of a new generation starts.

Selection: Individuals are selected according to their fitness for the production of offspring.

Recombination:Parents are recombined (crossover) to produce offspring. All offspring will be mutated with a certain probability. The fitness of the offspring is then computed. The offspring are inserted into the population replacing the parents, producing a new generation.

This cycle is performed until the optimization criteria are reached, or until a pre-set maximum number of generations have been generated.

The initially and randomly selected population is left to evolve for 30 generations, after which no significant change is found in the objective function value. So this is used as termination criteria for the algorithm [31].

Twelve-bit string element is used for the encoding of each of the controller parameters. The crossover and mutation probabilities are chosen to be 0.8 and 0.02, respectively.

Seyed Ebrahim Siahbalaei and Mahmood Ghanbari

The genetic algorithm MATLAB tool box developed by Chipperfield et al. [32] was used in the present study. Mean squared normalized error is considered as an objective function in this section. The lower and upper bounds of optimization parameters are set as $0 < k_1, \dots k_6 < 10$.

Figure (6) shows the best fitness value as a function of generation.

Black point is the best fitness value of populations in any generation and blue point is the mean of all individuals' fitness value in generations. As seen in this figure, mean value converge to the best value after 30 generations and the best fitness value is $f = 60.7$. The control parameters are found as:

$$k_1 = 9.49;\ k_2 = 6.76;\ k_3 = 5.2;$$
$$k_4 = 2.17;\ k_5 = 5.8;\ \ k_6 = 3.36$$

The error of the system for optimal parameters and non-optimal parameters are shown in following figures. As seen in this figure, by optimizing of control parameters, the tracking error set to zero in shorter time than non-optimized parameter system.

These figures imply that, optimal values of parameters lead to better estimation of system parameters and also result in fast control of the system.

To see the control effort for optimal and non-optimal control system, the control effort is plotted for both cases in Fig. 10.

As seen in this figure, the control effort for optimal parameters is more than non-optimal control effort. This is the motivation to use multi objective Genetic Algorithm by minimizing the control and estimation times as well as control effort.

Multi objective Optimization

To find the optimal values of parameters $k_1,\ to\ k_6$ we now use multi objective Genetic Algorithm.

As mentioned before, a single objective optimization algorithm will normally be terminated upon obtaining an optimal solution. However, for most realistic the multi-objective problems, there could be a number of optimal solutions. Suitability of one solution depends on a number of factors including user's choice and problem environment, and hence finding the entire set of optimal solutions may be desired.

Mathematically, a general multiobjective optimization problem contains a number of objectives to be minimized and constraints to be satisfied. In this case, a multiobjective optimization problem consists of optimizing a vector of functions:

$$Opt(F(x)) = (f_1, f_2, \dots f_n)$$

These functions $f_1, f_2, \dots f_n$ usually in conflict with each other, are a mathematical description of performance criteria.

The meaning of optimum is not well defined in this context, so it is difficult to have a vector of decision variables that optimizes all the objectives simultaneously. Therefore, the concept of Pareto optimality is used.

Seyed Ebrahim Siahbalaei and Mahmood Ghanbari

The concept of optimality in single objective is not directly applicable in multiobjective optimization problems. For this reason a classification of the solutions is introduced in terms of Pareto optimality. For the problem presented in this study, Pareto front is plotted in Fig. 11.

This points are non-dominated points. As seen in this figure, two objective functions are error norms ($\|x\|$) and maximum value of control effort ($\mathrm{Max}(u_1)$).

Based on the design conditions and physical constraints, one of the non-dominated points in Fig. 11 can be chosen which can lead to fastest control strategy of the control strategy with minimum effort.

The selected point here is shown in Fig. 11.

Fig. 12 shows the variation of system errors for the optimal values of gain obtained by multi objective strategy and the results are compared with Ref. [30].

This figure indicates that the optimal selecting of control gains lead to fast control.

Fig. 13 shows the control effort for optimal and non-optimal cases. As shown in this figure, for both cases, the control efforts are in same range.

In this paper we proposed the optimal adaptive controller to control the chaotic vibration of new proposed chaotic system. Single and multi-objectives genetic algorithms are used in this paper to find the optimal values for the parameters in this controller.

For the single objective case, the norm of variables of state space is considered as objective function and the obtained results demonstrated that the control of variable and the estimation of variable are done in shorter time of the previous reference. Comparison of optimal strategy control input with the non-optimal case revealed that this optimal strategy needs more control input.

For multi objective case, two objective functions were defined as the norm of variables of state space and the maximum value of control input. It is shown that proposed optimal control leads to small settling time and it doesn't need more control effort.

REFERENCES

1. E.N. Lorenz, Deterministic nonperiodic flow, Journal of the Atmospheric Sciences 20 (1963) 130–141.
2. G. Chen, T. Ueta, Yet another chaotic attractor, International Journal of Bifurcation and Chaos 9 (1999) 1465–1466.
3. T. Ueta, G. Chen, Bifurcation analysis of Chen's attractor, International Journal of Bifurcation and Chaos 10 (2000) 1917–1931.
4. J. Lü, G. Chen, A new chaotic attractor coined, International Journal of Bifurcation and Chaos 12 (2002) 659–661.
5. J.C. Sprott, Simple chaotic flows, Physical Review E 50 (1994) 647–650.
6. J.C. Sprott, Simplest dissipative chaotic flows, Physics Letters A 228 (1997) 271 274.
7. J.C. Sprott, A new class of chaotic circuit, Physics Letters A 266 (2000) 19–23.
8. O.E. Rssler, An equation for continuous chaos, Physics Letters A 57 (1976) 397–398.
9. G. van der Schrier, L.R.M. Maas, The diffusionless Lorenz-equations: Shil'nikov bifurcations and reduction to an explicit map, Physica D 141 (2000) 19–36.

10. Z.C. Wei, Q.G. Yang, Controlling the diffusionless Lorenz equations with periodic parametric perturbation, Computers and Mathematics with Applications 58 (2009) 1976–1987.

11. R. Shaw, Strange attractor, chaotic behavior and information flow, Zeitschrift fur Naturforschung A 36 (1981) 80–112.

12. G. Yang, G.R. Chen, A chaotic system with one saddle and two saddle node-foci, International Journal of Bifurcation and Chaos 18 (2008) 1393–1414.

13. G. Yang, Z.C. Wei, G.R. Chen, An unusual 3D autonomous quadratic chaotic system with two stable node-foci, International Journal of Bifurcation and Chaos 20 (2010) 1061–1083.

14. Pehlivan, Y. Uyaroglu, A new chaotic attractor from general Lorenz system family and its electronic experimental implementation, Turkish Journal of Electrical Engineering and Computer Science 18 (2010) 171–184.

15. K.M. Cuomo, A.V. Oppenheim, Circuit implementation of synchronized chaos with applications to communications, Physical Review Letters 71 (1993) 65–68.

16. S. Nakagawa, T. Saito, An RC OTA hysteresis chaos generator, IEEE Transactions on Circuits and Systems I: Fundamental Theory and Applications 43 (1996) 1019–1021.

17. J.C. Sprott, Simple chaotic systems and circuits, American Journal of Physics 68 (2000) 758–763.

18. S. Ozoguz, A. Elwakil, M.P. Kennedy, Experimental verification of the butterfly attractor in a modified Lorenz system, International Journal of Bifurcation and Chaos 12 (2002) 1627–1632.

19. Elwakil, M. Kennedy, Construction of classes of circuit-independent chaotic oscillators using passive-only nonlinear devices, IEEE Transactions of Circuits and Systems I: Fundamental Theory and Applications 48 (2001) 289–307.

20. Pehlivan, Y. Uyaroglu, M. Yogun, Chaotic oscillator design and realizations of the Rucklidge attractor and its synchronization and masking simulations, Scientific Research and Essays 5 (2010) 2210–2219.

21. S. Yu, J. Lü, W. Tang, G. Chen, A general multi-scroll Lorenz system family and its realization via digital signal processors, Chaos 16 (2006) 033126.

22. M.E. Yalcin, J.A.K. Suykens, J. Vandewalle, S. Ozoguz, Families of scroll grid attractors, International Journal of Bifurcation and Chaos 12 (2002) 23–41.

23. M.E. Yalcin, J.A.K. Suykens, J.P.L. Vandewalle, Cellular Neural Networks, Multi Scroll Chaos and Synchronization, World Scientific, Singapore, 2005.

24. K.S. Tang, G.Q. Zhong, G. Chen, K.F. Man, Generation of n-scroll attractors via sine function, IEEE Transactions on Circuits and Systems I: Fundamental Theory and Applications 48 (2001) 1369–1372.

25. J. Lü, G. Chen, Generating multi-scroll chaotic attractors: theories, methods and applications, International Journal of Bifurcation and Chaos 16 (2006) 775–858.

26. Pehlivan, Y. Uyaroglu, Rikitake attractor and its synchronization application for secure communication systems, Journal of Applied Sciences 7 (2007) 232–236.

27. Pehlivan, Y. Uyaroglu, Simplified chaotic diffusionless Lorenz attractor and its application to secure communication systems, IET Communications 1 (2007) 1015–1022.

28. Y. Uyaroglu, I. Pehlivan, Nonlinear Sprott94 Case A chaotic equation: synchronization and masking communication applications, Computers and Electrical Engineering 36 (2010) 1093–1100

29. M. Messias, D.C. Braga, L.F. Mello, Degenerate Hopf bifurcation in Chua's system, International Journal of Bifurcation and Chaos 19 (2009) 497–515.

30. V. Sundarapandian, I. Pehlivan, Analysis, control, synchronization, and circuit design of a novel chaotic, Mathematical and Computer Modelling 55 (2012) 1904–1915

31. K.Kristinsson, System identification and control using genetic algorithms, IEEE Trans. Systems, Man Cybernetics, 22, 1033–1046 (1992)

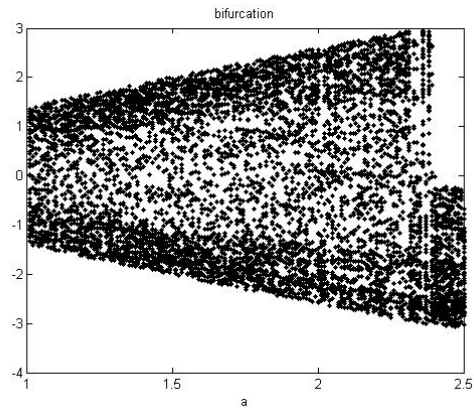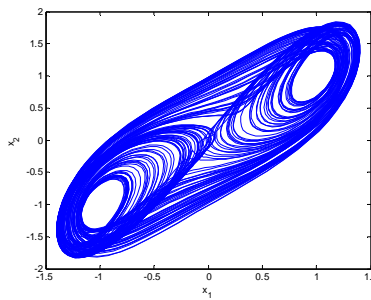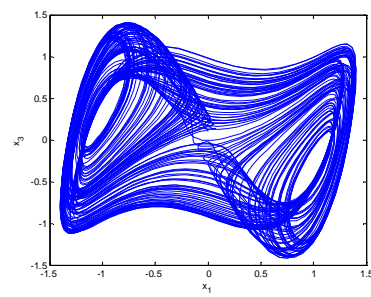**Seyed Ebrahim Siahbalaei and Mahmood Ghanbari**

Figure 24. Bifurcation diagram

(a)

(b)

(c)

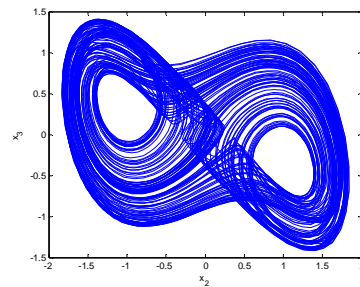**Seyed Ebrahim Siahbalaei and Mahmood Ghanbari**
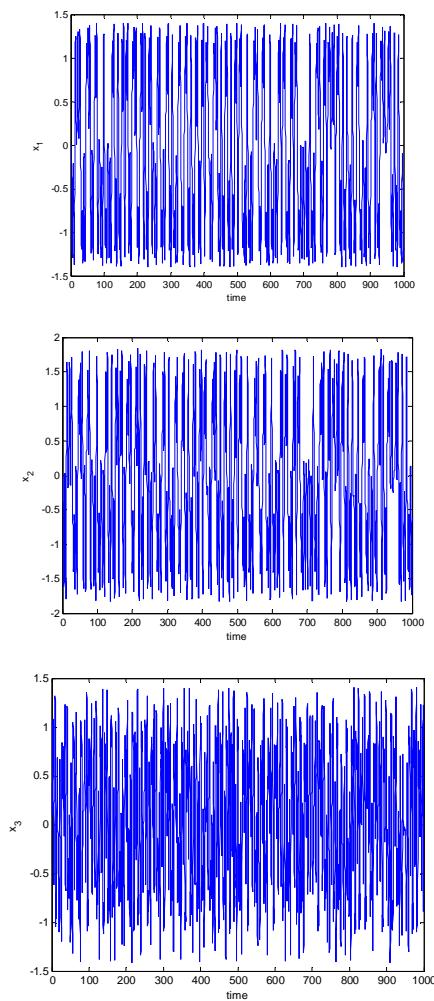

Figure 2. System phase plane [30]

Figure 3. Time response of the system states [30]

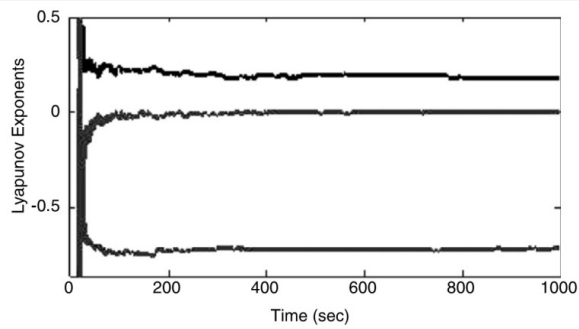**Seyed Ebrahim Siahbalaei and Mahmood Ghanbari**

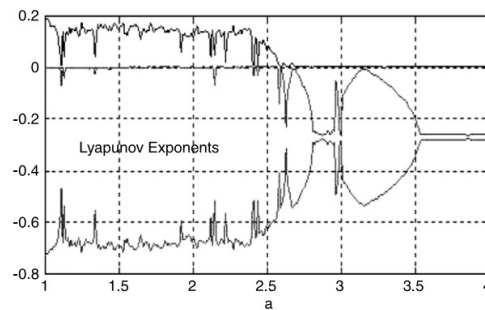**Figure 4. Lyapunov exponents as a function of time [30]**

Figure 5. Lyapunov exponents as a function of a [30]

Figure. 7. Time history of x_1 and a , Non optimal (Ref. 30) and optimal (This paper)

Seyed Ebrahim Siahbalaei and Mahmood Ghanbari

Figure. 6. Optimization procedure

Figure. 8. Time history of x_2 and b , Non optimal (Ref. 30) and optimal (This paper)

Seyed Ebrahim Siahbalaei and Mahmood Ghanbari

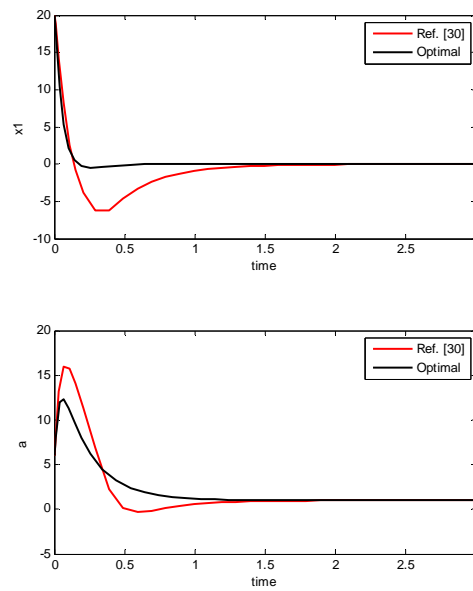**Figure. 9. Time history of x_3 and c , Non optimal (Ref. 30) and optimal (This paper)**

Figure. 10. Time history of u, Non optimal (Ref. 30) and optimal (This paper)

Seyed Ebrahim Siahbalaei and Mahmood Ghanbari

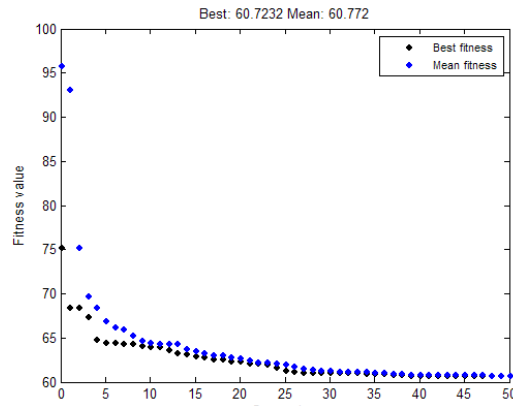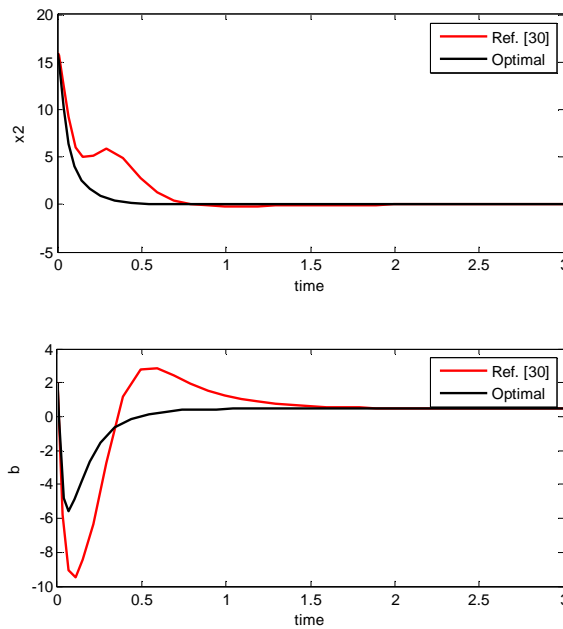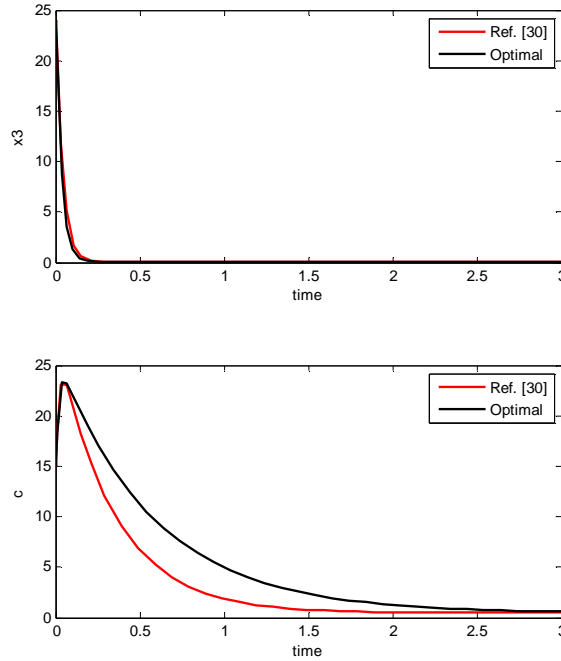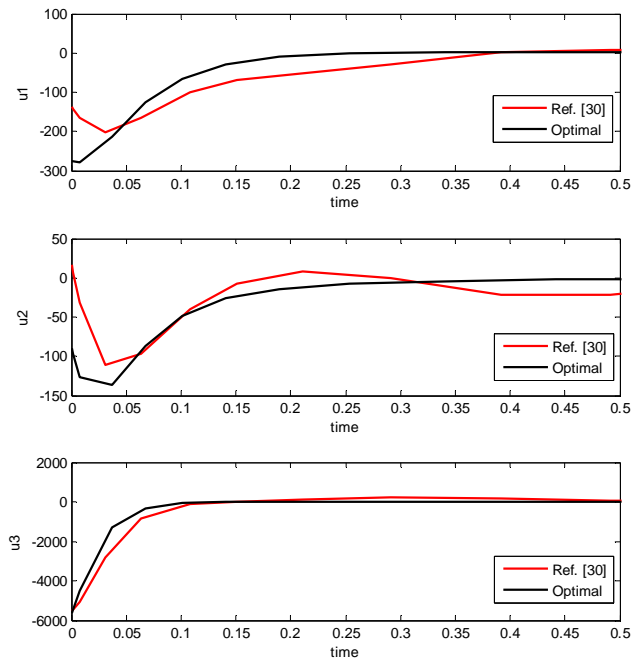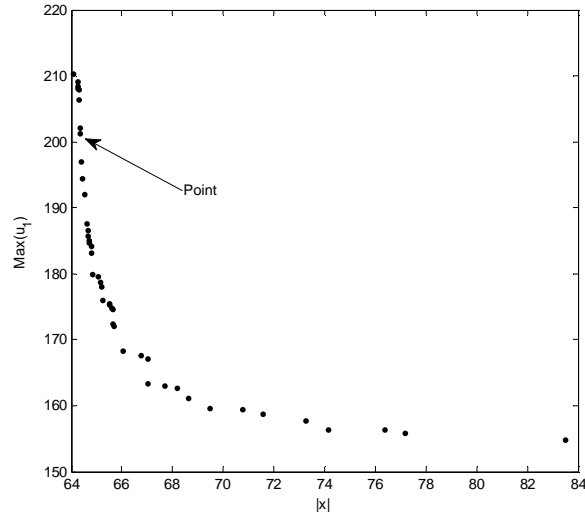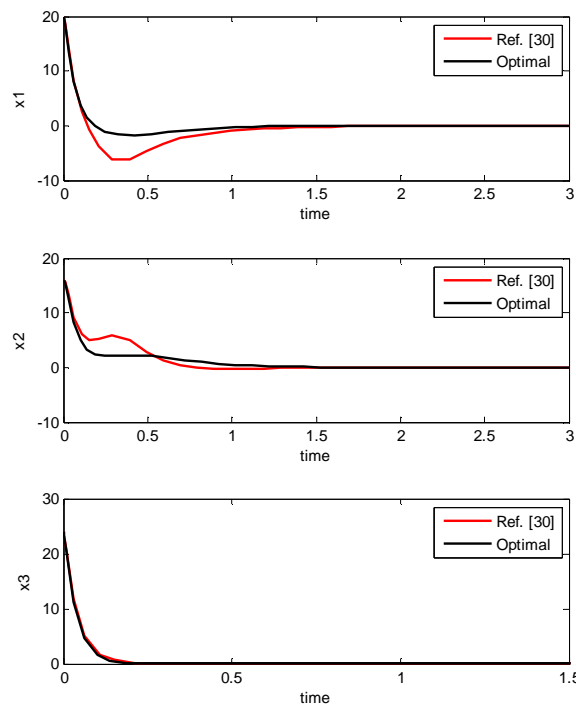**Figure. 11. The Pareto front of a set of solutions**

Figure. 12. Time history of state space variables

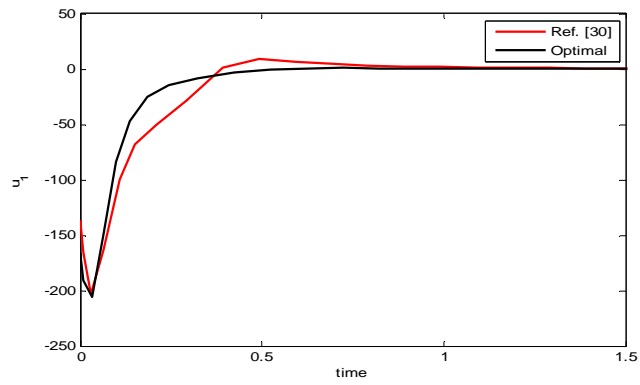**Seyed Ebrahim Siahbalaei and Mahmood Ghanbari**

Figure. 13. Time history of control input

RESEARCH ARTICLE

The Relationship between Spiritual Intelligence and Mental Health and Resilience of Iran's National Hockey Team

Khaled Dodman[1]* and Nasrollah Moradi kor[2]

[1]Department of Physical Education and Sport Sciences, Urmia Branch, Islamic Azad University, Urmia, Iran
[2]Research Center of Physiology, Faculty of Medicine, Semnan University of Medical Sciences, Semnan, Iran. .

*Address for correspondence
Khaled Dodman
Department of Physical Education and Sport Sciences,
Urmia Branch, Islamic Azad University,
Urmia, Iran.
E-mail: khalddodman@yahoo.com

ABSTRACT

Purpose: The present study investigated the relationship between spiritual intelligence, mental health dimensions and resilience of Iran's national hockey team in 2014.This study is cross-correlation and statistical society consists of all players in national team camp in May 2014.

Methods: The study sample consisted of 13 players in the national team camp that a total number sample was used. Used tools are 29 questions spiritual intelligence questionnaire of Abdollahzadeh and 28 questions public health questionnaire of Goldberg and 25 questions resilience questionnaire of Connor and Davidson. Spearman correlation was used to analyze results.

Findings: There isn't a significant relationship between spiritual intelligence and dimensions of mental health and resilience, but positive values of correlation indicates direction of spiritual intelligence and dimensions of mental health shows that whatever the spiritual intelligence to rise, mental health is increased tooaside from two dimensions of social functioning disorders and depression. Also, there isn't a significant relationship between spiritual intelligence and resilience, but positive values of correlation indicates direction of spiritual intelligence and resilience shows that whatever the spiritual intelligence to rise, resilience is increased too.

Khaled Dodman and Nasrollah Moradi kor

Conclusion: Spiritual intelligence, dimensions of spiritual mental health and resilience are in direct correlation and whatever spiritual intelligence increases, it is effective on mental health dimension and resilience.

Keywords: Spiritual intelligence, Mental health, Resilience, Iran's national hockey team

INTRODUCTION

Long time ago, human has been interested in research and exploration about dimensions, characters, features and types of conceptual intelligence. Here, there isn't any coherent and systematic research for one aspects of intelligence as "spiritual intelligence" and in order to understand and explain its features and components as other types of intelligence and this issue creates many difficulties for researchers in accurately distinguishing of components and their features. Due to limited research that can be found in the papers of the country in this area, it is not unexpected that we find relevant definitions and theories in their early stages. It looks like all human beings, regardless of its time and place which they are in, are looking for a life full of peace and safety. In modern societies, progress of science and technology has helped to protect people's safety and peace a lot, on the other hand, sense of meaninglessness and emptiness of modern human existence is rising parallel to it. One of the reasons of attention to spirituality in recent years is recognizing limitations of psychotherapy and medication to help clients to tackle change and growth. Patients still suffer greatly from their problemseven when best practices are used in the treatment. Another reason is that multiculturalism is an essential part of clinical activity. It is believed that religion and spirituality are an essential part of the clients' cultural world and finally, the experts strongly have been affected by research results that indicate a positive relationship between religious activity and mental health. However, such a relationship does not prove that religion is necessarily a cause of mental health. (Gary, 2008)Spiritual significance and spiritual development of human increasingly have attracted psychologists and mental health professionals' attention in the past few decades.Progress of psychology science on one hand and dynamic and complex nature of modern society on the other hand has led tospiritual needs of human stand up against desires and material needs and get more importance,so that World Health Organization for defining dimensions of human existence refers to physical, mental, social and spiritual dimensions and also present fourth dimension i.e. spiritual dimension in human growth and development. Despite the increasing emphasis of scientists on the spiritual dimension of human development, there isn't any single definition that encompasses entirety of spirituality. In recent years, spirituality is considered as an important aspect of humanistic action that has a consistent relationship with health and recovery. (Macdonald, 2002) Voun (1993) defines spirituality as a constant effort to answer the whys of human life. Spirituality is one of human's inner needs that some experts know it as ensure the highest levels in the field of growth cognitive, moral, emotional, personal (Faroe, 1983), human continuous try to answer whys of life (Vest, 2004). In clear word, optimal use of the creativity and curiosity to find reasonsis associated with survival and lifeas a result; growth is an important part of spirituality (Shahidi, 2000). Given that there are similarities between religion and spiritualitybut it has a wider concept than religion. Religion often needs to special rituals (according to culture) and dependent on government while spirituality is an inner and invisibility strength and with sense of their own, others world is more connected to the world and excellence (Hyde, 2004). Variety of health outcomes such as quality of life, biological psychosocial functions often have been affected by spiritual intelligence and coreligionist (Yang and Mao, 2007). Spiritual intelligence combines spirituality and intelligence structures within a new structure (Emmons,1999). It is defined as human capacity to ask final questions about meaning of life simultaneous exposureand integrated communication between us and the world in which we live (Wollman, 2001). It is one of multiple intelligences and takes multiple various methods and can coordinate and integrate inner life and soul with outer life and work in the worldand it may lead to human happiness and wellbeing (Vaughan, 2003). The World Health Organization defines health not only absence of disease, but a well-being combination and harmony between the physical, emotional, social and spiritual factors (Sadock and Sadock, 2003). It seems people who are spiritual orientationrespond better to the situation in dealing with an injury and handle causing pressure position (Mcewan,2004) and their pressure level is low (Macdonald,2002). Health is one of basic human needs that has vital for sustainable development (Ryff). Mental

health refers to the feeling of well being and ensuring its effectiveness, self-reliance, competition capacity, intergenerational dependence, self-actualization intellectual and emotional potential abilities etc. Of course considering differences between cultures, providing a comprehensive definition of mental health is impossible.However, there is general consensus on this that mental health is a phenomenon more than absence of mental disorders and what is certain is that the mental health as well as physical health is important (Changn and Chan, 2005). Health has a multidimensional concept thatin addition to the absence of disease and disability covers feelings of happiness and welfare. Most psychiatrists, psychologists and mental health professionals overlook positive aspects of health (Robbins, 2008). Although have been made efforts to shift from the traditional model of health have been prepared needed field to treat health as a state of well-being (Not merely absence of disease)but these efforts are not enough. New patterns of health emphasis mainly on negative features and tools that are used to measure health generally deal with physical problems (mobility, pain, fatigue), psychological problems(anxiety, depression)and social problems (inability to perform social roles, marital problems) (Seligman,2000). However, over the past decade and by expanding topics of positive psychology desire to study health positive aspects as well as the negative aspects of it are on the rise. Positive psychology oriented approach is caused by changes in the psychology science from addressing repair damages and towards improving life quality.It follows that benefit from strengths points of people as a shield against mental illness (Jacelon.1997). Hence the factors that lead to greater consistency and satisfaction of human to needs and threats to their lives are fundamental research structures of this approach (Garmezy andMasten, 2006). Between them, in recent years resilience as one of the main structures of this approach is allocated a special place in the field of psychology, evolution, psychology, family and mental health, so that each day number of studies of the structure is added .Garmezy and Masten (1991) define resilience as "A process, ability or successfully cope with the consequences of threatening environmental conditions" that has an important role in coping with stress and threat to life and its adverse effects (Conner,Davidson, 2003).In other words, resilience is adaptability control level depending on environmental conditions (Luthar,2000). Of course resilience is not only stable against injuries or threatening conditions and isn't a passive state in the face of a hazardous condition, but is an active and constructive participant in their surrounding environment;in other words, resilience is individual's ability against bio-psychological balance in dangerous situations(Rutter,1999).In addition researchers believe that resilience is a recovery with positive cognitive and emotional outcomes affective that this has an important role in more compatibility and satisfaction with life (Kumpfer,1996 ,Lazarus,2001). Kaempfer (1999) believes that resilience has an important role in return to initial balance or equilibrium to higher level; hence it provides a positive and successful consistency in life. Meanwhile Kaempfer point out thatpositive coping with life can be considered as result of resilienceas well as antecedents lead to higher levels of resilience. He knows this issue as complexity of defines by process look at resilience (Silliman,1997).In the field of resilience consequences, a number of studies have pointed to increasing levels of mental health and life satisfaction (Hamarat,2001 ,Basu,2004).

RESEARCH HYPOTHESES

There is a positive and significant relationship between spiritual intelligence and mental health demission.
There is a positive and significant relationship between mental health and resilience.
There is a positive and significant relationship between spiritual intelligence and resilience.

Research Methodology

The study statistical society constitutes Iran's national hockey team that 10 people were selected in total number sampling method. In this study, correlation method is used to explore relationships between variables. Research tools in this research include:

Spiritual Intelligence Questionnaire

This questionnaire consisted of 29 questions that is made and standardized by Abdollahzadeh et al. Questionnaire reliability of Abdollahzadeh et al was obtained by Cronbach's alpha 0.89. To research validity in addition to formal content validity that question was confirmed by expert's idea, factor analysis was used too and solidarity of all questions was above 0.3. In varimax rotation method to reduce variables 2 main factors were obtainedthat first factor with 12 questions was called "Understanding and communication with the source of life" and second factor with 17 questions was called "Spiritual life with inner core". The scale is scored as 5-point Likert scale.

Resilience Questionnaire

To measure resilience, Connor-Davidson Resilience Inventory (Luthar, 2000) was used. This 25 items scale consists of five components: 1.Merit / personal strength; 2. Trust Instincts / tolerate negative emotions; 3. Positive accepting of changes / secure relationships; 4. Control; 5. Spirituality that will be graded Based on Likert (from complete false-0 up to complete true-5). Reliability and validity of this test is verified in internal investigation.

Mental Health Questionnaires: Used mental health test (GHQ28) is one that designed and developed by Goldberg and Hiller in 1979 that has four scales:

A scale (Physical symptoms), (It covers people feel about their health status, fatigue and physical symptomsincluding physical signs).

B scale (It is Anxiety and insomnia).

C scale (Disorder symptoms in social function)؛ (It reveals people's Ability to cope with professional demands and everyday life issues and their feelings about current situation of life).

D scale (Symptoms of Depression), (Serious depression and distinct tendency to suicide). Time running this test is an average of 8 minutes that analyzed symptom and positive feelings of a person's health in the last month (A month before the test). Likert scoring method as (3-2-1-0) is used to scoring this test. In meta-analysis study conducted by Williams, Goldberg and Mary sensitivity of GHQ-28 is 0.84 (Between 0.77 till 0.89) and its characteristics average equal to 0.82 (Between 0.85 till 0.87).

Stability

Reliability is a measure that refers mainly to accuracy of its results. Reliability cites accuracy, trust, accountability, consistency or repeatability of test results.One of reliability tests methods is Cronbach's alpha coefficients. In this way, value of Cronbach's alpha is approved while it is more than 0.7 that higher value indicating its higher reliability. The reliability of spiritual intelligence is 0.771; mental health is 0.723 and resilience is 0.921. Therefore, Cronbach's alpha coefficients were calculated for each of 3 questionnaires. Alpha above 0.7 is suitable for above-mentioned questionnaires.

RESEARCH FINDINGS

There is a positive and significant relationship between spiritual intelligence and mental health of the national team players.

H_0: There isn't a significant solidarity between spiritual intelligence and mental health.

Khaled Dodman and Nasrollah Moradi kor

H1: There is a significant solidarity between spiritual intelligence and mental health.

According to obtained results of Spearman correlation test in table 1, sig is more than 0.05 (0.226, 0.302, 0.448, and 0.584) it means hypothesis H0 is confirmed and there isn't a significant correlation between spiritual intelligence and mental health. But positive value (Correlation-0.492, 0.363, 0.271, 0.198) indicate straight direct of spiritual intelligence and mental health, it means with the increase of spiritual intelligence also mental health is increased and vice versa. (Comment: according to test results, none of assumptions were statistically significant. One reason can be low sample size of study.With the increase in the number of samples possibility of a significant is increased).

H0: there isn't a significant correlation between mental health and resilience.

H1: there isn't a significant correlation between mental health and resilience.

According to obtained results of Spearman correlation test in table 2, sig is more than 0.05 (0.919, 0.343, 0.449, and 0.064)it means hypothesis H0 is confirmed and there isn't a significant correlation between mental health and resilience. But positive values in both the physical symptoms and anxiety and insomnia (Correlation-0.606, 0.271) indicate straight direct of resilience and mental health, it means with the increase of resilience also mental health is increased and negative values in two dimensions social dysfunction and depression (Correlation-0.335-0.037) is opposite.

There is a significant and positive correlation between spiritual intelligence and resilience of national team players.

H0: there isn't a significant correlation between spiritual intelligence and resilience.

H1: there isn't a significant correlation between spiritual intelligence and resilience.

According to obtained results of Spearman correlation test in table 3, sig is more than 0.05 (0.454)it means hypothesis H0 is confirmed and there isn't a significant correlation between spiritual intelligence and resilience. But positive value (Correlation-0.268) indicate straight direct of spiritual intelligence and resilience, it means with the increase of spiritual intelligence also resilience is increased and vice versa.

CONCLUSION

As noted above, spiritual intelligence represents a set of capabilities, capacities and spiritual resources that use of them increase adaptability and thus promote people's mental health (Moalemi, 2009, Fruhwald,2001). Findings of this study showed that there isn't a significant different between average of different groups of students base on mental health and resilience from spiritual intelligence but its straight direct means with the increase of spiritual intelligence also mental health and resilience is increased that quoted from 28, this finding is consistent with research results of (Dinner, Lochay, Oishi, 2002) studies. Since spiritual intelligence is an experienced ability that gives people access possibility to more knowledge and understanding and prepare areas to achieve perfection and advancement in life (Yaghobi,2010), so we can say that people with high spiritual intelligence will benefit higher rates of mental health and resilience and because of close relation with mental health, this explanation is consistent with the findings of Yaghobi et al (2008) that showed there is a significant relationship between spiritual intelligence and mental health. On the other hand, Dikmen points to positive impact of spiritual intelligence on mental health (Movlavi, 2009). So we can conclude that spiritual intelligence as foundation of individual beliefs plays main role in various fields, particularly promotion and provision of mental health and resilience. Therefore, attention to spiritual intelligence and explain it can help players and professional athletes for understanding value and meaning of life, solve problems in connect with themselves and others and the world.

ACKNOWLEDGMENTS

REFRENCES

1. Basu D. (2004). Quality-of-life issues in mental health care: Past, present, future. German Journal of Psy-chiatry. 7: 35-43.
2. Changn S, Chan A. (2005). Measuring Psychological well–being in the Chinese Personality and Individual Differences. Journal of Adolescence. 38(3):1307–1316.
3. Conner KM, Davidson JR., (2003). Development of a new resilience scale: The Conner- Davidson Resilience Scale (CD-RISC).Journal of Depression and Anxiety, 18: 76-82.
4. Emmons RA., (1999). The psychology of ultimate concern: Motivation and spirituality in personality. A ed. New York: The Guilford Press.
5. FruhwaldS,Loffler H, Eher R., (2001). Relationship between depression, anxiety and quality oflife: A study of stroke patients compared to chronic low back pain and myocardial ischemia patients. Journal of Psychopathology, 34: 50-56.
6. Garmezy N, Masten A.A., (2006). Particular resiliency to threatening environments. Journal of Experimental Social Psychology, 42: 323-336.
7. Hamarat ER. Thompson DA. Zabrucky KM. Matheny KB, (2001). Perceived stress and copingresource: Availability as predictors of life satisfactionin young, middle-aged, and older adults. Journal of Experimental Aging Research, 27: 181-196.
8. Hartz, Gary (2008). spirituality and mental health (Clinical Applications), Translators: Amir Kamgar& Isa Jafari, Tehran, Ravan publication.
9. Hyde B. (2004). The plausibility of spiritual intelligence: spiritual experience, problem solving and neural sites ustralian Catholic University. Aus Int J Child Spiritual, 9: 39-52.
10. Jacelon CS, (1997). The trait and process of resilience. Journal of Advanced Nursing. 25: 123-129.
11. Lazarus A, (2001). Ordinary majic: Resilience processes in development. Journal of American Psychology, 56:227-238.
12. LutharSS,Cicchetti D, Becker B, (2000). Theconstruct of resilience: A critical evaluation and guidelines for future work. Child Development, 71: 543-562.
13. Macdonald JJ. (2002). Spiritual Health in older men. Proceeding of the 1th on Seminar Older men and Community: Feb 21 Torento, Canada.
14. Mcewan W, (2004). Spirituality in Nursing: What Are the Issues?.OrthopNurs, 23: 321-6.
15. Moalemi, Sedigheh (2009). Examine relationship between mental health, spiritual intelligence and dysfunctional thoughts in students of Sistan v Balochestan University, Journal of Mental Health principles, Volume 12, Number 48 SS702-709.
16. Movlavi, Z (2009). Analysis relationship between spiritual intelligence and mental health of Hamadan University, thesis of Abu-Ali sina University.
17. Robbins BD, (2008). What is the good life?Positivism and Renaissance of Humanistic Psychology. Journal of Humanistic Psychologist, 36: 96-112.
18. Rutter M., (1996). Resilience concepts and findings: Implications for family therapy. Journal of Family Therapy. 1999. 21:119-144. 11.
19. Ryff CD, Singer B, (1996). Psychological wellbeing meaning measurement, and implications for psychotherapy research.Journalof sychotherapyandPsychosomatics. 65: 14-23.

20. Sadock B, Sadock V, (2003). Synopsis of psychiatry: behavioral sciences. 9th ed, New York: William &wilkins,p.2-3.
21. Seligman MA, Csikszent MH. (2000). Positive psychology, Journal of American Psychologist. 55(4) : 5-14.
22. Silliman B. (1997). Vulnerable but invincible: High risk children from birth to adulthood. Journal ActaPaediatrica Supplement.422:103-105.
23. Vaughan F. (2002). What is spiritual intelligence?. J Human Psychol; 42: 16-33.
24. Waller MA. (2001). Resilience in ecosystemic context: Evolution of the child. American Journal of Orthopsychiatry, 71: 290-297.
25. Wollman RN, editor. (2001). Thinking with your soul: spiritual intelligence and why it matters. 3rd ed. New York: Harmony Books; p.123-5.
26. Wong K, Yau SY. (2010). Nurses' experiences in spirituality and spiritual care in Hong Kong. Appl Nurs Res, 23-242-4.
27. Yaghobi, Abolghasem (2010). Examine relationship between spiritual intelligence and happiness of Bu-Ali Hamadan University students, Research in educational system, summer 2010, No.9.
28. Yang KP, Mao XY. 2007. A study of nurses' spiritual intelligence: A cross-sectional questionnaire survey. Int J Nurs Stud; 44: 999-1010.

Table 1: Spearman correlation coefficients of spiritual intelligence and mental health dimension

Variable		Count	Significant level	Correlation coefficient	Correlation describing
Spiritual intelligence	Physical symptoms	13	0/226	0/492	–
	Anxiety and Insomnia	13	0/302	0/363	–
	Disorder in social function	13	0/448	0/271	–
	Depression	13	0/584	0/198	–

Table 2: Spearman correlation coefficients of mental health dimension on resilience

Variable		Count	Significant level	Correlation coefficient	Correlation describing
Physical symptoms	Resilience	13	0/064	0/606	–
Anxiety and Insomnia		13	0/449	0/271	–
Disorder in social function		13	0/343	-0/335	–
Depression		13	0/919	-0/037	–
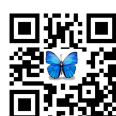
Khaled Dodman and Nasrollah Moradi kor

Table 3: Spearman correlation coefficients of mental health dimension on resilience

		Spiritual Intelligence	**Resilience**
Spiritual Intelligence	Correlation coefficient	1	0/268
	Significant level	0	0/454
	Count	13	13
Resilience	Correlation coefficient	0/268	1
	Significant level	0/454	0
	Count	13	13

RESEARCH ARTICLE

The Effects of Different Levels Discarded Dates on Blood Parameters and Volatile Fatty Acid Concentration of Kermani Sheeps

Jalal Bayati Zadeh[1]* and Nasrollah Moradi Kor[2]

[1]Department of Animal Science, Faculty of Agriculture, Shahid Bahonar University, Kerman, Iran
[2]Ph.D Scholar, Research Center of Physiology, Faculty of Medicine, Semnan University of Medical Sciences, Semnan, Iran.

*Address for correspondence
Jalal Bayati Zadeh
Department of Animal Science,
Faculty of Agriculture,
Shahid Bahonar University,
Kerman, Iran.
E-mail: bayati261@yahoo.com

ABSTRACT

Objective: The purpose of this study was to examine the effects of using different levels discarded dates on blood parameters and volatile fatty acid concentration of kermani sheeps. **Methods:** Four rumen cannulated kermani sheeps were used in a 4 × 4 Latin square change-over design within 21 days period. In this experiment, different amount of discarded dates including 0(control), 10, 20 and 30 % were used. Glucose, urea blood, HDL, LDL, cholesterol and volatile fatty acid were evaluated. **Results:** The results of this experiment showed that the increasing levels of discarded dates in diets of sheep increased glucose compared with the control treatment (P<0/05). With increasing levels of discarded dates HDL, LDL and cholesterol were decreased in sheeps (P<0/05). Total VFA concentration was significantly less in sheep fed 0 % discarded dates compared with other treatments. Percentage of propionic acid and butyric acid were significantly lower (P < 0.05) in sheep fed 0 % discarded dates compared with other treatments, but percentages of acetic acid was similar among treatments. **Conclusion:** Discarded dates as a supplement appears to increase volatile fatty acid production in rumen. The results must be interpreted with caution as only four sheep were used in the experiment.

Key words: Discarded dates, Blood parameters,Volatile Fatty Acid, Kermani sheep.

Jalal Bayati Zadeh and Nasrollah Moradi Kor

INTRODUCTOIN

Protein degradation by rumen microbes results in the formation of ammonia in rumen fluid and peptides and amino acids are intermediates in this process (Reynal et al., 2007). Alhomidy et al. (2011) reports using discarded dates increased growth and efficiency of digestion in sheep. Bayati zadeh et al. (2013) reported that the usage of discarded dates as supply energy increase utilization efficiency of nitrogen in the rumen. Javidan and Khezri (2013) indicated that the utilization of discarded dates increase synthesis of microbial protein in sheep. According to research ammonia production in rumen and utilisatin inability microibial of protein induce decrease efficiency dietary protein. Inefficient N utilization necessitates feeding supplemental protein, increasing milk production costs and contributing to environmental N pollution (Broderick., 2006). One of major objectives in protein nutrition of lactating ruminants must be to maximize ruminal formation of this high quality microbial protein and minimize feeding of costly protein supplements under all feeding regimes. Nowadays the known if microorganisms timely adequate access to the ATP used of ammonia for microbial protein synthesis. Microbial growth in the rumen is generally limited by energy rather than N supply (Russell et al., 1992). However, previous works reported enhanced growth and efficiency of rumen microbes (Russell and sniffen., 1984) or improvement in digestion of organic matter, dry matter and fiber (Griswold et al., 2003) with peptide increase in rumen fluid. Synchronization of rumen available protein and energy is one of the conceptual methods to increase the efficiency of utilization of nutrients by the ruminants. Sinclair et al. (1993) reported that the formulation of diets that are synchronous for energy and nitrogen release in the rumen has been shown to increase the efficiency of MP synthesis in the rumen. Palm date is produced largely in the hot and arid regions of the Middle East and North Africa and remains an extremely important subsistence product in many of the desert areas. The Iran is one of the most important date-producing countries in the world. Discarded dates are characterized by having high Total Digestible Nutrient (TDN) and being palatable for livestock (Al-Dobaib et al., 2009). Date waste contains carbohydrates and minerals and is a significant source of energy; thus, it may be possible to use date waste as an energy source for ruminants. Date fruit can provide 2.67 Mcal/kg of digestible energy. In comparison, barley provides 3.06 Mcal/kg of digestible energy. Because dates contain approximately 78.5% dry matter, 2.2% crude protein, 0.5% crude fat, 2.3% fiber, 72.9% carbohydrate and 1.9% ash, dates can supply 87% of the digestible energy provided by the same unit mass of traditional feed grain (Al-Khateeb and Ali-Dinar., 2001). The amount of energy in the diet and the source of energy affect the animal's feed conversion efficiency (Nunes., 1994). Furthermore, the amount of energy available from animal diets is dependent on the type of animal, on the weather conditions and on the production efficiency of the animal (Strzetelski., 1996). Because the price of animal feed has increased globally, alternative feeds with competitive prices must be developed. Many animal-herds' owners in different countries that producing dates are using discarded dates as a supplement to their animals' feed and Saudi farmers are not an exception. Al Dobaib et al. (2008) indicated that the usage discarded dates affected on milk yield and composition of Aradi goats. Bahman et al. (1997) reported that using date palm leaves in lactating cows did not affect milk yield and composition. However, discarded dates have a high amount of sugar with a large quantity of date syrup. To date, information available in the literature about the inclusion of discarded dates in diets of sheep is very scarce. The purpose of this study were to examine the effects of levels using different discarded dates on blood parameters and volatile fatty acid concentration of kermani sheeps.

MATERIALS AND METHODS

Location and experimental animal

This study was performed at Department of Animal Science, Shahid Bahonar University , located in kerman province; Iran (latitude 250 55 / N, longitude 530 26/ E , altitude 1755m) from January to March 2012(winter).In this study, four kermani sheeps fitted with rumen cannulae. The means of live weight was 55±4.5 kg for selected sheeps.

Jalal Bayati Zadeh and Nasrollah Moradi Kor

Feeds and feeding

Individual feeding was applied throughout the experiment. Each animal was put in a separate pen and provided with feeding and watering facilities. Four iso-caloric and nitrogenous rations were formulated (Table 1). The control ration was contained 0 % of discarded dates. The other three rations were formulated to replace 10, 20 and 30% of the control ration concentrate with discarded dates respectively. The four diets were offered to does as TMR diets and diets were restricted two times daily at 06:00AM and 06:00 PM; The sheeps had free access to water. Orts were collected and weights recorded once daily at 07:00 h and the feeding rate were adjusted daily to yield orts of about 5 - 10% intake.

Experimental period

This study were allocated to a 4 × 4 Latin square change-over design within 21 days period such that the first 14 days were considered as adaptation period and the last 7 days as collection period. During this period all sheeps were vaccinated and drenched against internal and external parasites.

Experimental procedures and chemical analysis

The dry matter (DM) was determined for weekly composites of feed and ort by drying at 60°C for 48 h (AOAC., 1990). Intake of DM was computed based on the 60°C DM determinations for total mixed ration (TMR) and orts. Composite samples were analyzed for total nitrogen, DM, ash and organic matter (AOAC, 1990), sequentially for neutral detergent fiber (NDF) and acid detergent fiber (ADF) (Van Soest et al., 1991). Blood samples were taken from the jugular vein by venipuncture into vacutainers containing the anticoagulants, lithium heparin, potassium oxalate, or potassium EDTA. Samples were centrifuged immediately, and the plasma harvested and stored at −20°C. Biochemical parameters (glucose, triglycerides, total cholesterol, HDL, LDL and urea blood), in blood serum was determined on the Olympus AU640. Samples of rumen fluid were collected at 0 (before feeding), 2, 4, 6,8,10 and 12 h after feeding on days 20 and 21 in each experimental period. Samples of rumen fluid were strained through four layers of cheesecloth and pH measured immediately. Each sample was acidified with 1ml of a 50% sulfuric acid solution and frozen until analyzed for determination of volatile fatty acid concentrations using gas chromatography (Shimadzu, GC-14B) as described by Leventini et al. (1990).

Statistical model of analysis

Data were analyzed using Proc Mixed in SAS (version 8.1; SAS institute Inc., Cary, NC)..Data were analyzed by adopting ANOVA for Latin square using GLM procedure of SAS program (1996) and Tukey, test for comparsion.The following model was fitted to all variables that did not have repeated measurements over time;

$$Y_{ijk} = \mu + T_i + P_j + C_k + e_{ijk}$$

where Y_{ijk} is the dependent variable, m is the overall mean, P_i is the effect of period i , C_j is the effect of sheep j , T_k is the effect of treatment k and e_{ijk} is the residual error. Differences between least square means were considered significant at P < 0.05 .

$$Y_{ijkl} = \mu + T_i + P_j + C_k + Z_m + ZT_{mi} + e_{ijkl}$$

Where Y_{ijkl} is the dependent variable, μ is the overall mean, P_i is the effect of period i , C_j is the effect of cow j , T_k is the effect of treatment k , Z_l is the effect of time I , ZT_{kl} is the interaction between time I and treatment k and e_{ijkl} is the

residual error. All terms were considered fixed except for e ijkl which was considered random. Differences between least square means were considered significant at P < 0.05 .

RESULTS

Blood parameters and volatile fatty acid concentrations

The blood parameters (glucose, urea, triglycerides, total cholesterol, HDL and LDL) are shown in Table 2. The use of discarded dates increase glucose with the control treatment (P < 0.05). Triglycerides, urea, total cholesterol, HDL and LDL were affected significantly with levels increased discarded dats in diets (P < 0.05). Increasing the level discarded dates reduce triglycerides, total cholesterol, HDL LDL and urea concentration (P < 0.05). The concentrations and percentages of VFAs are shown in Table 3. Total VFA concentration was significantly less in sheep fed 0 % discarded dates compared with other treatments (Figure 1). Percentage of propionic acid and butyric acid were significantly lower (P<0.05) in sheep fed 0 % discarded dates compared with other treatments, but percentages of acetic acid was similar among treatments (Figure 1).

DISCUSSION

Blood parameters and volatile fatty acid concentrations

The results of the present study showed that increasing the level discarded dates increased glucose and reduced triglycerides, total cholesterol, HDL, LDL. These results are in good agreement with those Javidan & Khezri (2013) reports effect of different levels discarded dates reduce triglycerides, total cholesterol, HDL, LDL in sheep. Increased glucose by addition of levels discarded dates could also be due to that higher propionic acid concentration in rumen fluid. Urea nitrogen excreted through urine significantly reduced when the level of discarded dates increased. The results are agreement with the findings Hassan zadeh et al. (2012). Reduced Urea nitrogen by addition of levels discarded dates could also be due to that lower ammonia nitrogen concentration in rumen fluid (Hassan zadeh et al. 2012). Previous studies (Lewis., 1975) have reported that concentrations of BUN are highly correlated to the level of ammonia production in the rumen. Ruminants mainly depends on fermentation produced in the rumen for energy, namely, VFAs. Even though the concentration of VFAs highly differs among diets, It generally ranges from 60 to 120 mmol/l (Bölükba̧sı, 1989; Leek, 1993). Total VFAs ranged from 93.5 to 115.6 mmol/l in the current study, which are in agreement with values reported in the literature (Hristov et al., 2001). Among VFAs, while acetic acid has an important role in meeting animal's metabolic energy requirement and milk fat synthesis, butyric acid supplies energy to ruminal epithelial cells. Approximately, 60% of animal's glucose requirement is provided by propionic acid. Thus, the percentages of VFAs have a very important role on animal production. The percentage of VFAs is mainly associated with the composition of diet. As sugar and starch content increase in diet, percentage of acetic acid decreases, but propionic acid content increases (Leek, 1993; Houtert, 1993). Total VFA concentration was significantly less in sheep fed 0 % discarded dates compared with other treatments. Percentage of propionic acid and butyric acid were significantly lower in sheep fed 0 % discarded dates compared with other treatments, but percentages of acetic acid was similar among treatments (Table 3). These results are in good agreement with those Javidan & Khezri (2013) reports effect of different levels discarded dates increase synthesis of microbial protein and total VFA concentration in sheep. The results obtained here are incomparable with research mentioned by Javandel et al. (2012). Al- Dobaib et al. (2008) indicated that the usage discarded dates affected on milk yield and composition of Aradi goats. Bayati zadeh et al. (2013) reported that the usage of discarded dates as supply energy increase utilization efficiency of nitrogen in the rumen. Increased percentages of propionic and butyric acids by addition of levels increased discarded dates could also be due to the reason synchronization energy and protein, effects of utilisation improving of rapidly available nitrogen diet, increase the efficiency of MP synthesis in the rumen or highest glucose in sheep fed

Jalal Bayati Zadeh and Nasrollah Moradi Kor

to discarded dates compared with control treatments. (khezri et al., 2009). Bayati zadeh et al. (2012) reported that the usage of discarded dates as supply energy was increased synthesis microbial protein.

CONCLUSION

Results of this experiment indicate that the usage of discarded dates increased VFA concentration in kermani sheep. The results of this study demonstrate that discarded dates can be used as a replacement for concentrate in sheeps diets. Due to the relatively low cost of discarded dates, their inclusion in sheeps diets can reduce both the cost of feed and overall production costs and environmental N pollution.

REFERENCE

1. AFRC., 1993. Energy and protein requirements of ruminants. CAB International, Wallingford, uk.
2. AL- Dabeed, S.N., 2005. Effect of feeding low quality date palm on growth performance and apparent digestion coefficients in fattening Najdi sheep. Small Rum. Res. 57: 37-42.
3. Al- Dobaid, S. N., Mehaia, M.A ., Khalil, M. H., 2009. Effect of feeding discarded dates on milk yield and composition of aradi goats. Small Rum. Res. 81: 167-170.
4. AL—Ani, A.N., Hassan, S.A ., Aljassim , R.A.M., 1991. Dries date pulp in fattening diets for Awassi lambs. Small Rum. Res. 6: 31-37.
5. Al-Dabeeb, S.N ., Ahmed, B.M., 2002. Effect of yeast culture in sheep rations differing in their roughage to concentrate ratio on digestion, nitrogen balance and rumen fermentation. Egypt. J. Nuti. Feedstuffs,5: 1-11.
6. Al-Farsi, M. ., Lee, C.Y., 2008. Optimazation of phenolics and dietary fibre extraction from date seed. Food Chemistry. 108: 977-985.
7. Alhomidy, S.N., Basmaeil, S.A.N., Al- Owaimer, A.M., El-Wazirand M., 2011.Effect of Feeding Different Amounts of Discarded Dates on Growth and Efficiency of Digestion in Sheep. Australian Journal of Basic and Applied Sciences, 5(3): 636-640.
8. Al-khateeb, A.A ., Ali-Dinar, H.M., 2001. Date Palm (Phoenix dactylifera L.): Production and research in Kingdom of Saudia Arabia. The Date Palm International Symposium, Windhoek, Nambia.
9. Al-Kinani, L.M., Al-Wash .,A.H., 1975. Study of different proportions of date stones in the ration for fattening Awassi lambs. Iraq J. Agric. Sci., 10: 53-62.
10. Al-Yousef, Y.M., El-Hag, G.A., El-Gasim, G.A., Al-Muthim, F.N., 1993. The utilization of date and other Agricultural by-products as feed ingredients in Ruminant Rations. King Abdulaziz City for Science and Technology. Final report.
11. Anon., 1995. Annual Report. Rowett Research Institute, Bucksburn, Aberdeen. AB21 9SB.
12. AOAC., 1980. Official methods of analysis. 13th edition, Association of Official Analytical Chemistry, Washington, DC, USA.
13. AOAC., 1990. Official Methods of Analysis. 15th Edn., Association of Official Analytical Chemists, Washington, DC., USA.
14. Bahman., A.M., Topps, J.H., Rooke, J.A., 1997. Use of date palm leaves in high concentrate diets for lactating Friesian and Holstein cows. J. Arid Environ. 35, 141–146.
15. Bayati Zadeh, J., Khezri, A., Dayani, O., Tahmasbi, R., 2013. Effects of discarded dates on rumen fermentation and digestibility in Kermani sheep. Online Journal of Veterinary Research. 18(5): 415-422
16. Bölükbaşı, F., 1989. In: Cilt, I. (Ed.), Textbook of Physiology: Body Heat and Digestion System. A. Ü. Basımevi, Ankara.
17. Broderick, G. A., 2006. Improving nitrogen utilization in the rumen of lactating dairy cows. Proc., Florida Ruminat Nutr Symp, Best Western Gateway Grand, Gainesville FL.

18. Broderick, G.A., 2003. Effects of varying dietary protein and energy levels on the production of lactating dairy cows. J. Dairy Sci. 86: 1370-1381.

19. Chamberlain, D.G., Robertson, S., Choung, J.J.,1993. Sugars versus starch as supplements to grass silage: effects on ruminal fermentation and the supply of microbial protein to the small intestine, estimated from the urinary excretion of purine derivatives, in sheep, J. Sci food and Agri. 63, 189-194.

20. Chen, G., Russell, J. B., Sniffen, C. J.,1987. A procedure for measuring peptides in rumen fluid and evidence that peptide uptake can be a rate-limiting step in ruminal protein degradation. J. Dairy Sci. 70:1211–1219.

21. Cotta, MA., Russell, J.B .,1982. Effect of peptides and amino acids on animal nutrition. J. Dairy Sci. 74: 3583-3597.

22. Crook, W. M., Simpson, W. E., 1971. Determination of ammonium in Kjeldahl digest of crops by an automated procedure. J. Sci. Food Agric. 22:9.

23. Crooke, W.M., Simpson, W.E .,1971. Determination of ammonia in kjeldahl digests of crops by an automated procedure. J. Sci. Food Agric. 22:903-916.

24. El-Gasim, E.A., Al-Hag, G.A., Khattab, A.H., Mustafa, A.I., Al-Shaieb, I.E., 1986. Chemical and nutritional evalution of the by products of date processing industry. The second symposium on the date palm in Saudi Arabia march 3-6(II): 189-199.

25. El-Hag, G.A., Al-Yousef ,Y.M., Al-Mulhim, F.N., 1993. A study of different proportions of dates in the ration of sheep. In: Proceedings on the III Symposium on the Date Palm in Saudi Arabia. King Faisal Univ., Al-Hassa, KSA, pp: 343-350.

26. Griswold., K.E., Apgar, G.A., Bouton,J., Firkins, J.,L 2003. Effects of urea infusion and ruminal degradable protein concentration on microbial growth, digestibility and fermentation in continuous culture. J. Anim. Sci. 81: 329-336.

27. Hassan zadeh, M., Dayani, O. (2012): Determination of treated digestibility and degradation of grape pomace with neurospora sitophila by using in vitro and in situ. The 5 th Iranian Congress on Animal Science, Esfahan, Iran.

28. Hemeidan, M., Al-Hag, G., Al-Dosary, M., Al-Yousef ,Y., Al-Turki, I., 1993. Use of dates as an Alternative energy source in sheep fattening rations. The third Symposium on the date palm in Saudi Arabia,January 17-20(II): 359-366.

29. Hristov, A.N., Ivan, M., Rode, L.M., McAllister, T.A., 2001. Fermentation characteristics and ruminal ciliate protozoal populations in cattle fed medium- or high concentrate barley-based diets. J. Anim. Sci. 79, 515–524.

30. Ismail, S., 2000. Non-conventional feed in animal nutrition and poultry (In Arabic) International Investments and culture - Egypt.

31. Javidan, S., Khezri, A. (2013): Study the effect of using discarded dates on rumen fermentation parameters, nitrogen metabolism and performance of kermani sheep. The first national congress of dates iranian. Shahid Bahonar University of Kerman, Iran**.**

32. Khalili, H., Huhtanen, P., 2002. Effect of casein infusion in the rumen, duodenum or both sites on factors affecting forage intake and performance of dairy cows fed red clover-grass silage. J. Dairy Sci. 85: 909-918.

33. Khezri, A., Daneshmesgaran, M., 2010. Effects of carbohydrate sources with different rate of degradation on rumen fermentation, ammonia and peptide nitrogen concentration in Holstein dairy Cows The 4 th Iranian Congress on Animal Science, Tehran, Iran.

34. Leek, B.F., 1993. Digestion in the ruminant stomach. In: Swenson, M.J., Reece, W.O. (Eds.), Dukes' Physiology of Domestic Animals, 11th ed. Comstock Publishing Associates (A Division of Cornell University Press), Ithaca/London, pp. 387–416.

35. Lewis, D., 1975. Blood urea concentration in relation to protein utilization in the ruminant. J. Agric. Sci. (Camb.) 48:438-446.

36. Nunes, C.S., 1994. Micorobial probiotics and their utilization in husbandry. Revista portuguesa de Ciencias veterinarias, 89: 166-174.

Jalal Bayati Zadeh and Nasrollah Moradi Kor

37. Reynal, S.M., Ipharraguerre, I.R., Lin̄eiro, M., Brito, A.F., Broderick, G.A., Clark, J.H., 2007. Omasal flow of soluble proteins, peptides and free amino acids in dairy cows fed diets supplemented with proteins of varying ruminal degradabilities. J. Dairy Sci. 90: 1887 1903.

38. Russell, J. B., Rychlik, J. L., 2001. Factors that alter rumen microbial ecology. J. Dairy Sci.292:1119–1122.

39. Russell, J.B., O'Connor, J.D., Fox, D.G., Van Soest, P.J., Sniffen, C.J.,1992. A netcarbohydrate and protein system for evaluating cattle diets: I. Ruminal fermentation. J. Anim.Sci. 70:3551–3561.

40. Russell, J.B., Sniffen, C.J. 1984. Effect of carbon-4 and carbon- 5 volatile fatty acids on growth of mixed rumen bacteria in vitro. J. Dairy Sci. 67:987–994.

41. Sannes, R.A., Messman, M.A., Vagnoni, D.B., 2002. Form of rumen-degradable carbohydrate and nitrogen on microbial protein syntesis and protein efficiency of dairy cows. J. Dairy Sci. 85:900-908.

42. Sinclair, L.A., Garnsworthy, P.C., Newbold, J.R., Buttery, P. J., 1993. Effect of synchronizing the rate of dietary energy and nitrogen release on rumen fermentation and microbial protein synthesis in the sheep. J. Agric. Sci. 120:251-263.

43. Strzetelski, J., 1996. Modern principles and methods of fattened cattle nutrition. Instytut zootechniki biuletyn informacyjny, 34: 45-65.

44. Van Soest, P.J., 1994. Nutritional Ecology of the Ruminant. Cornell University Press, Ithaca, NY.

Table 1: **Ingredients and chemical composition of the diets**

Ingredients, % of DM	Control	10	20	30
Alfa alfa hay	36	31.5	30.5	29
wheat Straw	6	9.5	10.5	11.5
Discarded dates	0	10	20	30
Soybean meal	2	6.5	9.5	12.5
Barley	30	16.5	4.5	0
Corn	8	6.5	4	0
Wheat Bran	16	17.5	19	15
Vitamin Permix	1	1	1	1
Mineral Permix	1	1	1	1
Chemical composition				
Metabolizeable energy(Mcal/Kg)	3.28	3.28	3.28	3.28
Crude protein %	13.5	13.5	13.5	13.5
NDF %	49	49	49	49
ADF %	26.5	26.5	26.5	26.5
*NFC %	25	25	25	25

*NFC = 100 - (%NDF + %CP + %fat + %ash) according to the NRC (2001) model.

Jalal Bayati Zadeh and Nasrollah Moradi Kor

Table 2: Means comparison for blood parameters in kermani sheeps Discarded dates (%)

Item(mg/dl)	Control	10	20	30	SEM
Glucose	74[b]	79[ab]	80[a]	85[a]	4.4
Cholesterol	45[a]	40[ab]	40[b]	39[b]	3.34
HDL	38[a]	38[a]	35.4[b]	33.2[b]	3.1
LDL	29	28.7	25	24.8	
Urea	23[a]	21.5[a]	16.88[ab]	13[b]	1.22

Values with different superscripts in the same row differ significantly (P < 0.05)

Table 3: Means comparison for volatile fatty acid concentrations in kermani sheeps. Discarded dates (%)

Item	Control	10	20	30	SEM
VFAs (mmol/l)					
Total	93.5[ab]	101.7[b]	110.4[a]	115.6[a]	20.11
Acetic acid	62.3[a]	69.3[a]	75.1[a]	75.1[a]	7.5
Propionic acid	15.9[ab]	18.4[b]	22.9[a]	26.2[a]	4.69
Butyric acid	14.4[ab]	17[b]	18.9[a]	24.5[a]	5.34
Proportions of VFAs (Percentage of total VFA)					
Acetic acid	66.63	68.43	68	67.56	4.4
Propionic acid	17[c]	18[ab]	20.74[b]	22.66[a]	3.25
Butyric acid	15.4[ab]	16.71[b]	17.11[a]	21.19[a]	4.36

Values with different superscripts in the same row differ significantly (P < 0.05)
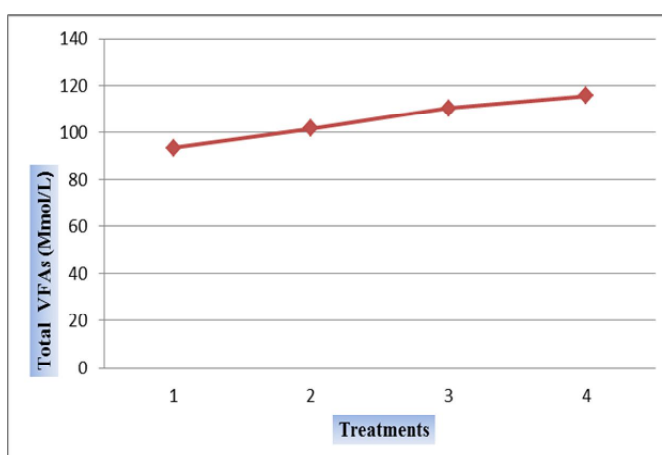

Figure 1. Total volatile fatty acid oncentration in rumen fluid of kermani sheeps
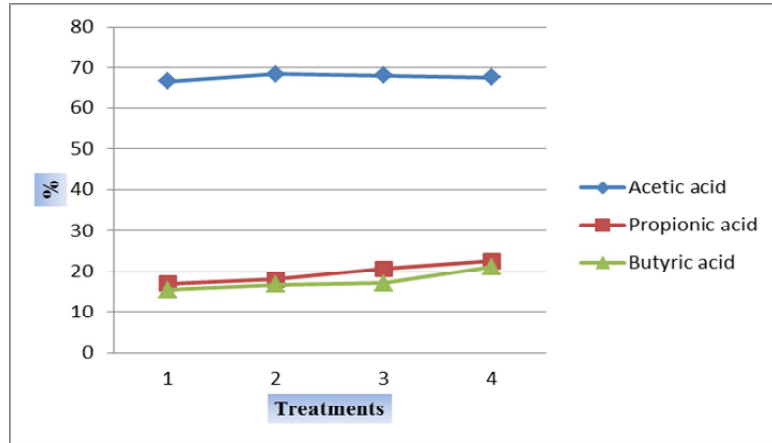
Jalal Bayati Zadeh and Nasrollah Moradi Kor

Figure 2. Percentage of total volatile fatty acid concentration in rumen fluid of kermani sheeps

RESEARCH ARTICLE

Using N-SPECT Model for Estimation of Runoff and Sediment Yield of Qaleh-Shahrokh Watershed, Isfahan

Nazly Yaribakht and Ali Akbar Jamali*

Department of Watershed MGT, Maybod Branch, Islamic Azad University, Maybod, Iran.

*Address for correspondence
Dr. A.A. Jamali
Ph.D in Watershed Management
Assistant Professor
Department of Watershed Management Eng.,
Maybod Branch, Islamic Azad University,
Maybod, Iran.
Fax: +983532370969 Mobile: +983532370163
E-mail: jamaliaa@maybodiau.ac.ir

ABSTRACT

Soil erosionin termsofeconomic, socialand environmental factorsis importantsoits controlisneeded forwatershedmanagement.In recent years, the use ofmodeling as a means ofassessing the measures ofreducing erosionisdiscussed.The studyaimed toestimate the amount ofrunoffandsediment yield inQaleh-Shahrokhwatershed, Isfahan, Iran,usingthe Nonpoint-Source Pollution and Erosion Comparison Tools (N-SPECT) model.Qaleh-Shahrokhwatershed with an area of about 142440 hectares is located in the southwestern part of Isfahanprovince.The N-SPECT modelisasoftwareextensiontoArcGISsuite.In this study thelayers ofdigital elevation model (DEM),land use, the iso rain erosivity, isohyetal, soilpolygon layer withtwo fieldsof hydrologic soil groups andthe soil erodibility coefficientwere studied asinput maps to the model.Qaleh-Shahrokhstationis locatedon the Zayanderood river andmeasures the total sediment yield of the watershed.Comparison ofmodelresultsandrealdatashow thatspecialsediment yield obtained by modelandrealspecialsediment yield during 9 water years is equal to 9.6and 8.7 tons per hectare per year, respectively, andspecialrunoff obtained by modelandrealspecialrunoff during 9 were 977 and 13455cubic meters per hectare per year, respectively.As regardsthismodel is a newmodel, so it should be run inotherareasand the resultsshould be compared with theactualfielddatatoensureits accuracyandefficiency.The advantage of this model over other models is in pixel by pixel and cumulative calculating of sediment yield and run of finall parts of the water shed and its sub basins.

Key words: sediment yield, runoff,model, N-SPECT,watershed

Nazly Yaribakht and Ali Akbar Jamali

INTRODUCTION

Soil erosion is one of the main problems of watershed management, which cause to reduce the volume of reservoirs and reduced water quality due to the presence of pollutants. Given the role of runoff in surface hydrology and soil erosion, estimation of surface runoff is necessary to evaluate the performance of water in catchments,to design sensors to protect soil and water and also to reduce the sediment yield and flood hazard.Although many models are available for direct estimating of runoff, but many of the models due to the needs to high input data and calibration requirements, have a limited application, therefore the models used for decision making should be simple and needs to the little data and specific hypotheses. Iran is a large country with a dry climate and low precipitation and water shortage as one of the major limiting factors of the development has been considered in Iran. Rainfall runoff in watersheds in addition to financial damages and loss of human life caused by flood, would result in erosion and loss of fertile surface soil and sedimentation in streams and reservoirs (Alizadeh, 2004). To cope with this problem, experts in watershed management, Hydrologists and water resources researchers develop empirical formulas and mathematical models and computer models that can be used to estimate the amount of runoff and sediment in watersheds and also to determine sensitive areas to runoff. In some cases, they can be used to determine the runoff flow rate and they have very different accuracy. Remote sensing using satellite data had grown in the last decades and such information can be used especially in cases where there is no field information or data have not been updated and thereforethey cannot show the rapid changes(Rastgooet al.,2006). GIS is a set of software, hardware, data and user that is used to capture, manage, analyze, and provide spatial data. Remote sensing is also use to recover and identify objects in a distant places using theimages and detection tools (Esmaeeli and Abdullahi, 2010). Different softwares and models have developed and used for this purpose, such as Modified Pacific Southwest Inter Agency Committee (MPSIAC) and erosion potential model (EPM) etc., which are mostly compatible with the climatic conditions in different areas. Most models used in studies of soil erosion are usually empirical methods called gray box (Alizadeh, 1989). Watershed area is the most important physical factor that has impact on maximum, minimum and annual average of runoff discharge rate, type of hydrograph andrunoff volume. Watersheds are divided into three categories based on their area: small, with an area of less than 100 square kilometers, the average watersheds with an area between 100 and 1000 square kilometersand large with an area of more than 1000 square kilometers. Qaleh-Shahrokhwatershed with an area of 142440 hectares is considered as a large Watershed (Mahdavi, 2007).N-SPECT was originally created for use in Arc GIS.8.X and then was updated to use in the Arc GIS9.X. N-SPECT is an extension in Arc GIS software that is used to estimate sediment and runoff and also to check the quality of produced water. In this study runoff and sediment yield in the watershed is estimated using this software and investigation of the effective parameters of the runoff and sediment yield. Using new softwares and check them for output accuracy can facilitate research in this field.Bayat et al., (2000) have used two model EPM and MPSIAC to estimate the runoff and sediment in Taleghan watershedand using GIS (Geographic Information System) have studied the random points of watershed and their properties.They have used digital maps and statistics softwares for determining the correlation and multivariate regression and in the end they concluded that the accuracy of MPSIAC model is more than EPM model and most of Geology factors and canopy are important factors in the production of sediment yield and runoff , runoff slope and height are important in the next level.Rastgoo et al., (2006) compared four methods MPSIAC, EPM, FAO and BLM in the estimation of erosion and sedimentation of Tangkenesht watershed. The results showed that due to the lack of information in the study area,between these empirical methods that the first two modelsare quantitative and the last two models are qualitative, the differences observed between EPM and MPSIAC models are due to inherent differences between these two methods but the observed differences between food and agriculture organization (FAO) and burea land management (BLM) models is due to their qualitative parameters and personalisation of expertise's comments. Researches revealthat the MPSIAC model provides better results and can be used for watersheds with no statistics.Abedini et al.,(2013) examined the rate of soil erosion and sediment yield in the Meshkin Chay watershed using EPM method. The purpose of this study was to identify the status of sediment yield in related to theeffective factors in producing sediments. In this regard, the Arc GIS software, IRS satellite images, data from hydrometric and meteorological stations, topographic and geologic maps were used in the implementation of EPM model. The results show that three major factors: topography,

Nazly Yaribakht and Ali Akbar Jamali

lithology and land use changes play an important role in controlling soil erosion and sediment yield and represents a very severe erosion in the study area.Ghazavi et al.,(2012) compared the models EPM, MPSIAC and PSIAC in the estimation of erosion and sediment yield using GIS. Using slope, land use and geology maps, the map of homogenous units were prepared and each of the effective factors in the erosion and the parameters of the model were determined separately for each unit and finallythe annual rate of erosion and sediment yield was calculated for each subbasin. The results showed that the PSIAC method is more suitable than two other models for calculating the annual rate of erosion and sediment yield in natural conditions and in the study area.Lifen et al.,(2013) measured the risk of soil erosion in the different rainfall scenarios using the Revised Universal Soil Loss Equation (RUSLE) model in China. In this study the soil erosion from water sources along the sea areas during the rainy seasons were analyzed and evaluated, finally the following results were obtained:1) In this way the risk of soil erosion and the results of the differences among the various states can be effectively investigated and identified , sothe risk is likely to be identified. 2) Controllig the vegetation and soil erosion are practices that play an important role in maintaining these resources.Ries et al.,(2014) conducted a study on the soil erosion in a Mediterranean karst area. They have studied on surfaces dried by wind in a semi-arid climate of Spain, using accurate rain simulator and the reason of erosion by wind and rain was determined relatively. They showed that the effects of rain and wind in soil erosion is important. A realistic assessment of the amount of soil erosion in endemic areas may be useful for reducing soil erosion. There is some study for more information about this method and model (Karimi et al., 2015; Khalili et al., 2015).

The main objective of this study was to estimate the amount of runoff and sediment yieldin Qaleh-Shahrokhwatershed using N-SPECT model and its sub-objectives, were the use of satellite imagery for mapping runoff in the model and the introduction and use of the software in the estimation of runoff and sediment yield in the study area.

MATERIALS AND METHODS

Study area

Qaleh-Shahrokh watershed with an area of about 142440 hectares is located between longitudes 50 º 18' 23" to 50 º 22' 19" East and latitudes 32 º 18' 20" to 32 º 45' 21" north (Figure 1).The minimum and maximum elevation of the study area is 2080 and 3920 meters, respectively. The village is located in a distance of 36 kilometers away fromChadegan districtin thehillside of the mountainand it has a coldclimate. Its population is 1054 and required water supplied from aqueducts, local streams and springs. In this study some nomerical data, some maps and Arc GIS,N-SPECT and X-tools extensions were used (Figure 2 and 3).

Qaleh-Shahrokhhydrometric station is located in longitude50 º 39' and latitude 32 º 39' on Zayanderood-river before entering the river to the dam and an altitude of 2100 meters above sea level. The river originates from the eastern slopes of the central Zagros Mountains. The main sources of water in this basin originates and flows from snowmelt. River systems in the watershed, primarily composed of the collection of several small and filled with water branches in the name of Cham Dar, Dare Zari, Dare Ghazi, Dare Khoorie and Dare Dolatabad. Annual average of 700 million cubic meters of water transported through the first and second canals of Koohrang in Chelgard area through Zari branches. About 50 km away from the beginning of the main branche, the Plasjan river joins to it from the left bank of the river and these two rivers form the river inflow to the reservoir.In general, the layers of DEM derived from Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) Image, land use, the raster iso rain erosivity, the raster isohyetal in centimeter and soil polygon layer with two fields of hydrologic soil groups and the soil erodibility coefficient (K) were prepared as input maps to the model. Amounts of runoff and sediment yield will be calculated by the model in the output of watershed. In addition to field observation and soil sampling in this study topographic maps with a scale of 1:50,000 and 1:25,000, satellite images and softwares such as Arc GIS, Google Earth, N-SPECT, Global Mapper, X-Tools, Map Source were used.Figure 4 shows the digital elevation model ofQaleh-Shahrokh watershed.

In Figure 5 we see that due to the large area of the watershed, it includes various lands with different areas. Land cover maps showed that the study area contains good, medium and poor pastures, horticultural lands, dry farming lands, residential areas, forests, etc. In order to determine the hydrologic soil groups and soil erosion index in Qaleh-Shahrokh watershed, field observation and the soil excavation was done using shovels, from beginning to end of the watershed and in the different land uses, during different months of the year, randomly 100 profiles were excavated, then the soil samples were spread on the paper, crushed by roller, then aggregation testswere conducted and organic matter was calculated using AASHTOOT'267 test.Also, using the interpolation method (kiriging method) in Arc GIS, the raster layer was produced. Figure 6 and Figure 7 show the maps of hydrologic soil groups and soil erodibility factor (k) (ton.m2.hr/jol.ha.cm.year) of Qaleh-Shahrokh watershed, respectively.

As can be seen in Figures 8 and 9 for preparing the iso rain erosivity and isohyetal maps, statistics of the existing stations were analyzed in Arc GIS environment and after interpolation the raster layer was produced.

The Sediment rating curve, which is a relationship based on the best -fit curve for discharge rates and their corresponding suspended sediments was drawn.The necessity to determine the exponential relationship of suspended sedimentsis resulted from the limited observational data in which there is data aboutthe simultaneous determination of suspended sediments (tons per a day) and related discharge rate (cubic meter per Seconds) only for a few days.In a linear rating curve method, concentration or sediment yield data and their corresponding discharge rate were shifted to a logarithmic coordinate system and the best fitted line using the least squares method passes among the points.So in this method, regardless of the distribution of the points just a line passes through the points. As can be seen in figure 10, discharge and sediment yield are directly related and by an increase in discharge rate the sediment yield rate also will be increased.

RESULTS AND DISCUSSION

Due to the proximity of the actualsediment yield values with the values obtained by model, estimates have been pretty close to reality .About the runoff can be concluded that the estimated values are actually lower than real values. According to the figure 11, the estimated value for sediment yield is equal to 009 + e 1.36816 Kg or 1368168.192t/yr and specific sediment yield, which is obtained by dividing the total amount of sediment yield to the area of watershed is equal to 9.6 t/ha/yr for Qaleh-Shahrokh watershed.

According to the figure 12, the estimated value for runoff is equal to 1.39165e + 011or 139165351.936 m^3/yrand specific runoff is equal to 977m^3/ha/yrfor Qaleh-Shahrokh watershed.In areas where the amount of precipitation and runoff is high the color is darker and the color is lighter in other areas. This model calculates the runoff and sediment at all points along the drainage of the basin.The information on land cover, soil, and rain were processed to estimate the volume of surface flows in local levels and watershed.Runoff-sediment yield models are used to estimate the amount of sediment and according to studies carried out so far this program was not used for field and ecological studies and only in some watershed in the Gulf of Mexico, Pacific Islands, South Atlantic region and the range of areas in North America is used. Flow direction and its accumulation within a watershed is calculated by N-SPECT model using spatial information related to altitude. Pandy et al.,(2008) concluded that WEPP model is a advanced computer model that can estimate erosion and sediment yield on the hillsides and inside of waterways. This model is closer to the N-SPECT results and only one exit point response.Results of this model is closer to the N-SPECT results and only it is not responding on a exit point. N-SPECT, also provide the ability to compare the current situation with the proposed changes in land use and land cover. N-SPECT computer model and remote sensing techniques for preparing the needed maps in this watershed was used for the first time. The most important factor in access to accurate estimates is providing the appropriate information and high-resolution maps in the ARC GIS environment as model inputs. In this study thelayers ofDEM,land use, the iso rain erosivity, isohyetal, soilpolygon layer withtwo fields of hydrologic soil groups and the soil erodibility coefficient were prepared as input maps to the model.Rastgoo et al., (2006) for other models like PSIAC and FAO, examined 9 and 6 factors, respectively. The small number of

parameters for the model makes the easier run, on the other hand, because the main factors are chosen so the model accuracy does not decrease. Ahmadi et al (2008), concluded that PSIAC model is recommended over the EPM model to estimate sediment yield rates and suggested that both models are easy to use.Estimation of Sediment yield rate by the N-SPECT model is closer to reality and the model underestimates the runoff. After calibration, the N-SPECT model can be a viable alternative for several popular models.In any watershed it is not possible that hydrometric stations can be installed in various points but this model has the potential to consider anywhere in the watershed as a station and by clicking on various points in different directions, the estimated amount of runoff and sediment yield can be observed while other models do not have such a feature. Providing appropriate information and high accuracy maps in ARCGIS environment as inputs of the model are the most important factors in access to accurate estimates.

REFERENCES

1. Abedini M, Shabrang Sh, Esmaeeli A. Evaluation of soil erosion and sediment yield in Meshkin Chay watershed using EPM method. Journal of Geography and Development 2013;10:100-87.

2. Ahmadi H, Mohamadi AA. Evaluation of sediment estimation using EPM and PSIAC models and the impact of Dehnamak watershed geomorphology on it. grassland and desert Research Quarterly 2008;17:340-352.

3. Alizadeh A. Soil erosion and conservation. Publication of Astan Qods Razavi;1989.

4. Alizadeh A. Principles of Applied Hydrology. Publication of Astan Qods Razavi; 2004.

5. Bayat R, Refahi HG, Darvishsefat AA, SarmadianF. Efficacy evaluation of MPSIAC and EPM models in estimating sediment in Taleghan watershed using GIS. Journal of Agricultural Science 2000;32:203-217.

6. EsmaeeliA,AbdullahiKh.Soil ConservationandWatershed Management, Mohaghegh Ardebili University, first edition; 2010.

7. Ghazavi R, Vali AA, Maghami Y, Abdi Zh, Sharafi S. Comparison of EPM, MPSIAC and PSIAC models in the estimation of erosion and sediment yield using GIS. Geography and Development 2012;27:117-126.

8. Karimi M, Jamali AA, Morovvati A. N-SPECT Model and its Results Compare with Real Data in Estimation of Watershed Runoff and Sediment Yield in Jafarabad Watershed, Bahabad, Yazd, Indian Journal Of Natural Sciences (IJONS). April2015;5(29):xxx-xxx.

9. Khalili S, Jamali AA, Hasanzadeh M, Morovvati A. Investigation of runoff and sediment yield using N-SPECT model in Pelasjan (Eskandari), Isfahan, Iran. Journal of Biodiversity and Environmental Sciences (JBES) 2015;x:xxx-xxx.

10. Lifen Xu, Xuegong Xu, Xiangwei M. Risk assessment of soil erosion in different rainfall scenarios by RUSLE model coupled with Information Diffusion Model: A case study of Bohai Rim, China, CATENA2013;100:74-82.

11. Mahdavi M. Applied Hydrology, Tehran University press, Fifth Edition; 2007.

12. Rastgoo S, Ghahreman B, Davari K. Comparison of four methods MPSIAC, EPM, FAO and BLM in the estimation of erosion and sediment yield of Tang Kenesht watershed. National Student Conference of Water and Soil Resources; 2006. p. 10-1.

13. RastgooS, Ghahreman B, Sanaei Nezhad H, Davari K, Khodashenas SR. Estimation of erosion and sediment yield of Tang Kenesht watershed Using MPSIAC and EPM models and GIS. Journal of Science and Technology of Agriculture and Natural Resources 2006;10:91-104.

Nazly Yaribakht and Ali Akbar Jamali

14. Ries J, Marzen M, Iserloh T, Fister W. Soil erosion in Mediterranean landscapes–Experimental investigation on crusted surfaces by means of the Portable Wind and Rainfall Simulator.Journal of Arid Environments2014;100-101:42-51.
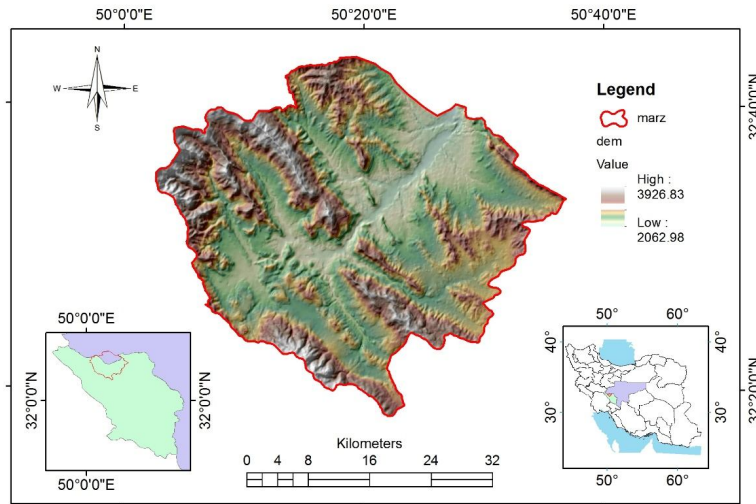
Figure 1: Location map of the Qaleh-Shahrokhwatershed in two provinces and in Iran
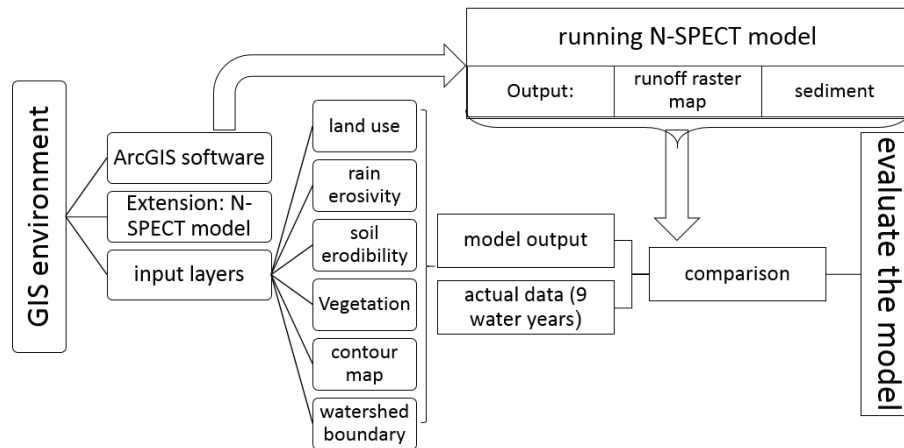
Figure 2: Research stages flow chart

Nazly Yaribakht and Ali Akbar Jamali
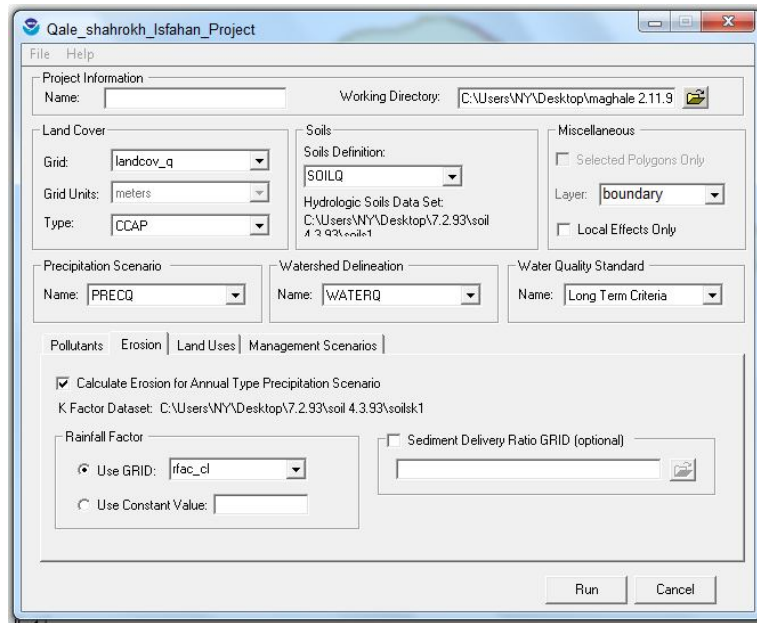
Figure 3: Main window of N-SPECT software model
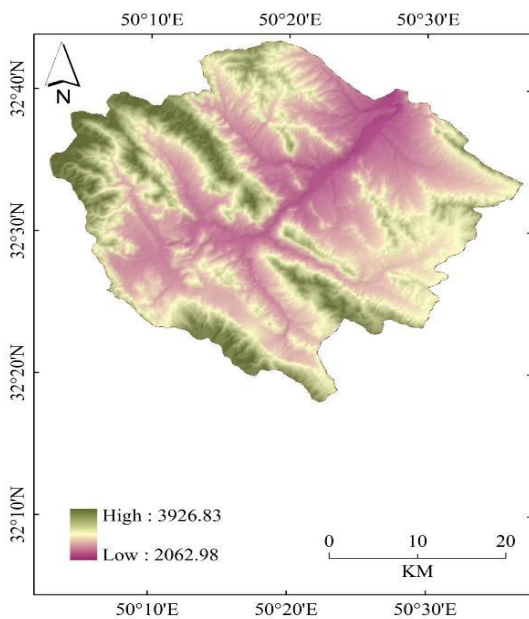
Figure 4: Digital Elevation Model of Qaleh-

Shahrokh watershed
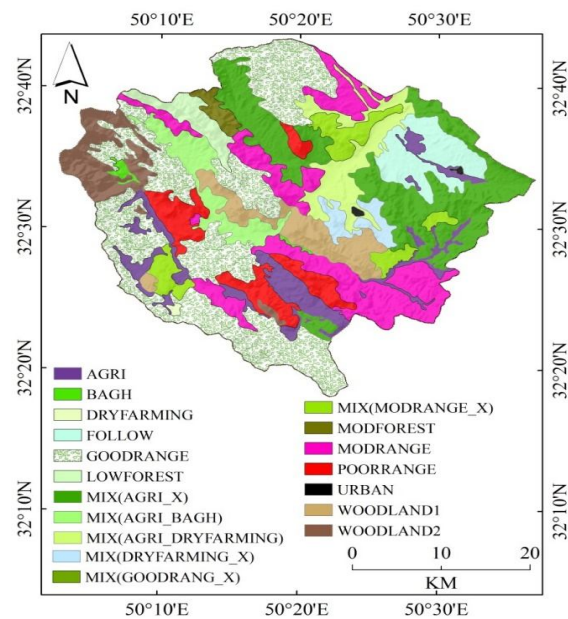
Figure 5: Land use map of the study area
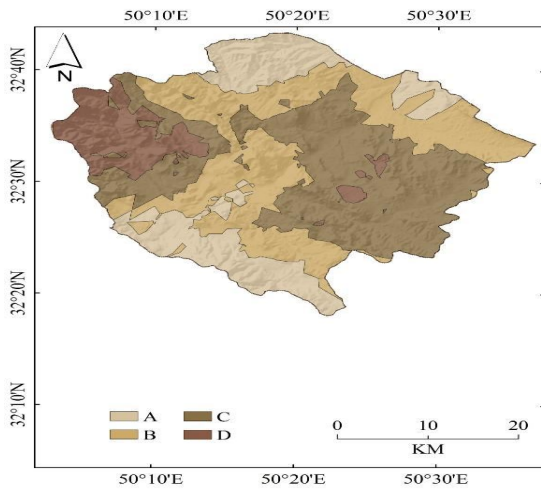
Figure 6: hydrologic soil groups of the Qaleh-Shahrokh watershed
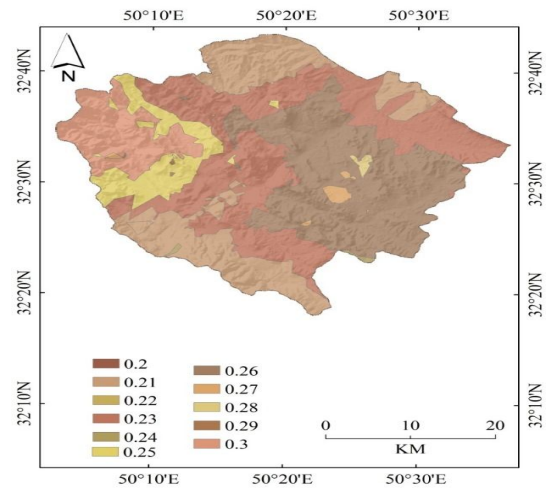
Figure 7: soil erodibility factor (k) of the Qaleh-Shahrokh watershed(ton.m².hr/jol.ha.cm.year)
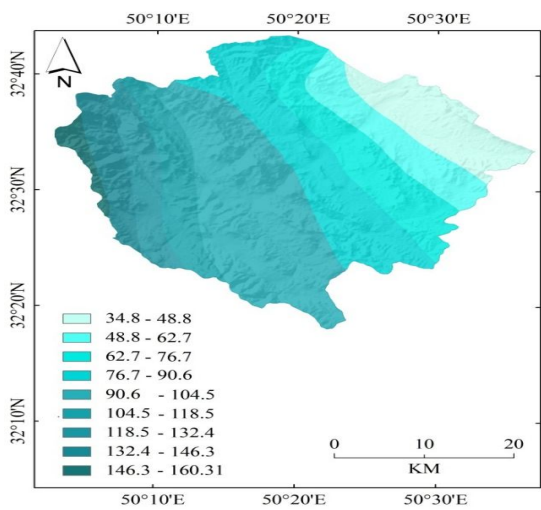
Figure 8: isohyetal raster map of the watershed (mm)
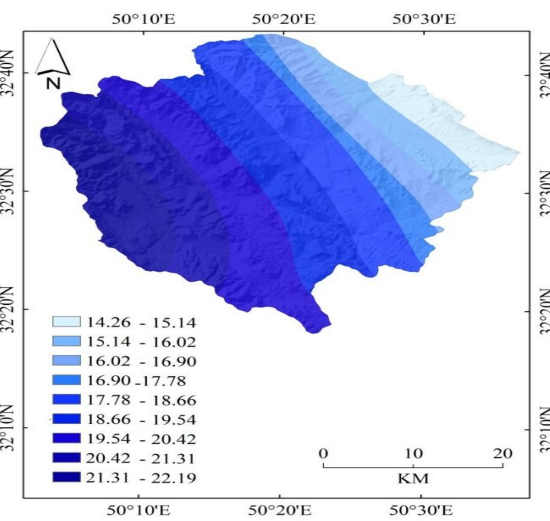
Figure 9: rainfall erosivity (R) raster map of the watershed (MJmmha⁻¹hr⁻¹year⁻¹)

Nazly Yaribakht and Ali Akbar Jamali
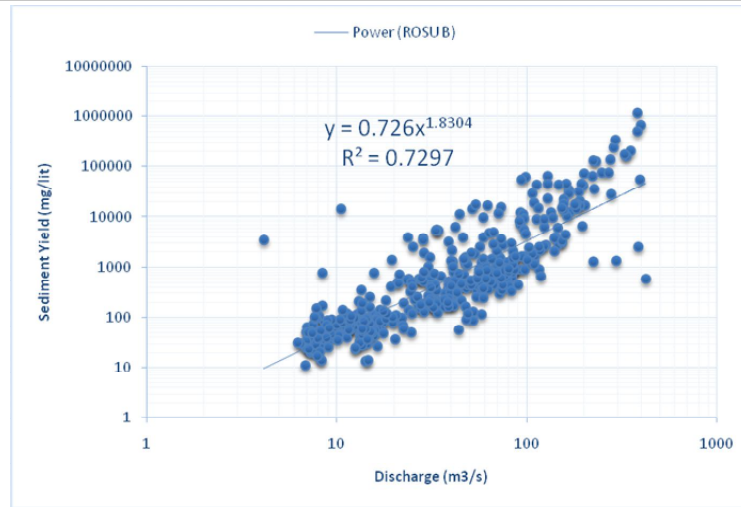
Figure 10: discharge and sediment yield rating curve
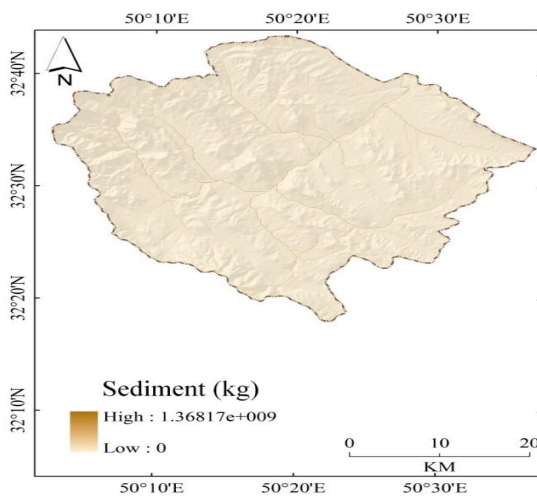
Figure 11: Estimated sediment yield values of model (Kg)
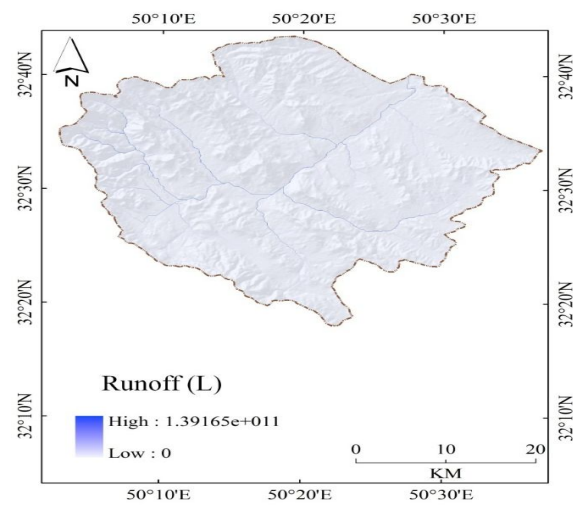
Figure 12: Estimated runoff values of model (L)

RESEARCH ARTICLE

Epulis Granulomatosa and Radicular Cyst Associated with a Primary Molar: A Case Report

MitraTabari (DDS)[1],ShimaNafarzadeh (DDS)[2] And Samaneh Hemmati (DDS)[3]*

[1]Assistant Professor, Department of Pedodontics, Faculty of Dentistry, Babol University of Medical Sciences, Babol- Iran.
[2]Assistant Professor, Department of Oral Pathology, Faculty of Dentistry, Babol University of Medical Sciences, Babol- Iran.
[3]Postgraduate Student, Department of Pedodontics, Faculty of Dentistry, Babol University of Medical Sciences, Babol- Iran.

*Address for correspondence
Samaneh Hemmati
Faculty of Dentistry,
Babol University of Medical Sciences,
Babol- Iran
E-mail: Samaneh_hemmati@yahoo.com

ABSTRACT

Radicular cyst is the most common odontogenic cyst of the jaws, but in the primary dentition is considered rare and most of these are associated with mandibular molars.Epulisgranulomatosais a lesion originating from an extraction socket. This paper present case report of a patient with Simultaneous presence oftwopathologicallesions,epulisgranulomatosa and radicular cyst associated with a primary molar.The treatment includedtooth extraction and surgical excision of the lesion under local anesthesia.

Key words: radicular cyst, epulisgranulomatosa, primary molar

INTRODUCTION

Radicular cyst is an inflammatory cyst which is originated from the inflammatory activation of epithelial cell rests of malassez in periodontal ligament consequence of pulp necrosis [1]. Radicular cysts arising from primary dentition are rare, comprising 0.5-3.3% of the total number in both the primary and permanent dentition [2] and most of these are associated with mandibular molars [3]. These cysts commonly involve the apex of the affected tooth [2]. Radicular cysts are slow growing and usually asymptomatic until secondarily infected [4] or detected by routine radiographic

Samaneh Hemmati *et al.*

examination [5]. These cysts clinically unnoticeable because of painless nature and small size but some long standing lesions may exhibits swelling, tooth mobility and displacement of an uneruptedtooth [5]. In the cases which clinical and radiographical finding indicate periapical inflammatory lesion the treatment include extraction or endodontic treatment of the affected tooth and the management of radicular cysts was depended to the size of lesion. If the size of lesion was small, total enucleation was the treatment of choice, but in large lesion marsupialization was the suitable technique because the vitality of unerupted successors was preserved [5].

Epulis granulomatosa is a post-surgical lesion originating from an extraction socket.A definitive diagnosis can be achieved by clinical and histopathological finding. The treatment of Epulis granulomatosa was surgical excision of the entire lesion [6].

Case report:

A healthy 5-year-old girl was referred to the pediatrics department of Babol School of Dental Medicine, babol, Iran, with a chief complaint of post-surgical swelling emanating from an extraction socket located in the mandibular left primary second molar region 2 weeks after extraction. Size of the mass increased gradually, but was not painful. There was no history of systemic disease. Patient's oral hygiene status was fair and the adjacent tooth (mandibular left primary first molar) grossly decayed.

Clinical examination revealed a nodular mass arising from the socket of 75. The swelling was round, firm, painless and pedunculated measuring 1×1 cm in size (figure 1).

Radiographic examination showed a carious lesion involving the pulp chamber of 74. Orthopantomogragh revealed a single well-defined periapical radiolucency in relation to the apices of primary first molar measuring about 1.5×2 cm in size extending from mesial surface of 74 to distal of the socket of 75 suggestive of a cyst (figures 2)

Treatment plan included surgical excision of entire lesion with extraction of the mandibular left primary first molar under local anesthesia finally the socket curetted thoroughly. A tissue specimen was then sent for the histological examination.

Histopathologic evaluation showed a granulation tissue consisting blood vessels and infiltration of chronic inflammatory cells. The lesion was covered by oral epithelium (Fig3). In addition a cystic lesion covered withparakeratinized stratified squamous epithelium was seen. The connective tissue wall showed chronic inflammatory cells infiltration and blood vessels (Fig 4). The diagnosis was epulisgranulomatosa which emanating from an extraction socket and radicular cyst in relation to the apices of primary first molar.

During the follow-up period, soft tissue and hard tissue healing was good.

DISCUSSION

Radicular cystsoccurrence in relation to primary teeth is considered rare [2]. Most of these are associated with mandibular molars [3].Many of radicular cysts are asymptomaticand are detected by routine radiographic examination [5].Radicular cysts are derived from the inflammatory activation of epithelial cell rests of malassez in periodontal ligament consequence of pulp necrosis [1]. Lustmann and Shear [7] in their literature review report the criteria were used in diagnosis of radicular cysts. The criteria included (1) the presence of a necrotic primary tooth in relation to the radiolucent lesion. (2) The presence of a radicular cyst epithelial lining in the lesion. (3) No involvement of the permanent bud.

Samaneh Hemmati *et al.*

In this case we can see all the above criteria about radicular cyst. Nagata et al [8] in their review presented the several differences between radicular cysts derived from primary teeth and those originating from permanent teeth. The differences include short time presentation of primary teeth, easy drainage because of the presence of numerous accessory canals and tend to resolve on their own consequence the extraction or exfoliation of the associated tooth. These differences lead to most of the cases were neglected and not submitted for histological examination and these could be the reasons for the rarity of these cysts in primary teeth.

In the present case simultaneous presence oftwopathologicallesions, epulis granulomatosa and radicular cyst in the same region was reported. Epulis granulomatosa is a post surgical lesion arising from extraction socket. In this caseepulis granulomatosa arising from the socket of 75, 2 weeks after extraction of tooth and radicular cyst in relation to 74 which has caries with pulp involvement. The surgical excision of the lesion and extraction of the associated tooth were considered as treatment of choice. During the follow-up period, soft tissue and hard tissue healing was good. The adverse effects of an untreated radicular cyst include disturbance in dental development, swelling, tenderness, tooth mobility and displacement of an unerupted teeth [9] so by early diagnosis and treatment may prevent from the above problems.

REFERENCES

1. Delbam AC, Cunha RF, Vieira AE, and Pugliesi DM, "Conservative treatment of a radicular cyst in a 5-year-old child: a case report", International Journal of Pediatric Dentistry 2003; 13(6): 447-450.
2. Ramakrishna Y and Verma D. "Radicular cyst associated with a deciduous molar: A case report with unusual clinical presentation". J Indian SocPedodPrev Dent 2006; 24(3): 158-160.
3. Mass E, Kaplan I, Hirshberg A. "A clinical and histopathological study of radicular cysts associated with primary molars". J Oral Pathol Med 1995;24(10):458-61.
4. Penumatsa NV, Nallanchakrava S, Muppa R, Dandempally A, and Panthula P. "Conservative approach in the management of radicular cyst in a child: case report". Case report in dentistry 2013; 1-3
5. Nagarathna C, Jaya AR, Jaiganesh I. "Radicular cyst followed by incomplete pulp therapy in primary molar: A case report". Journal of indian society of pedodontics and preventive dentistry 2013; 31(3): 191-193
6. Leong R and Seng GF. "Epulisgranulomatosa: extraction sequellae". Gen Dent 1998; 46(3): 252-5.
7. Lustmann J and Shear M. "Radicular cysts arising from deciduous teeth. Review of the literature and report of 23 cases". International journal of oral surgery 1985; 14(2): 153-161.
8. Nagata T, Nomura J, Matsumura Y, Yanase S, Fujii T, Oka T, Uno S, Tagawa T. "Radicular cyst in a deciduous tooth: a case report and literature review". J Dent Child 2008; 75(1): 80-84.
9. Gandhi S and Franklin DL. "Presentation of a radicular cyst associated with a primary molar". European archives of paediatric dentistry 2008; 9(1): 56-59.

Samaneh Hemmati *et al.*
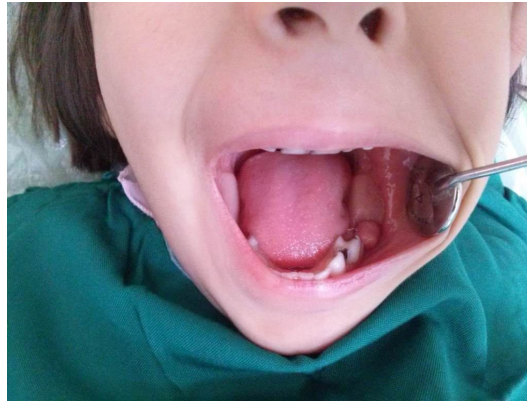
Figure 1: preoperative picture showing swelling arising from the socket of 75 and grossly decayed 74

Figure 2: Orthopantomograph showing single well-defined periapical radiolucency in relation to the apices of lower left primary first molar
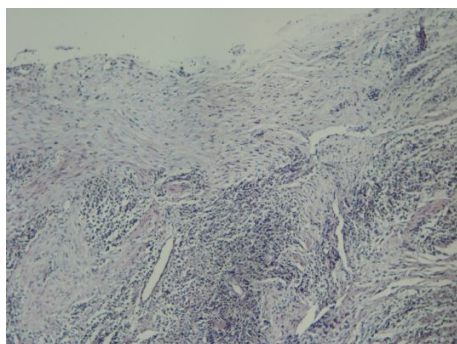
Fig 3: Histopathologic view of radicular cyst

Samaneh Hemmati *et al.*
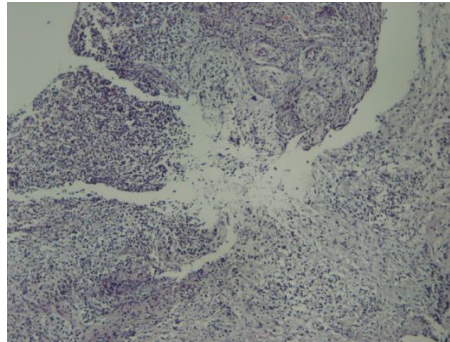
Fig 4: Histopathologic view of epulisgranulomatosa

RESEARCH ARTICLE

Divorce Crisis Experience in Individuals Undergoing Infidelity (A Qualitative Study)

Shila Latifzadeh[1], Kourosh Zarea[2]* Malek Fereidoni-moghadam[3]

[1]Student committee research center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.
[2]Chronic Disease Care Research Center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.
[3]Chronic Disease Care Research Center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.

*Address for correspondence
Zarea Kourosh PhD,
Chronic Disease Care Research Center,
Nursing & Midwifery School,
Ahvaz Jundishapur University of Medical Sciences,
Ahvaz, Iran.

ABSTRACT

Background: If disloyalty and betrayal occur in a family the betrayed spouse will be damaged more than anybody else causing mental health disorder and loss of their emotional and behavioral balance. This research was carried out to explain the divorce crisis in the betrayed spouses.

Research Method: This qualitative research was carried out as the content analysis method in Ahvaz in 2014. Data was collected through 18 semi-structured interviews with 14 betrayed participants that were selected through purposeful sampling. The data was analyzed using conventional content analysis approach.

Results: After analyzing the data three main themes and seven subcategories were identified. The themes included divorce issues with the subcategory of "fear of disclosure", divorce push with the subcategory of "moving towards divorce" and divorce inhibitors with the subcategories of "fear of consequences, lack of support, and parent household problems".

Conclusion: The findings indicate that some of the participants in the research hadn't forgiven their spouse after detecting their betrayal and broke up, but some others had to ignore their partner's faults and continue their lives due to some reasons such as the concern to lose their children, fear of loneliness and lack of support.

Key words: Spouses' experiences, divorce crisis, marital infidelity, qualitative content analysis

INTRODUCTION

Humans need to satisfy their needs to satisfy their lives' needs in social situations particularly within the family. Life is constantly changing (1) because nobody lives in a vacuum and a considerable part of human behavior includes communication with other people especially the family members (2). In many aspects of social and family life, humans are always in touch with other members of the community and family and have to adapt to group life in order to survive and meet their demands. They have to collaborate with others in order to achieve common goals. Everybody needs to achieve a satisfactory adaptation to the family and society members in such circumstances and that is why the problems and obstacles of humans' adaptation originate from their social and family lives (1).

Family is the most fundamental pillar of each society and certainly the most important social institution because it plays the major role more than other social institutions such as the government and educational and cultural institutions in the formation of individuals' personality and transmission of social values and norms (3). Obviously, mate selection is one of the first emotional and legal commitments and one of the most important decisions of individuals in their lives. In spite of positive consequences of male selection many spouses unfortunately have problems in establishing and maintaining friendly and close relationships with each other and often require professional help (4). Mate selection method can affect the rate of adaptation and satisfaction of couples so that spatial, kinship, social, cultural, and religious proximities can lead to more compatibility of couples and reduction of possibility of differences and separation and divorce, ultimately (5). Marital relationship is described as the most important and fundamental human relationship because it provides the basic structure for building family relationship and training the next generation. Marital satisfaction is a very important and complicated aspect of a marital relationship. In other words, one of the critical aspects of a marital system is the satisfaction that the spouses experience and feel in their relationship (6). Chaos and failure of the family as the most original and the most sacred social institution are the concerning issues of today communities (7). The conflicts and differences between spouses are quite natural. Due to the nature of their interactions, the conflicts arise when there are disagreements or the needs are not met; as a result, the spouses feel anger, frustration, and discontent towards each other (8). The research conducted on the marital relationships indicates that many emotional and mental problems have social psychological roots (9). In definition, marital infidelity is crossing the border of marital relationship by an individual and establishing physical or emotional intimacy with someone outside the relationship (10). This is a shocking and traumatic interpersonal damage incident for the damaged partner of life (11). Infidelity involves a series of behavioral elements such as inappropriate emotional and sexual demands, opportunism, irresponsibility, and intentional deception the acceptance of which is not easy for those who are somewhat engaged in the problem (10). The conducted studies show sexual and emotional infidelity in relationships (12), so that sexual infidelity, as the name implies, means to establish sexual relationship with someone other than the spouse (13) and emotional infidelity is emotional involvement with someone other than the life partner (14). Infidelity and betrayal are a kind of behavioral disorder (15) because due to their abnormal and undesirable effects they cause various problems and damage to the others (16). Many studies have shown that individuals' reactions to their spouse infidelity are like post0traumatic stress symptoms such as shock, confusion, anger, depression, self-esteem damage, and loss of confidence in personal and sexual issues (17). Basset in his study showed that men reported more anger and damage in response to sexual infidelity rather than emotional infidelity (8). Not all couples, however, think that breaking up their relationship after facing infidelity is the solution. Some couples carefully ask their partners if they have fallen in love with their illegitimate partners or not. Some of them even enter couples therapy and attempt to discover the root of problem and to continue their marital relationship. Some are looking for more details to accurately determine the nature and duration of infidelity and the other factors involved. Some end up their marital life by forgetting their partner (19).

Studies show that disloyalty is one of the leading causes of divorce, spousal abuse, and spouse killing in different cultures (20). On the other hand, concurrent with the increasing trend of relationships with the opposite sex before

Zarea Kourosh *et al.*

marriage, the failure of marriages is increasing too (21). Infidelity was the main reason of divorce application time in the study carried out by Vincent Agan (22) and in a study carried out on 160 different cultures, infidelity was the most common reason of divorce (23). Iran has been introduced as the fourth country of the world in terms of the ratio of divorce to marriage (18). According to the Department of Civil Registration and Census, the rate of divorce in Iran in 2012 was 150324 cases which increased compared to 142841 cases in 2011 (9). If the rate of divorce is increasing in a society, it is surely on the verge of crisis (24). Accordingly, it can be said that infidelity is growing and yet something that is difficult to estimate (25). Unfortunately, no actual data is available about couples with illicit relations crisis and the relevant issues (26). Yet, it has been estimated that the rate of infidelity among American married couples ranges from 26 to 75% (21). Infidelity and betrayal are the issues that require more research to determine their causes and to make their results widely available for people especially spouses to benefit from the research results (9).

Since the number of visitors to the judicial authority is increasing everyday to submit a petition for family dispute and demand for divorce (27) and as most of the studies on infidelity are done quantitatively and have mainly investigated the individuals attitude towards infidelity or its consequences and definitions and have less considered the issue qualitatively, and with regard to the increasing rate of divorce due to the couples infidelity and also the development of mass media such as satellite, communications software, etc., and changing lifestyles and lack of intensive domestic research in this filed and in order to assist the family planning officials, counselors, and psychiatric nurses to identify the hidden aspects of this important social-family issue using the experiences of betrayed spouses for family counseling to improve lives and compatibility and to prevent the collapse of the foundation of the family and to help the people who are involved in this psychosocial phenomenon, the research has been carried out in order to explain divorce crisis experience in betrayed spouses in Ahvaz.

RESEARCH METHODS

The present research is a qualitative study which has been done via the qualitative content analysis method with the conventional approach since March to August, 2014. Methodology refers to a philosophical framework, basic assumptions, and characteristics of a particular landscape in humanities that consists of approaches to life, knowledge, and human being and is usually associated with a procedure. Perhaps it can be said that methodology is a theory that is in the research background and responds to how and why to use the applied method (28).

Qualitative research refers to any research in which the results and findings are obtained in a way other than statistical and quantitative methods. Qualitative research can be carried out on individuals' lives, living experiences, behaviors, emotions, feelings, organizational performance, social changes, cultural phenomena, and interactions among folks (29). The purpose of qualitative approaches is to explain the interaction patterns in the natural tissue of the participants' situation (30).

Qualitative research provides a systematic and subjective approach to describe the live experiences of individuals and makes such experiences meaningful. These types of studies try to understand the meaning or the nature of individuals' experiences, to find out what people are doing, and how they are thinking. Qualitative research focuses on the totality of the phenomena and pays attention to the depth, richness, and complexity of humans' phenomena. Therefore, qualitative research is the most appropriate method to study human experiences (31).

Qualitative research is mainly based on inductive reasoning. Its data are subjective and result from the perceptions and opinions of the participants in the study and the researchers themselves. The findings obtained through qualitative research lead to understanding a phenomenon in a particular situation and therefore cannot be generalized. However, they provide an insight that can be used more widely as a guide for activities such as nursing activities (32). Currently, two main applications of content analysis are specified: first, the quantitative method which is often used in studies such as media studies and second, its qualitative approach which is used in nursing research and education (33).

Zarea Kourosh *et al.*

A lot of authors and researchers have discussed about the content analysis definition. Burns and Grove know content analysis as one of the qualitative analysis methods used to classify words and items within the text. From their perspective, the content analysis is a research method which is used for the systematic and objective description of the content obtained through communication (28).

Polit and Beck consider the content analysis as the process of organizing and integrating traditions, writings, and qualitative data, so that they lead to the emergence of themes and concepts (34). Nevertheless, the perfect definition of qualitative analysis of content can be stated as the following:

"Content analysis is the analysis and interpretation of written, spoken, or visual communication messages with their systematic and purposeful definition of their features often used in nursing (35).

According to Elo model, the qualitative content analysis includes three steps:

Qualitative content analysis can be divided into three categories: 1. Conventional or traditional analysis; 2. Directed or targeted analysis; 3. Comprehensive or abridged analysis (36).

In the present study the conventional analysis was used to analyze the data. The data analysis process can be summarized in the following steps:

1. Determining the research title, objectives, and population

2. Sampling, doing interviews, and preparing the transcripts of the interviews

3. Selecting inductive approach

4. Sensing and immersing in the data by reading the interviews several times

5. Selecting units of meaning

6. Open encoding: converting sentences or phrases into phrases or words and writing them down in the margin

7. Creating subcategories: classifying basic codes and categories under greater headings by placing similar codes and categories in one group

8. Abstract or summary: formulating a general description of the research title by producing main classes through the lower categories

9. Validating the data (37)

In qualitative research, the researcher is not only the data designer and analyst but also the data collection tool. Therefore, his skill, experience, accuracy, tact, and commitment can have a great influence on the results of the research (38). In order to achieve this goal, the researcher must have a close and direct relationship with the participants to achieve real and reliable data (39). The qualitative researcher tries to select some samples purposively based on the point that what kind of information is required based on the preliminary findings. Therefore, sampling is done based on the objective (34). The sample size is determined based on the collected data and their analysis. Data collection continues until the researcher feels the data is saturated. Data saturation means that collecting more data is

the repetition of previous collected data and no new data is obtained. In qualitative studies, the repetition of previous data or themes or highlights reflects the adequacy of the sample size. As a result, it is not possible to determine the number of participants in advance (40).

In order to achieve this standard, after each interview, the text was rewritten word by word on paper. The rewritten texts of each interview were encoded and the initial codes were extracted. After encoding each interview and with regard to the obtained results, the next participant was selected. Totally, 12 spouses who were betrayed were asked to give deep and semi-structured interviews. During the interviews by asking open-ended questions that were recorded by the voice recording device and the filed notes, it was tried to provide an opportunity for the interviewees to express their own experiences.

In the present study, the qualitative content analysis is used. The purpose of the research approach is to describe the phenomenon intensively and the results of the analysis are the concepts or classes that describe the desired phenomenon.

Qualitative content analysis process can be divided into three main phases:

1. Preparation phase, 2.organizing phase, and 3.reporting. The key feature of content analysis is that a lot of words in the text are divided to many smaller classes. At the preparation phase, the analysis unit which is the text of the interviews is selected (41). Then the researcher tries to make sense of the data by reading the text several times (42) with the aim of immersion in the data (33). In this study, the data were analyzed since the first interviews and parallel with the interviews (simultaneous analysis). The texts of the interviews were transcribed word by word. Then, the tapes of the interviews were listened to several times and the texts of the interviews were reread so that the researcher could achieve an overall understanding of the data. Then, the analysis process continued using the inductive approach. Primitive codes were identified and written in the margin of the of the interview text.

In the next step of the research, the qualitative data are organized including open encoding, creating categories and abstraction. The purpose of categorization is to provide a sense of the phenomenon description, to increase the perception and production of knowledge. While formulating the categories through inductive content analysis, the researcher decides to place everything in similar categories through interpretation. Abstraction means formulating a general description of the research topic through the generated categories (36). In this research, after the extraction and identification of the original codes, those which were similar were placed in the same category. Each group was named using the features of the words content. Categories with similar events were grouped as the themes. Finally, the summarization process continued as far as it was possible and reasonable.

In order to verify the qualitative data four criteria are used including reliability, capability of integrity or confidence, impartiality or approval, and the capability of application or transmission. Reliability refers to ensuring the accuracy of data and information and means that the obtained data are in accordance with the participants' goals and meaning. In order to increase the reliability, the researcher has used long-term engagement, persistent observation, integration and use of external observers (33). In the present study, in order to achieve this standard, the combination of different methods is used such as attending the locations of interviews, observing and discussing with the participants, conducting deep interviews, and rechecking the interviewees. After conducting and implementing the interviews, the texts were submitted to the participants to ensure the accuracy of the data and the extracted data were used by other experts and researchers familiar with qualitative data.

The ability to transfer depends on the use of the results in another situation or generalization of findings beyond the studied situation. Diversity and comprehensiveness of the selected samples and deep expression and description of the research are ways to increase transfer capability and the readers will be able to achieve similar or different

conclusions by reading the research report. Moreover, it was tried to express all detailed phases of the research implementation accurately and to interpret the data.

Confidence which is the reliability of the data over similar time and conditions is obtained through step by step repetition and accurate assessment of data and relevant documents by the external observer. Moreover, the assessment leads to verification, as well. Verification capability is associated with the decisions made during the research implementation. Others should be able to judge the appropriateness of the research process and to follow it and also to agree on the meaning of the data. This criterion is identified by proving the point that the researcher has no bias in the research process (33). In this study the researcher submitted the interviews, the initial codes extracted from the texts and also the codes classification to the supervisor and advisor to ensure the right and accurate process of data collection and analysis. To investigate data by external supervisors, the initial extracted codes together with the obtained classes and themes were submitted to two researchers familiar with qualitative research to benefit from their complementary ideas at encoding process.

FINDINGS

In this study, 14 subjects participated who had undergone infidelity and referred to counseling centers, courts, and attorney offices and totally 18 sessions of interview were held with them. 78.57% of the participants were female and 21.42% were male.

The average age of the participants in the study was 34 years and the average age of their spouses was 39 years. 80% of the marriages were non-families. In 20% of the marriages, the couples got acquainted through friendship and in 80% through traditional suiting. 13% of the marriages were done without the consent of the individual. 21% of the studied subjects had no children. 30% of the studied subjects were employed. 28% of the subjects referred to counseling centers after detecting infidelity. 21% continued their lives and 78% ended up their marital life.

By conducting 18 deep and semi-structured individual interviews and rewriting them word by word 520 initial codes were extracted from the texts. After putting the codes in categories based on similarities and conceptual contents, 10 subcategories were obtained which were divided to 4 classes and were ultimately summarized to 3 main themes. The themes included divorce issues with the subcategory of "fear of disclosure", divorce push with the subcategory of "moving towards divorce" and divorce inhibitors with the subcategories of "fear of consequences, lack of support, and parent household problems".

The First Theme: Divorce Issues

The main theme is divorce issues which in this research refer to the factors that have made the individual hide the reason for their divorce and even the divorce itself.

The Sixth Participant:

"I got divorced 5 years ago. None of my colleagues knows about it. I'm embarrassed to tell them my husband has betrayed me. I don't like them to pity me. Only my parents in my family know the main reason for the divorce".

The Second Participant

"I'm embarrassed to tell anybody about it. That is why I didn't tell my family why we broke up. I'm happy I didn't enter his life and have no children"

The Second Theme: Divorce Push

The main theme of the research is divorce push which in this research refers to the factors that have made making decision for divorce easier for the betrayed person and thus they have decided to divorce. The findings of the research indicate that for some of studied subjects this event has been so unexpected and unforgivable that they have broken up in spite of knowing the divorce problems and consequences. One of the participants says in this regard:

The First Participant:

"My son told me to get divorce. He doesn't change. If you are waiting for him to quit his behavior you are just wasting your time."

The First Participant:

I was tired. I couldn't tolerate anymore. My health was threatened. I decided to get divorced to save myself."

The Third Theme: Divorce Inhibitors

This theme refers to the factors that have made the individual tolerate the infidelity despite the dramatic and unforgivable act of disloyalty and continue their marital life. A participant states in this regard that:

The Thirteenth Participant:

I thought to get divorced, but what about my family? We were cousins and I was worried about my parents. What would happen if I got divorced? My family wouldn't support me and wouldn't provide me a shelter. My father wouldn't fight with my uncle. On the other hand, I'm not able to live by myself. I cannot manage life alone. How should I deal with the problems? My husband was right. I have no self-confidence".

The First Participant:

Since I was not employed and couldn't make my living and as I was so proud that I couldn't beg my family for help. I wasn't able to get divorced."

The Tenth Participant:

I wasn't able to get divorced. I had four children. I had to continue to live for my children. I had nobody to support me. I had to manage my life myself."

The Eights Participant:

I never forgive him. My enemy hadn't done what he did with me. I think what he did is lust. I don't get divorced. It's not true before my son-in-law. We don't have any marital relationship anymore."

DISCUSSION

One of the characteristics of the marriage is the commitment of each one of spouses to one another and mutual rights, so that this commitment is the foundation of common life. Otherwise, spouses or family members will lose their mutual trust more and more.

Family is a multi-structural unit with different biological, mental, social, cultural, and economic aspects. When the family functions such as biological, social, cognitive, and emotional functions are damaged on after the other, the members of the family will gradually lose their satisfaction. The gradual reduction of family members' satisfaction first leads to failure and then causes legal dissociation which is called divorce. Divorce is a

Reducing the gradual appreciation of family members

The cause of the failure and eventually break the law

This type of divorce is called dissociation.

Divorce is a crisis in life (43). Goldenberg considers marital disruption and divorce the most important factors causing stress after the sudden death in the family 944). Basically, when a third party enters a marital conflict (children, close family of both partners and friends relationship network), the normal and daily relationships of the couples get impaired and their cooperation and mutual assistance in matters related to each other will decrease because each partner reacts in some ways to the opposite side coalitions and to their being margined due to ignoring the spouse's demands, negligence, delay in performing their tasks, aggression, communication with their own relatives, anger and long silences, prevention of sexual relationship, etc. In this way, the feeling of insecurity casts a shadow on the relations and financial independence in such circumstances is discussed as a support (45). The effects and consequences of divorce on women have been widely reported that can be explained in three individual, family, and social areas. Hafarian in his study has stated that the divorced women are more vulnerable than the other women (46). Farzadfar has stated in his research that women are under a lot of psychical and mental pressures. The other consequences of divorce on the divorced women that were expressed by Fukuda are the low quality of life, financial problems pressure, negative moral attitude towards divorced women in society, social isolation, and damage to their social relationships due to the lack of social security (47). The results are consistent with the findings of the research. Deciding to end a close relationship is not an easy or unimportant task. It is accompanied with a feeling of regret and self-blaming. Fear of loneliness after divorce is the feeling that women express more than men. This fear mainly results from the concern that whether they will find another partner. They are afraid that they might not be able to live without a man and take care of their children alone or find a job and manage themselves and their children financially. This real fears result from factual doubts about financial issues, labor market, problems of raising children alone, and changes in individual and social life. The results of the qualitative research on describing the divorce crises experience in spouses, who have undergone disloyalty in Ahvaz, reflected the positive and negative factors affecting the betrayed individual in making decision, so that sometimes the betrayed persons had to continue their lives despite the existing problems and sometimes they were forced to get divorced.

Specialists and experts have probably faced illicit relationship crisis in society and in counseling sessions and know how the crisis has disrupted the safe and warm environment of the home and household. By having more knowledge about the factors that direct individuals towards illicit relationships and more awareness about how to treat such a crisis, it is possible to help the couples solve the problem and experience more successful marital life and create healthier social environment.

ACKNOWLEDGEMENT

CONCLUSION

Through this research it was found that when after the disclosure of infidelity the dispute and quarrel increases between the couples and the spouses do not come to a conclusion, some of the betrayed spouses, due to the nastiness and abnormal nature of the action in society, do not look for the reason, leave home, and prefer to get divorced than to continue their lives and some others, due to some circumstances such as taking care of the children prefer to be patient and continue their lives. Psychology and consultation have been able to solve many individual and marital problems. Family health and individual health are followed by public health.

REFERENCES

1. Navabi N s. Effectiveness of group therapy approach Bern conversational analysis (TA) increasing feelings of marital satisfaction among women in Tehran in 1386. thesis. 1386:1-136.
2. Hatfield E, Rapson R. Culture and Passionate Love. University of Hawaii, USA. 2005:12-20.
3. Abassian M, Ghazinezhad M. Qualitative study of social factors Spouse Killings. Women in Development & Politics of women. 1390;9:81-115.
4. Parizadeh m, Kadivzadeh T. Handbook of Public Health: Ministry of Health and Medical Education; 1385.
5. Fatehi D A, Nazari A. Sociological analysis of the factors affecting couples tend to divorce in Isfahan. Social Security Studies. 1389:13-54.
6. Yousefi R, Abedin A. Effectiveness of intervention schemes based on the model of marital satisfaction. Journal of Clinical Psychology. 1389;2:25-38.
7. Njafi S E, Mohammad N Z. Court records of the family and the factors affecting their increase: Strategic Thoughts of Women and Families; 1388.
8. Shafee N A, Hosseinian S. Evaluate the effectiveness of cognitive-behavioral group counseling on marital conflict. Educational and Psychological Research. 1386;3:1-22.
9. Shah Mohammadi A, Darvize Z. Increase the effectiveness of communication skills training on marital partnersDrug addicts and prevent the return of the man in the city. Addiction Studies. 2009:3-28.
10. Agha J B S, Motahar N S. Investigating the causes of infidelity couples in Bushehr. International Congress of Religious Vandyshh. 1392:1-12.
11. Bashir P S. Efficacy of cognitive processing in posttraumatic symptoms, quality of life, self-esteem and sexual satisfaction in women exposed to marital infidelity. Journal of Mental Health Counselor. 1391;2:193-208.
12. Kern E. Infidelity among College Students in Committed Relationships. Case Western Reserve University. 2010:2-18.
13. Babin B. Sex Differences in Emotional and Sexual Infidelity. Thesis Proposal. 2002:1-30.
14. Babin B, Dindia K. SEX DIFFERENCES AND SIMILARITIES IN EMOTIONAL AND SEXUAL INFIDELITY. Arizona State University.
15. Klein M. THE IMPACT OF ACCOUNTS AND ATTRIBUTIONS FOLLOWING MARITAL INFIDELITY. University of Missouri – Columbia. 2007:1-147.
16. Hamidi O, Ahmadi S. Factors affecting the formation of marital infidelity. Chamran univercity. 1391:1-9.
17. Allen E. Premarital Precursors of Marital Infidelity. FAMILY PROCESS. 2008:243-59.

18. Yousefi N. Comparison of the effectiveness of the treatment plan based approach to family therapy and the emotional Bowen always the desire to divorce divorce applicant clients. Journal of Clinical Psychological Science. 1390;3:53-64.

19. Rafee S, Hatami A. The relationship between early maladaptive schemas and attachment in women with marital infidelity. Journal of Sociology. 1390;2:2136.

20. Fathi M, Fekr A H. Factors underlying women's marital disloyalty. Quarterly Journal of Social Welfare. 1392;13:109-31.

21. Khalaj A F. Impact on the probability of interaction with the opposite sex before marriage, divorce among university educated. Journal of Social and Cultural Council of Women and Family. 1391;15:49-91.

22. Javid M, Kazemi M. Impact on quality of life, couples therapy, couples affected by marital infidelity in Tehran. Journal Health Research and Community Development and Health Promotion Research Center Gonabad. 1390;1:54-63.

23. Shackelford T, Leblance G. Emotional reactions to infidelity. Florida Atlantic University. 2000;14:643-59.

24. Moshki M, Shah Gh Z. The couple divorced Rrsyvzyt and factors related to divorce from the perspective of the underlying city in the years 1387-88. Ofogh danesh,Medical science of Gonabad. 1390;17:35-44.

25. Basset J. Sex Differences in Jealousy in Response to a Partner's Imagined Sexual or Emotional Infidelity with a Same or Different Race Other. Department of Psychology, Southeastern Louisiana University. 2005;7:71-84.

26. Hasan A H, Mojarad S. Effectiveness of coping with marital adjustment (EFT) and positive emotions couples having relationships outside of marriage. Psychology reaserch. 1390;2:25-38.

27. Harris G. GENDER, JEALOUSY, AND REASON. PSYCHOLOGICAL SCIENCE. 1996;7:364-6.

28. Joulaei S. Phenomenological exploration of patient rights[Dissertation]. Tehran University Of Medical Science. 2007.

29. Grove S, Burns N, Burns N, Gary J. The Practice Of Nursing Research:Appraisal,Synthesis,and Generation Of Evidence. Elesvier. 2008.

30. Jouibari L. Comfort Patient:Providing a model[Dissertation]. Tehran University Of Medical Science. 2005.

31. Parsa Yekta Z. Caring, a concept analysis. Moddares journal. 2005;7(2):9-31.

32. Burns N, Grove S, Gray J. Understanding Nursing Research:Building an Evidence-Based Practice. AbeBookscom. 2011.

33. Graneheim U, Lundman B. Qualitative content analysis in nursing research:concept,procedures and measures to achieve trustworthiness. Nurse Education Today. 2004;24:12-105.

34. Polit D. Essentials of nursing research : appraising evidence for nursing practice. Wolters Kluwer/Lippincott/Williams & Wilkins Health. 2014.

35. Gerrish K, Lacey A. The Research Process in Nursing. Wiley. 2010.

36. Hsieh H, Shannon S. Three approaches to qualitative content analysis. Qualitative Health Research. 2005;15(9):88-1277.

37. Elo S, Kyngas H. The qualitative content analysis process. Journal of advanced nursing. 2008;62(1):15-107.

38. Holloway I, Wheeler S. Qualitative Research in Nursing and Healthcare. Wiley. 2009.

39. Zare K. Exploring the experiences of nurses in psychiatric care[Dissertation]. Tehran university of medical science. 2012.

40. Zeighami R, Bagheri Nesami M, Haghdoost Oskoui S, Nikravesh M. Content analysis. Iran Journal Of Nursing. 2008;21(53):41-52.

41. Gutherie J, Petty R, Yongvanich K, Ricceri F. Using content analysis as a research method to inquire into intellectual capital reporting. Journal of Intellectual Capital. 2000.

42. Morse J. Qualitative Health Research:creating a New Discipline. Left Coast Press. 2012.

43. Rahmani N, Ghasimi M. Causes psychological, social and economic perspective divorce Divorce family courts. Dena Journal. 2007;4:1-14.

44. Hossein Poor M, Shahrooee S. Efficacy of cognitive-behavioral therapy, family education on marital satisfaction. New findings in psychology. 2011:95-106.

45. Shafee Nia A, Hosseinian S. Evaluate the effectiveness of group counseling with cognitive – behavioral On marital conflict. Educational and Psychological Research Faculty of Psychology and Educational Sciences of the University of Isfahan. 2008;3:1-22.
46. Hafarian L, Aghaee A. Comparison of quality of life (and dimensions) of divorced women and Ghyrmtlqh and Its relationship with demographic characteristics in Shiraz. Knowledge and Research in Applied PsychologyIslamic Azad University of Khorasgan. 2010;41:64-86.
47. Fukuda Y, Nakamura K. Municipal health expectancy in Japan: decreased healthy longevityof older people in socioeconomically disadvantaged areas. BMC Public Health. 2005;5:1-9.

Table 1:

Number of sessions/ interview duration	Age	Gender	Code
2 sessions, 115 m	41	Female	1
1 session, 45 m	39	Male	2
1 session, 50 m	35	Male	3
1 session, 40 m	33	Male	4
1 session, 65 m	31	Female	5
2 sessions, 110m	51	Female	6
1 session, 60 m	31	Female	7
1 session, 55 m	29	Female	8
1 session, 60 m	48	Female	9
2 session, 80 m	32	Female	10
1 session, 75 m	30	Female	11
1 session, 100 m	28	Female	12
2 session, 85 m	31	Female	13
1 session, 20 m	30	Female	14

Table-2:

Main themes	Sub-themes	Concepts
Divorces issues	Fear of disclosure	Secret divorce, secret the reason for divorce
Divorce push	Moving towards divorce	Divorce to save children from the mire, children urging to divorce, saving oneself
Divorce inhibitors	Fear of consequences	For the sake of children, low self confidence, concern for parents, fear of loneliness, not divorcing to keep one's face
	Lack of support	Financial dependence on husband and lack of supportive family
	Parent household problems	Parent household problems, concern for parents

INSTRUCTION TO AUTHOR (S)

Manuscripts should be concisely written and conform to the following general requirements: Manuscripts should be type written in double-space in A4 sized sheets, only on one side, with a 2 cm margin on both sides. Research Papers should have more than 15 pages, Review Articles in the range of 15-30 pages and Short Communications up to 15 pages, inclusive of illustrations. Pages should be numbered consecutively, starting with the title page and the matter arranged in the following order: Title page, Abstract, Introduction, Materials and Methods, Results, Discussion or Results and Discussion, Acknowledgements, References, Illustrations (Tables and figures including chemistry schemes along with titles and legends) and figure and Table titles and legends. Abstract should start on a separate page and each table or figure should be on separate sheets. The titles "Abstract" and "Introduction" need not be mentioned. All other section titles should be in capital letters while subtitles in each section shall be in bold face lower case followed by a colon.

Title Page - Title page should contain title of the paper in bold face, title case (font size 14), names of the authors in normal face, upper case (font size 12) followed by the address(es) in normal face lower case. The author to whom all correspondence be addressed should be denoted by an asterisk mark. The title should be as short as possible and precisely indicate the nature of the work in the communication. Names of the authors should appear as initials followed by surnames for men and one given-name followed by surname for women. Full names may be given in some instances to avoid confusion. Names should not be prefixed or suffixed by titles or degrees. Names should be followed by the complete postal address or addresses with pin code numbers of the place(s), where the research work has been carried out. At the bottom left corner of the title page, please mention "*Address For correspondence" and provide a functional e-mail address. Address of the corresponding author to whom all correspondence may be sent should be given only if it is different from the address already given under authors' names. Trivial sub-titles such as 'Title', 'Author', 'Address' or 'Place of Investigation' shall not be included in the title page. Title page should be aligned centre except for "* Address For correspondence". Provide a running title or short title of not more than 50 characters.

Abstract - Should start on a new page after the title page and should be typed in single-space to distinguish it from the Introduction. Abstracts should briefly reflect all aspects of the study, as most databases list mainly abstracts. Short Communications as well as Review Articles should have an Abstract.

Key-words - Provide four to ten appropriate key words after abstract.

Introduction - Shall start immediately after the Abstract, as the next paragraph, but should be typed in double-space. The Introduction should lead the reader to the importance of the study; tie-up published literature with the aims of the study and clearly states the rationale behind the investigation.

Materials and Methods - Shall start as a continuation to introduction on the same page. All important materials used along with their source shall be mentioned. The main methods used shall be briefly described, citing references. Trivial details may be avoided. New methods or substantially modified methods may be described in sufficient detail. The statistical method and the level of significance chosen shall be clearly stated.

Results - All findings presented in tabular or graphical form shall be described in this section. The data should be statistically analyzed and the level of significance stated. Data that is not statistically significant need only to be mentioned in the text - no illustration is necessary. All Tables and figures must have a title or caption and a legend to make them self-explanatory. Results section shall start after materials and methods section on the same page.

INSTRUCTION TO AUTHOR(S)

Discussion - This section should follow results, deal with the interpretation of results, convey how they help increase current understanding of the problem and should be logical. Unsupported hypothesis should be avoided. The Discussion should state the possibilities the results uncover, that need to be further explored. There is no need to include another title such as "Conclusions" at the end of Discussion. Results and discussion of results can also be combined under one section, Results and Discussion.

Acknowledgements - Should be given after the text and not in the form of foot-notes.

References - Should be numbered consecutively in the order in which they are first mentioned in the text (not in alphabetic order). Identify references in text, tables, and legends by Arabic numerals in superscript in square brackets. References cited only in tables or figure legends should be numbered in accordance with the sequence established by the first identification in the text of the particular table or figure. Use the style of the examples below, which are based on the formats used by the international journals. The titles of journals should be abbreviated according to the style used in international journals. Use complete name of the journal for non-indexed journals. Avoid using abstracts as references. Information from manuscripts submitted but not accepted should be cited in the text as "unpublished observations" with written permission from the source. Avoid citing a "personal communication" unless it provides essential information not available from a public source, in which case the name of the person and date of communication should be cited in parentheses in the text. For scientific articles, contributors should obtain written permission and confirmation of accuracy from the source of a personal communication. The commonly cited types of references are shown here, for other types of references such as electronic media; newspaper items, etc. please refer to ICMJE Guidelines (http://www.icmje.org).

Articles in Journals

1. Devi KV, Pai RS. Antiretrovirals: Need for an Effective Drug Delivery. Indian J Pharm Sci 2006;68:1-6.
   List the first six contributors followed by *et al.*
2. Volume with supplement: Shen HM, Zhang QF. Risk assessment of nickel carcinogenicity and occupational lung cancer. Environ Health Perspect 1994; 102 Suppl 1:275-82.
3. Issue with supplement: Payne DK, Sullivan MD, Massie MJ. Women's psychological reactions to breast cancer. Semin Oncol 1996;23(1, Suppl 2):89-97.

Books and other Monographs

4. Personal author(s): Ringsven MK, Bond D. Gerontology and leadership skills for nurses. 2nd ed. Albany (NY): Delmar Publishers; 1996.
5. Editor(s), compiler(s) as author: Norman IJ, Redfern SJ, editors. Mental health care for elderly people. New York: Churchill Livingstone; 1996.
6. Chapter in a book: Phillips SJ, Whisnant JP. Hypertension and stroke. In: Laragh JH, Brenner BM, editors. Hypertension: pathophysiology, diagnosis, and management. 2nd ed. New York: Raven Press; 1995. p. 465-78.

Illustrations: Tables - Should be typed on separate sheets of paper and should not preferably contain any molecular structures. Only MS word table format should be used for preparing tables. Tables should show lines

INSTRUCTION TO AUTHOR(S)

separating columns but not those separating rows except for the top row that shows column captions. Tables should be numbered consecutively in Arabic numerals and bear a brief title in capital letters normal face. Units of measurement should be abbreviated and placed below the column headings. Column headings or captions shall be in bold face. It is essential that all tables have legends, which explain the contents of the table. Tables should not be very large that they run more than one A4 sized page. Tables should not be prepared in the landscape format, i. e. tables that are prepared width wise on the paper.

Figures - Should be on separate pages but not inserted with in the text. Figures should be numbered consecutively in Arabic numerals and bear a brief title in lower case bold face letters below the figure. Graphs and bar graphs should preferably be prepared using Microsoft Excel and submitted as Excel graph pasted in Word. These graphs and illustrations should be drawn to approximately twice the printed size to obtain satisfactory reproduction. As far as possible, please avoid diagrams made with India ink on white drawing paper, cellophane sheet or tracing paper with hand written captions or titles. Photographs should be on glossy paper. Photographs should bear the names of the authors and the title of the paper on the back, lightly in pencil. Alternatively photographs and photomicrographs can be submitted as jpeg images. Figure and Table titles and legends should be typed on a separate page with numerals corresponding to the illustrations. Keys to symbols, abbreviations, arrows, numbers or letters used in the illustrations should not be written on the illustration itself but should be clearly explained in the legend. Avoid inserting a box with key to symbols, in the figure or below the figure. In case of photomicrographs, magnification should be mentioned either directly on them or in the legend. Symbols, arrows or letters used in photomicrographs should contrast with the background. Method of staining should also be mentioned in the legend.

Chemical terminology - The chemical nomenclature used must be in accordance with that used in the Chemical Abstracts.

Symbols and abbreviations - Unless specified otherwise, all temperatures are understood to be in degrees centigrade and need not be followed by the letter 'C'. Abbreviations should be those well known in scientific literature. *In vitro, in vivo, in situ, ex vivo, ad libitum, et al.* and so on are two words each and should be written in italics. None of the above is a hyphenated word. All foreign language (other than English) names and words shall be in italics as a general rule. Words such as carrageenan-induced inflammation, paracetamol-induced hepatotoxicity, isoproterenol-induced myocardial necrosis, dose-dependent manner are all hyphenated.

Biological nomenclature - Names of plants, animals and bacteria should be in italics.

Enzyme nomenclature - The trivial names recommended by the IUPAC-IUB Commission should be used. When the enzyme is the main subject of a paper, its code number and systematic name should be stated at its first citation in the paper.

Spelling - These should be as in the Concise Oxford Dictionary of Current English.

SHORT COMMUNICATIONS

The journal publishes exciting findings, preliminary data or studies that did not yield enough information to make a full paper as short communications. These have the same format requirements as full papers but are only up to 15 pages in length in total. Short Communications should not have subtitles such as Introduction, Materials and Methods, Results and Discussion - all these have to be merged into the running text. Short Communications preferably should have only 3-4 illustrations.

INSTRUCTION TO AUTHOR(S)

REVIEW ARTICLES

Should be about 15-30 pages long, contain up-to-date information, comprehensively cover relevant literature and preferably be written by scientists who have in-depth knowledge on the topic. All format requirements are same as those applicable to full papers. Review articles need not be divided into sections such as materials and Methods and Results and Discussion, but should definitely have an Abstract and Introduction, if necessary.

PUBLICATION FEE

To publish the paper in our journal author should be paid **Rs. 3000 (INDIA) USD 90 (Foreign Author)** in advance by money transfer or DD drawn in favour of TamilNadu Scinetific Research Organisation, Pudukkottai.*All correspondence relating to subscription and manuscript submission may be address to

Editor in Chief, Indian Journal of Natural Sciences
C/o Tamil Nadu Scientific Research Organization (TNSRO)
39,Mura Bhavan,Koodal Nagar,Rajgopalapuram Post
Pudukkottai -622003,TamilNadu,India Contact Nos: 04322-261088, 9952886637,9894217573
E.mail:ijonstnsro@gmail.com,editorijons@gmail.com
For open access please visit our official website : www.tnsroindia.org.in

BIOGRAPHY

Acharya Jagadis Chandra Bose

V.Bhuvaneshwari

Deapertment of Physics,JJ College of Arts and Science,Pudukkottai,TamilNadu,India.

Jagadis Chandra Bose, popularly known as J.C. Bose, occupies a unique position in history of modern Indian science. He is regarded as India's first modern scientist. But then it is also true that Bose was not the only pioneer of modern Indian science. Prafulla Chandra Ray (1861-1944), who established an Indian school of chemistry and a chemical industry, and Srinivasa Ramanujan (1887- 1920), the great mathematician, are equally familiar names in the annals of modern history of Indian science and who were Bose's contemporaries. It was Ramanujan, who was first elected as Fellow of the Royal Society, the ultimate recognition given by the British Scientific establishment. But then as one of Bose's biographers, Subrata Dasgupta, writes : "Bose was the first Indian to be admitted in person to the sanctum sanctorum of English, thus western science". In January 1897 Bose delivered a lecture at the Royal Institution, London, a Friday Evening Discourse, then most prestigious and visible platform for announcing new discoveries. It was Michael Faraday (1791-1867) who started the Friday Evening Discourse in 1826. Some of the most prominent British scientists worked in the Royal Institution and participated in these discourses. In this lecture Bose demonstrated his devices for the generation and detection of radio waves.
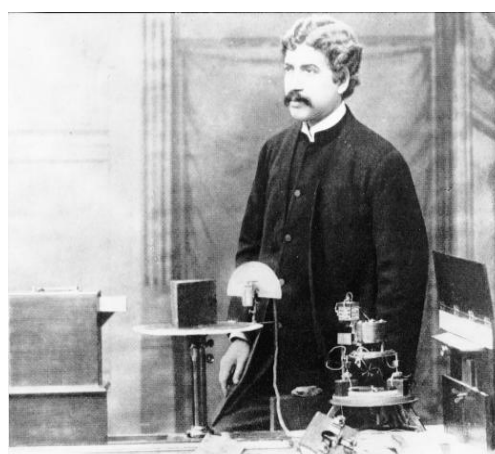
Bose did pioneering research, first in physics and then in physiology. In 1888 Heinrich Rudolf Hertz (1857-94) produced and detected electromagnetic waves in the 60 cm wavelength range and in doing so he verified James Clerk Maxwell's (1831-79) electromagnetic theory. However, Bose was the first to produce millimeter-length radio waves and study their properties. Bose also perfected the method of J.C. Bose Dream 2047 CMY transmission and of reception of electromagnetic waves. In recent years there has been welcome news of proper credit being given to Bose for his pioneering work in the area of wireless telegraphy. The Institute of Electrical and Electronics Engineers (IEEE) in one of their publications wrote : " Our investigative research into the origin and first major use of solid state diode detector devices led to the discovery that the first transatlantic wireless signal in Marconi's world-famous experiment was received by Marconi using the ironmercury-iron-coherer with a telephone detector invented by Sir J.C. Bose in 1898." Bose was a pioneer in microwave optics technology. He was the first to show that semiconductor rectifiers could detect radio waves. Bose's galena receiver was amongst the earliest examples of a lead sulphide photo conducting device.

3957

Bose's his theories about the relationship between living and non-living and plant's response to stimuli were not taken seriously in his time and even today some of his ideas have remained esoteric. However, as D.M. Bose, who succeeded Bose as Director of the ,Bose Institute has pointed out "his model of an electric eye which records with electric signals message received from outside world, his physical model of memory as a mechanism for storing information justified his being considered a precursor of the modern discipline of cybernetics." It is now recognised that Bose had made very significant contributions to the field of chronobiology and circadian rhythms even before these two technical terms were coined.Bose was the pioneer of experimental science in India. He was an inventor of the first order. He devised many sensitive instruments for his research both in physics and physiology.

Bose was a close friend of Rabindranath Tagore (1861-1941) and received much emotional support from him at difficult times. Before seriously taking up scientific investigation (1894), Bose spent many of his vacations visiting and photographing historic places of scenic beauty, armed with a full sized camera. Some of his experiences he wrote down in vivid Bengali prose. These,together with some of his other literary addresses and writings, were published in a volume called 'Abyakta'.Jagadis Chandra Bose was born in Mymensingh, in his mother's parental house, now in Bangladesh on 30th November 1858, the same year in which India, which was being administered by the East India Company since 1757, came directly under crown rule. Lord Canning, Governor General, as the East India Company's Chief Administrator of India used to be called since 1772 when Warren Hastings assumed the office, was proclaimed Viceroy. Bose's ancestral home was at the village named Rarikhal in Vikrampur, not far from Dhaka (then Dacca), the capital of present-day Bangladesh. His father Bhagaban(also spelt as Bhagwan) Chandra Bose served the British India Government in various executive d magisterial positions. At the time when Bose was born, Bhagaban Chandra was Deputy Magistrate of Faridpu and it is here Bose's early childhood was mainly spent.

Bhagaban Chandra was no ordinary government servant. To quote Patrick Geddes, who was Professor of Botany at St. Andrews University, and the author of one of the most authentic biographies of Bose : "Bose's father – Bhagaban Chunder Bose, Deputy Magistrate of Faridpur – was the active defender, not only of the townlet but of the scores of villages around as well. The modern magistrate is mainly settled between his courthouse and his home; but here in those days a man was needed, picked not only for judicial capacity, intelligence and local knowledge, but for active initiative and courage and thus prepared at any moment to assume command of his own police and his people as well, and be ready even to raid the raiders. Of this readiness various stories might be told. As a single example, hearing of a gang of dacoits in his neighourhood, Mr. Bose mounted an elephant and with the very few police available, rode straight into the very heart of the dacoits' camp.

Taken by surprise, they broke and scattered; the ready magistrate dropped down, captured the leader with his own hands, and took him back for trial." Bhagaban Chandra had kept in his household a dreaded ex-dacoit, whom he had earlier sentenced to imprisonment, to look after young Jagadis Chandra. Though Bhagwan Chandra served the British Government he was a staunch nationalist and also a dreamer. He undertook, not always with success, many educational, agricultural and technical projects aiming to provide employment and promote opportunities to his less fortunate countrymen. In 1869 Bose's father went to Burdwan as Assistant Commissioner.

Bhuvaneshwari

Here he opened workshops in carpentry, in metal turning in general metalwork and even a foundry. Bose was very much influenced by his father's ideals. While speaking at the fiftieth anniversary of the Exhibition and Mela founded by his father at Faridpur Bose said : "A failure ! Yes, but not ignoble nor altogether futile. And through Michael Faraday Heinrich Rudolf Hertz witnessing this struggle, the son learned to look on success or failure as one, and to realize that some defeat may be greater than victory. To me his life has been one of blessing, and daily thanksgiving. Nevertheless everyone had said that he had wrecked his life, which was meant for greater things. Few realize that out of theskeletons of myriad lives have been built vast continents. And it is on the wreck of a life like his, and of many such lives, that will be built the the greater India yet to be. We do not know why it should be so; but we do know that the Earth-Mother is always calling for sacrifice."

Bose started his education in a vernacular or Bengali School, a pathsala, which was founded by his father in Faridpur. It may be noted that Bhagaban Chandra could have easily sent his son to the local English School. However, he wanted his son to learn his mother tongue and know his own culture before he learned English and knew the foreign culture. In this Pathasala Bose studied with the children of peasants, fishermen and workers. In their company Bose imbibed a love of nature. Bose often attended Jatras (folk plays) in village fairs and which inspired him to read the great epics, Mahabharata and Ramayana. The character of Karna in Mahabharata influenced him deeply. To quote Bose: "From his (Karna's) low caste came rejection, came every disadvantage; but he always played and fought fair! So his life, though a series of disappointments and defeats to the very end – his slaying by Arjuna– appealed to me as a boy as the greatest of triumphs. I still think of the tournament where Arjuna had been victor, and then of Karna coming as a stranger to challenge him. Questioned of name and birth, he replies, "I am my own ancestor! You do not ask the might Ganges from which of its many springs itcomes: its own flow justifies itself, so shall my deeds me!' Further he wrote : "Like that of my boyhood's hero Karna, my life has been ever one of combat and must be to the last. It is not for man to complain of circumstances, but bravely to accept, to confront, and to dominate them."

In 1869 Bose was sent to Kolkata (then Calcutta), where after spending three months at the Hare School he was admitted in St. Xavier's College, which was both a secondary school and a college. This institute was founded by Belgian Jesuits in 1860. Here Bose came in contact with Father Eugene Lafont (1837-1908), who played an important role in developing a tradition of modern science in Kolkata. With Lafont's initiative St. Xavier's College put a special emphasis on science teaching. In 1875 he established a small astronomical observatory in the College. He was one of those principals who persuaded the Calcutta University to offer an undergraduate course in science.

Lafont also gave popular science lectures at the Indian Association for the Cultivation of Science, which was established by Mahendra Lal Sircar (1833-1904) in 1876. In fact, he was the first lecturer of the Association. Bose was very much influenced by Lafont. To quote Patrick Geddes: "All the pupils of Father Lafont, so long Professor of Physics in that College (St. Xavier's College), recall his teaching and influence as truly educative. His wealth of experiments and vivid clearness of exposition of them, made is class most interesting in the hole college; and his patient skill, his subtlety, as well as brilliance of experimentation, were appreciated by this young student above all. Here was Bose's first discipline towards that combination of intellectual lucidity with wealth of experimental devise and recourse by which he has all the more fully represented and honoured his old master by surpassing him."

Bhuvaneshwari

In 1879 Bose passed the BA examination in Physical Science Group of the Clacutta University. At the time of his graduation Bose did not have clear plan for his future career except that he wanted to go to England for higher training. However, his father's economic situation was far from satisfactory for this venture. His father'sinnovative schemes and investment had mostly failed and as a result he was burdened with debts. There were some projects which were successful but then Bose's father did not make profit out ofthem. For example the People's Bank, the forerunner of the later co-operative societies, started by his father was highly successful. Had Bose's father kept the shares that he had bought as its founder there would have been no financial difficulty.

But he had given away his shares to his poorer friends. Bose decided that his first duty was to earn money and help his father in paying off the debts. Following his father's example thenatural choice was to join the coveted Indian Civil Service. However, his father did not want his son to become a civil servant, which he thought would take his son away from the common people. In fact, his father wanted that his sonshould be helpful to the common man and which could not be done by becoming a civil servant in British India.

Finally it was decided that Bose would study medicine in some English University. In realizing this goal Bose faced two difficulties. First as stated above his father's financial condition was totally inadequate to support such expensive educational stay in England. What is more at that time Bhagaban Chandra was on two years' medical leave on reduced pay and he was not sure when his health would permit him to resume his duties with its full pay. His second difficulty was his mother's worry in sending him to unknown western world. In those days the sea-voyage was considered extremely dangerous. And she had lost her second son,aged ten and so she had become highly possessive of her only remaining son.

But when considering these factors Bose had decided to settle down in India, and see what he could do best, his mother Banasundari Davi, suddenly decided that his son should go to England as he had originally planned. She said: "My son, I cannot understand much of this going to Europe, but I see your heart's desire is to educate yourself to the utmost; and so I have made up my mind.You shall have your heart's desire. Though nothing is left of your father's fortune, I have my jewels; I have even some money of my own. Between these I can manage it. Go you shall". For a mother it was a courageous decision and India and Indians should be thankful to her. After his mother's consent his father also readily agreed. His objection was to becoming a civil servant and studying law. So selling her mother's jewels Bose sailed for England.

However, after a year's study he had to abandon his plan to study medicine because of the recurrence of a fever he had contracted earlier, and which exacerbated, by the odours of the dissecting rooms. In January 1882 Bose left London for Cambridge where he took admission in Christ's College to study natural sciences. His decision to join the Christ's College was influenced by the fact that his brother-in-law, Ananda Mohan Bose (1847-1906), had earlier studied there. Ananda Mohan, who took the Mathematics Tripos in 1874, was Cambridge's first Indian wrangler. Among Bose's teachers at Cambridge were: Lord Rayleigh, (1842-1919), Michael Foster (1836-1907), Sidney Vines (1849-1934) and Francis Darwin (1848-1925).

In 1884 Bose obtained a Bachelor of Arts with a second class in natural sciences tripos and in the same year he also obtained a Bachelor of Science from the University of London. After coming back to India he

joined the Presidency College at Kolkata in 1885. He was the first Indian to be appointed Professor of Physics in the Presidency College.

His appointment was strongly opposed by Sir Alfred Croft, then Director of Public Instruction of Bengal and Mr. Charles R. Tawney, Principal of the Presidency College. But Bose finally managed to get the appointment because of the intervention of Lord Ripon, then Viceroy of India. In getting his appointment Bose was helped by Professor Fawcett, the economist and then Postmaster-General of Britain. Fawcett was a friend of Bose's brother-in-law Ananda Mohan Bose. With Fawcett's letter of introduction Bose met Lord Ripon at Shimla. In those days, Simla used to be the summer capital of India. Ripon was very nice to Bose and he promised to nominate him for the Imperial Educational Service. But after coming to Kolkata when Bose met Croft he was not at all welcomed. Croft said : "I am usually approached from below, not from above. There is no higherclass appointment at presentavailable in the Imperial Educational Service, I can only offer you a place in the Provincial Service, from which you may be promoted." Bose did not accept the offer.

The Viceroy again wrote to the Government of Bengal asking explanation for the delay in appointing Bose. Finally Croft was forced to appoint Bose. In those days the Britishers thought that Indians were not capable of holding high post in educational service and thus Imperial Educational Service was out of their bound, howsoever qualified might they be. For example P.C. Ray, who returned from England with a PhD degree, could not make it to the Imperial Educational Service. He had to be content with the Provincial Service. Unlike in case of Indian Civil Service, which an Indian could join by passing the prescribed examination, the Imperial Educational Service was accessible only through nomination.

Though Bose, because of Lord Ripon's personal intervention, was given an appointment in the higher service he was taken on temporary basis with one-half of the pay attached to such an appointment. Bose protested and he asked for the same salary as an European was entitled to get. When his protest was not entertained he refused to accept his salary. He continued his teaching assignment for three years without any salary. Finally both the Director of Public Instruction and the Principal of the Presidency College fully realised the value of Bose's skill in teaching and also his lofty character. As a result his appointment was made permanent with retrospective effect. He was given the full salary for the last three years in lumpsum, which he used for paying off his father's debt.In 1894 on his thirty-fifth birthday Bose decided to pursue scientific research and not to be confined with teaching assignment alone. There was no laboratory or apparatus or peers.

He conducted his researches in a small 24 square foot room, which he was given in the Presidency College. With the help of an untrained tinsmith he devised and constructed new apparatus for his first research on electric radiation. Bose was inspired to study the properties of electric waves after reading Oliver Lodge's book Heinrich Hertz and His Successors. Bose devised and fabricated a new type of radiator for generating radio waves. He also built a unique and highly sensitive 'Coherer' or radio receiver for receiving radio waves. Bose's coherer was far more compact, efficient and effective than the ones used in Europe. It was Oliver Lodge who had devised an improved version of coherer inveted in 1890 by Eduard Branly (1846-1940) of France.

Though Branly invented the coherer but he did not conceive it as a detector, it was Lodge's contribution. Even the term 'coherer' was coined by Lodge. Branly had shown that metal fillings enclosed in glass

tubes with loose contacts form an insulator. Though the fillings themselves were good conductors, they would be highly resistant to small voltages. However, in the presence of Hertzian waves their resistance was enormously reduced or in other words they switched to a conducting state and they would remain in that state until shaken or tapped slightly. In the coherer developed by Lodge wires in contact with the fillings placed in a glass tube led out from the end of the tube and were connected in a series with a galvanometer. When there is a radiation, the fillings would switch to a conducting state and a current would be obtained and which will be detected by the galvanometer. Bose's receiver was a great advance on that of Branly and Lodge. In earlier versions the sensitivity varied and at times they behaved in an erratic manner. Bose replaced the irregular fillings by fine wire spiral springs.

They were fixed in ebonite and under control of a spring. Using his improved equipment Bose demonstrated various properties of radio waves like reflection, absorption, interference, double reflection and polarisaton. He also demonstrated a new type of radio waves as small as 1 centimeter to 5 millimeters. Such waves are now called microwaves, and are used in radars, ground telecommunication, satellite communication, remote sensing and microwave ovens. In May 1895, he read his first research paper before the Asiatic Society of Bengal 'On the polarisation of Electric Rays by Double Reflecting Crystals". In the same yearone of his papers titled "On the Determination of the Indices of Refraction of Sulphur for the Electric Ray" was communicated to the Royal Society of London by Lord Rayleigh. The paper was read before the RoyalSociety in December 1895 and it was accepted for publication in the Society's proceedings in January 1896. Bose's three articles were published in The Electrician of Friaday 27 December. These were probably the first papers to be published by an Indian in a western scientific periodical. It may be noted that in those days, The Electrician was amongst the most prominent periodicals devoted to electrical matters. In spite of the most adverse circumstances Bose succeeded just by his seer dedication and ingenuity.

The Royal Society of London not only accepted his paper for publication, also offered him financial help from their Parliamentary grant so that Bose could continue his researches. The University of London awarded him Doctor of Science (DSc) without any examination. Lord Kelvin congraturalted Bose by stating that he was "literally filled with wonder and admiration…for his success in the difficult and novel experimental problem". Marie Alfred Cornu (1841-1902), the former President of the French Academy of Sciences, wrote : "the very first results of your researches testify to your power of furthering the progress of science. For my own part, I hope to take full advantage of the perfection to which you have brought your apparatus, for the benefit of the Ecole Polytechnique and for the sake of further researches I wish to complete." Bose's sudden success in his research and its appreciation by leading scientists in England and other western countries had their impact in India. The attention of the Lieutenant-Governor of Bengal, Sir William Mackenzie, was drawn to Bose's work and he tried to improve the conditions under which Bose was working. A new post with higher emoluments, with more initiative and with reasonable leisure for research' was created for Bose. However, this appointment was cancelled because of Bose's refusal to support the official line in a meeting of the Calcutta University, of which he was a Fellow.

After failing to overcome the opposition of the Education Department in giving sanction to the new appointment the Lieutenant Governor decided to reimburse the expenditure incurred by Bose in carrying out his researches. However, Bose refused to accept the grant for his past work. But he accepted the Government's annual grant of Rs. 2500/ - (£166) for his future research work at the Presidency College. At the initiation taken by William Macknzie, the Education Department agreed to send Bose on deputation

to England for six months. And he sailed for England on 24th July 1896. He gave a lecture-cumdemonstation on his new findings on radio waves at the meeting of the British Association for Advancement of Science at Liverpool. Among those present were Sir James Johnson Thomson (1856-1940), Oliver Lodge and Lord Kelvin. It was Bose's first interaction with the English scientists after his success in research.

The assembled scientists were highly impressed by Bose's presentation. Lord Kelvin climbed upto the ladies' gallery to congratulate Mrs. Abala Bose on her husband's brilliant work. He was also invited by the Royal Institution to deliver a Friday Evening Discourse. It was a great honour. The Government of Idia extended his deputation for another three months for the preparation of the lecture. He delivered his Friday Evening Discourse on 19th July 1897. The title of the lecture was 'On the polarization of Electric Rays". More than five hundred people including Oliver Lodge, James John Thomson and Lord Kelvin had assembled to hear Bose. The lecture was not only praised but it was considered valuable enough for publication in the Transactions of the Royal Society. Bose's fame spread quickly to the neighbouring countries, France and Germany. He was invited by Physical Society of Paris and leading physicists of Berlin to explain his results.

Bose's peers in England were highly impressed by his achievements and they wanted to help improve the conditions under which Bose was working. He had no proper laboratory for carrying out his research work. Lord Kelvin wrote to Lord George Hamilton, then Secretary of State: "It would be conducive to the credit of India and the scientific education in Calcutta, if a well-eqipped Physical Laboratory is added to the resources of the University of Calcutta in connection with the Professorship held by Dr. Bose." Lord Kelvin's letter was followed by a letter jointly signed by a number of eminent scientists including Lord Joseph Lister (1827-1912), then President of the Royal Society, Professor Fitzerland, Sir William Ramsay, Sir George Gabriel Stokes (1819-1902) and many others.

This communiqué stated: "to the great importance which we attach to the establishment in the Indian Empire of a Central Laboratory for advanced teaching and research in connection with the Presidency College, Calcutta. We believe that it would be not only beneficial in respect of higher education, but also that it would largely promote the material interest of the country; and we venture to urge on you the desirability of establishing in India a Physical Laboratory worthy of that great Empire." The Secretary of State not only sent the letter to the Government of India but he also endorsed the proposal by stating that `being of opinion that the question of establishing an institution of the kind mentioned is deserving of consideration by Your Excellency in Council.' Though the then Viceroy Lord Elgin informed Bose that the government would beinterested in his project but the concerned government department finally decided that though the project was important but it might be postponed for future. The foundation of such a laboratory was laid in 1914, just one year before Bose's retirement.

Bose was very much against in patenting his invention. He had resolved not to seek any personal advantage from his invention. He pursued science to only for itself but for its application to the benefit of mankind. In his Friday Evening Discourse at the Royal Institution, London, he made public his construction of the coherer. Thus The Electric Engineer expressed 'surprise that no secret was at any time made as to its construction, so that it has been open to all the world to adopt it for practical and possibly moneymaking purposes." In 1901, one of the great manufacturers of wireless apparatus, approached Bose for signing a remunerative agreement as to his new type of receiver. However, Bose declined the offer.

Bhuvaneshwari

One of his American friends, Sara Bull (also known as Mrs. Ole Bull), was able to persuade Bose to file a patent application for his galena receiver. The application was filed on 30 September 1901 and it was granted on 29 March 1904 (US patent No. 755,840). However, Bose refused to accept his rights and allowed to lapse the patent.

At the Physical Section of the British Association's meting at Bradford, England in September 1900 Bose read a similar paper. Here also his ideas were widely appreciated by the physicists. After the Bradford meeting Bose fell ill and he was confined for two months. On recovery, he was invited by his old friends and teachers. Lord Rayleigh and Sir James, Dewar (1842-1923) to work at the Davy-Faraday Laboratory of the Royal Institution. Bose delivered his second Friday Evening Discourse at the Royal Institution on May 10, 1901. This time on his research on the responses to living and non-living. The lecture was highly appreciated. Bose's ideas were first opposed by John Burdon Sanderson and Augustus Waller, the two eminent plant physiologists on June 6, 1901 when Bose read his paper at the Royal Society. Following their criticism the Royal Society did not publish this paper. Bose decided to prolong his stay at London to conduct experiments to prove his theory. Somehow he managed to get his deputation extended. After his two year stay Bose decided to come back India though he was offered a job at a British University.

After coming back to Kolkata Bose continued his work on the responses living and non-living and the physiological properties of plant tissues and the similarity of their behaviour with that of animal tissues. He presented the results of his investigation in the form of monographs.Bose demonstrated that plant tissues under different kinds of stimuli like mechanical, application of heat, electric shock, chemicals and drugs, produce electric response similar to that produced by animal tissues.

He also tried to demonstrate that similar electric response to stimulation could be noticed in certain inorganic systems. For his investigations Bose invented several novel and highly sensitive instruments. Among these the most important one was the Crescograph -an instrument for measuring the growth ofa plant. It could record a growth as small as 1/100,000 inch per second. Bose's experiments on plants were mostly performed on Minosa pudica and Desmondium gyrans (Indian Telegraph plant). In all his investigations Bose attempted to offer original interpretations. He attempted to devise models whichwere illustrative of physical basis of memory. His findings subsequently influenced subjects like physiology, chronobiology, cybernetics, medicine and agriculture .

Bose retired from educational service as Senior Professor of Physics in 1915. In fact he was to retire in 1913, on the completion of his fifty-fifth year, as per Government rules of those days. However, the Government of Bengal, in recognition of his service to the Presidency College and of his scientific achievements, extended his period of service for two years. After his retirement the Government also made him Professor Emeritus on full pay instead of pension. And this way he remained permanently connected to the Presidency College. Even after his retirement his researches were not interrupted. He continued his plant physiological investigation in a small laboratory set up in his own house. In the meantime he was also working towards the establishment of a research institute. The foundation ceremony of this institute took place on 23rd November 1917. Bose was able to collect about Rs. 11 lakhs for its endowment, in this effort he was greatly helped by his friend Rabindranath Tagore. Bose became its lifetime director. His inagural speech summerising the ideals that led him to establish the institute was really inspiring.

Bhuvaneshwari

Bose's inaugural speech produced a profound impression both in India and abroad. One of London's leading newspapers, The Times wrote : "To bringing about the scientific renaissance (In India) Sir Jagadis had influentially contributed. Indians are justly proud of the possession of a few men who have gained world-wide reputation in their particular fields of activity, and this pride reacts strongly on public opinion. At the Research Institute a group Indian post-graduate students devote their lives to research. The published Transactions of the Institute show that under the leadership of this eminent Bengali, Indianresearch is making substantial contribution to scientific knowledge, that in this field there is no fundamental difference between the Western and the Eastern mind, as was assumed when Sir Jagadis began his work". The Athenaeum wrote : "The foundation of an Institute for research in pure science is an event in the history of India. The publication of the Transactions, the first fruits of its activity, shows that it is an event also in the history of science."

I dedicate to-day this Institute – not merely a Laboratory but a Temple…The advance of science is the principal object of this Institute and also diffusion of knowledge. We are here in the largest of all the many chambers of this House of Knowledge – its Lecture Room. In adding this feature, and on a scale hitherto unusual in a Research Institute, I have sought permanently to associate the advancement of knowledge with the widest possible civic and public diffusion of it; and this without any academic limitations, henceforth to all races and languages, to both men and women alike, and for all time coming.

The lectures given here will not be mere repetitions of second-hand knowledge. They will announce, to an
audience of some fifteen hundred people, the discoveries made here, which will be demonstrated for thefirst time before the public. We shall thus maintain continuously the highest aim of a great seat of learning by taking active part in the advancement and diffusion of knowledge. Through the regular publication of the Transactions of the Institute, these Indian contributions will reach the whole world. The discoveries made will thus become public property. Besides the regular staff there will be selected number of scholars, who by their work have shown special aptitude, and who would devote their whole life to the pursuit of research. They will require personal training and their number must necessarily be limited. But it is not the quantity but quality that is of essential importance. It is my further wish that, as far as the limited accommodation would permit, the facilities of this Institute should be available to workers from all countries. In this I am attempting to carry out the tradition of my country, which, so far back as twenty-five centuries ago welcomed all scholars from different parts of the world within the precincts of its ancient seats of learning at Nalanda and at Taxila…

In 1903 Bose was honoured with Commander of the Order of the Indian Empire (CIE) at Delhi by the British Government. He received in 1912 the Commander of the Star of India (CSI) at the Coronation of the British Emperor. He was knighted by the British Government in 1916. Bose was elected a fellow of the Royal Society (FRS) of London in 1928. Bose died on 23 November 1937 at Giridih in Bihar. We would like to end this article by quoting Geddes : "The life-story of Jagadis Bose is worthy of close and ardent consideration by all young Indians whose purpose is shaping itself towards the service of science or other high cause of the intelligence or social spirit. It is possible that looking upon the triumph of the end and knowing nothing of the long uphill road, the slow costly attainment of ends, they may think that a fine laboratory or other material endowment the antecedent condition of successful achievement in intellectual creation. The truth indeed, is far otherwise.

Bhuvaneshwari

The countless obstacles which had to be surmounted only called forth in Bose all the endurance and all the effort which are latent in manly natures, welding them to the fullest strength of character and intensity of thought by which alone a great life-task can be accomplished. In contemplating the great career of his fellow countrymen, the young India will be stimulated to put brain and hand to fine tasks, nothing fearing. Thus will he be inspired not only to recover the noble intellectual tradition of the Indian past, but to restate these traditions in modern times and find the greatest challenge for mind and soul in achieving their vital relation with the coming age."

Books written by Bose

1. Response in the Living and Nonliving, Longmans, Green & Co., London, 1902.
2. Plant Response as a Means of Physiological Investigations, Longmans, Green & Co. London, 1906.
3. Comparative Electro-Physiology, Longmans, Green & Co. London 1907.
4. Reserches on Irritability of Plants, Longmans, Green & Co. London 1913
5. Collected Physical Papers, Longmans, Green & Co. London 1920.
6. Plant Autographs and Their Revelations. The Macmillan Company, New York, 1927.
7. Abyakta (in Bengali) Bangyia Vigyan Parishad, Calcutta, 1921
8. Physiology of Ascent of Sap, Longmans, Green & Co. London 1923
9. Letters to Rabindranath Tagore (in Bengali Patrabali), (edited & annotated by D.Sen). The Bose Institute, Calcutta, 1994.

RESEARCH ARTICLE

Investigate the Effect of Attribution Retraining and Rhythmic Movements Training on the Recovery of the Visual Memory of the Students in Rural Regions

Farzane Saneie[1]*, Hossein Kareshki[2] and Ali Ghanaie Chamanabad[2]

[1]M.A in Educational Psychology, Ferdowsi University of Mashhad, Mashhad, Iran.
[2]Department of Educational Psychology, Ferdowsi University of Mashhad, Mashhad, Iran.

*Address for correspondence
Farzane Saneie
M.A in Educational Psychology,
Ferdowsi University of Mashhad,
Mashhad, Iran.
E-mail: farzane.saneie@gmail.com

ABSTRACT

The purpose of the present study is to investigate the effect of attribution retraining and rytmic movements Training on the Recovery of the visual memory of the students in rural regions in Iran. The study had a pretest-posttest quasi-experimental design with 45 subjects randomly assigned to one control and two experimental groups. The Wechsler Intelligence Scale for Children-Revised (WISC-R) and Colorado Learning Difficulties Questionnaire (CLDQ) were given before the start of the study. Moreover, in the pretesting phase, a researcher-made spelling test was administered to the subjects of the study. The subjects in the first experimental group were given attribution retraining for 8 sessions along while the second experimental group was was given rhythmic movements training for 8 sessions. The cross-comparison of the 3 groups showed that there was a statistically significant difference among them in the reduction of the visual memory errors which had the highest frequency among the errors observed. Moreover, the results obtained showed that there was no significant difference between the two treatment methods used in the two experimental groups, attribution retraining and rhythmic movements Training.

Key words: attribution retraining, rhythmic movements training, visual memory.

INTRODUCTION

Learning and literacy are the most significant cultural and civil needs of contemporary man in general, and of people in countries like Iran, in particular. These countries should put a special emphasis on education, knowledge, and wisdom of their people in order to achieve national development (Ghanaie, 2008). In general, all people, both ordinary people and those with learning disorders, should be provided with enough opportunities to flourish their abilities (Ghanaie, 2008). Learning disabilities includes a wide range of academic problems, the thorough understanding of which necessitates a closer focus on social, emotional and behavioral domains of childhood life.(Aslani,Alizade,Ebrahimi & Farrohi, 2013). The term learning disorder refers to a unitary concept or a failure in academic or school achievement. This disorder has a heterogeneous nature reflected in one's achievement patterns, strengths and weaknesses in data processing, and classification systems as academic problems in a special area like reading (dyslexia) or writing (dysgraphia) disorders. (Casey, 2012). The field of learning disorders has a special importance, with a combination of old and new theories and ideas. Although it has recently entered normal educational curriculums (programs), it has been present in the field of special education in general, and education of retarded students in particular (Jalil Abkenar, Ashuri, 2014). One of the forms of learning disabilities is Writing Disorder. Although students suffering have a normal intelligence, because of Central Nervous System Dysfunction, their writing skill is lower than what is expected of students of their age (Givon, 2013). It has been reported that illegible handwriting, spelling problems, and composition disabilities accounted for 1.3-2.7, 3.7-4,and 1-3 percentage of observed disorders, respectively. The main causes mentioned in the literature for spelling difficulties include: lack of accuracy, weakness in fine motor skills (dexterity), difficulties with visual perception of letters and words, weakness of visual and auditory memory, difficulty to transfer information from sense channel (mode) to another and the abstractness of topics in spelling tasks. The student must learn to establish a relationship between the sound s/he hears and the letter s/he writes down (Seyfenaraghi, 2002). The findings so far indicate that people suffering learning disabilities show the following features: low frustration tolerance, poor self esteem, low morale, and deficit in social skills, impaired academic achievement, increased school dropout and poor vocational achievement (Efstratopoulou, 2012). Therefore, it can be claimed that the important factors causing learning disabilities have different physical, emotional and cognitive components that may be observed in intelligent children. The majority of the treatments provided to help children with these disorders focus on one dimension. What is needed seems to be a treatment approach in which there is a simultaneous attention to cognitive, motivational, physic al and emotional factors.

The following results were obtained after the spelling (orthographical) problems of 40 fifth graders of primary schools were analyzed:

As shown in the above table, accuracy and visual memory are the most important causes of orthographical problems. (According to the data misspelling due to visual memory and accuracy has the most frequency among other misspelling.)

Because visual memory is the main cause for the students' misspellings, an attempt was done in the present study to help students in rural deprived areas improve their spelling ability through using a cognitive-motivational treatment. The findings of the present study can be of great use for school teachers, educational and rehabilitation center's co-workers and school counselors and parents. More specifically, the purpose of the present study was to investigate the effect of attribution retraining and rhythmic movement training on improving the visual memory of the students. As a result the following hypotheses were made:

-Attribution retraining has no significant effect on improving students' visual memory.

-Rhythmic movements training have no significant effect on the recovery of visual memory.

Farzane Saneie *et al.*

- There is a statistically significant difference between these two methods in terms of their effects on students' spelling ability.

METHODS

The present study was an applied pretest-posttest quasi-experimental one with a control group. The treatment provided to two experimental groups is considered the independent variable which has two forms: attribution retraining and rhythmic movement training. The dependent variable is the improvement of the visual memory of the students in 3 groups (two experimental and one control group) measured through the spelling tests administered before and after the treatments given to the two experimental groups. The statistical population of the present study included all male fifth graders with spelling disorders registered in the Center for Remedial Instruction of the Students with Special Learning Disabilities in 2013-14.

Some 45 fifth graders were included in the sample of the study. The subjects of the study were selected on a purposive random sampling procedure from among students with learning problems registered in Jovein Educational center for students with special learning problems. More specifically, in a meeting with parents of the students, the purpose of the study along with its procedures was explained, then, 45 students, all of whom went to school in poor, deprived and less developed regions, were selected from among those willing to participate in the study. All the teachers participating in the study were similar in terms of work experience and teaching methodology. The following instruments were used in the present study:

The Wechsler intelligence scale-fourth edition (WISC-IV): The Wechsler intelligence scale-fourth edition is an update of Wechsler intelligence scale for children. Wechsler test was translated, adjusted with children and normalized by Abedi, Sadeghi and Rabiee with the financial support of the department of education of Chahar Mahale Bakhtiari. The final reliability coefficients reported for the subtests of this test through Cornbrash's Alpha and split-half method were 65%- 92% and 76%- 91%, respectively. The high correlation observed between the subtest scores and the total test scores shows the suitable validity of this test. The reported validity indexes for this test ranged between .66 to .92 (Sharifi, Rabiei, 2013).

Colorado learning difficulties questionnaire (CLDQ): This questionnaire was designed to identify children with learning disabilities by Wilkie et al. this questionnaire, with desirable psychometric properties, relates learning problems to five major causes: reading, arithmetic calculation social awareness (understanding), social anxiety and educational facilities. The present questionnaire which has twenty items was administered to the parents.

A Researcher-made spelling test: this spelling test was made by a group of five teachers of the fifth grade of primary school. The test contained sentences with common spelling problems made by fifth graders. The reliability of the test was estimated by test-retest method. Moreover, the validity of the test was confirmed by seven experienced and knowledgeable primary school teachers.

The subjects of the study were randomly assigned to the control and experimental groups. The subjects of each experimental group received 8 2-hor-long sessions in a period of 2 months. More specifically, the subjects in the first experimental group received 8 sessions of attribution retraining while those in the second group received rhythmic movement training for 8 sessions.

Farzane Saneie *et al.*

The present Study's finding

SPSS was used for the descriptive and inferential statistical analysis of the data. First, the gathered data were described using frequency, percentage, mean, and standard deviation. Then, some statistical tests including one-way anova, monova, chi-square, and Tukey test were run on the described data.

First hypothesis: attribution retraining has a positive effect on improving students' visual memory.

There was a statistically significant difference between the two groups (attribution retraining and control) in terms of visual memory average scores (p<0.001) in that visual memory mean score in attribution retraining is significantly higher than that of the control group. In other words, fifty five percent of the observed variance in the experimental group was due to the independent variable (attribution retraining). According to effectiveness of chi Eta 50.3 percent changes due to attribution retraining.

Second hypothesis: rhythmic movement training has a positive effect on improving students' visual memory.

There was a statistically significant difference between the visual memory mean scores of the control group and the rhythmic-movement-training group at p<0.007 significance level. That is, the mean score of the visual memory in the rhythmic movement training group was higher than that of the control group. More specifically, considering the size of the Etha square, it seems that some 28.8 percent of the observed variance in the experimental group was due to the rhythmic movement training.

Third hypothesis: there is a statistically significant difference between the extend of the effect of the two treatment methods, attribution training and rhythmic movement training, on the improvement of the visual memory of the students.

After the treatment, the number of visual memory-based misspelling problems in both experimental groups (attribution retraining and rhythmic movement training) was meaningfully lower than that in the control group (p<0.01). Moreover, there was no statistically meaningful difference between the two experimental groups in terms of the number of visual memory-based misspelling problems (p=0.199).

DISCUSSIONS AND CONCLUSION

The present study was conducted to investigate the effect of attribution retraining and rhythmic movement training on improving students' visual memory. The findings of this study showed that these two methods, attribution retraining and rhythmic movement training, along with other special training techniques used The Center for Remedial Instruction of the Students with Special Learning Disabilities, could have some positive effect on improving the visual memory scores of the subjects and thus decrease the number misspelling problems they had.

The results indicated that there was a statistically significant difference between the visual memory mean scores of the subjects in the attribution retraining and rhythmic movement training groups, on the one hand, and that of the control group, on the other hand (p<0.001). The results obtained in the present study were congruent with those obtained by several other researchers including Soleyman Nejad and Shahraray (2000). In their study, they showed that when students realized that the success factors were internal to them, they were more likely to experience higher school achievements because they had higher expectations of themselves. Moreover, Tolland and Bolin, in their study, showed that attribution retraining led to higher levels of school achievement. The findings of this study are, also, compatible with the findings of Jennifer el and Kopper' s study(2013) on the effectiveness of rhythmic movement on the performance of students with learning disabilities. They concluded that rhythmic movement, as a

treatment technique, is comparable to the common play therapy programs. In the same vein, Ghanaeie and Kareshki (2011) in their study concluded that rhythmic movement can improve the school performance of the students, and can increase their intellectual and cognitive abilities. In the present study, the subjects in all of the three groups were of the same level of age, sex, educational level, language and culture; they have normal IQ, and received the normal instruction for the fifth graders in the school curriculum of Iran. The usual teaching methods for normal children are not suitable for children with learning disabilities in that they suffer some form of retardation (Balooti, Bayati & Alimoradi, 2012). The findings of the present study showed that these two therapy methods, attribution retraining and rhythmic movement training, could be used as appropriate methods to improve the visual memory of the students. The most remarkable finding of this study was the significant reduction in visual memory-based misspelling problems which are the most frequently occurring types of spelling problems among students. The findings of this study are in agreement with theoretical underpinnings of attribution theory and brain flexibility theory. It seems very useful to incorporate these two therapy methods along with other neuro-psychological, and motivational factors into the teaching approaches for students with learning disabilities so that more stable and consistent advances could be made in this field.

REFERENCES

1. Aslani , j.,Ebrahimi ghavam abadi., s., & Farrokhi., n. (2013). Effect of combined application of psychological - a pessimistic explanatory style training to students with learning disabilities . Journal of learning disabilities, 2 (1), 6-24.

2. Balouti, Alireza., Bayat, Mohammad Reza. & Alimoradi, Mahnaz. (2012). Relationship between visual perception and reading disability in primary students (first, second, third grade) of Ahwaz city. Intrnational research journal of applied and basic sciences, 3(10), 2091-2096.

3. Casey. J. (2012). A Model to Guide the Conceptualization. Assessment, and Diagnosis of Nonverbal Learning Disorder. Canadian Journal of School Psychology, 27(1). 35-57.

4. Efstratopoulou, M., Janssen, R., & Simons, J. (2012). Differentiating children with Attention Deficit/ Hyperactivity Disorder, Conduct Disorder,Learning Disabilities and Autistic Spectrum Disorders by means of their motor behavior characteristics. Research in Developmental Disabilities, 33(9), 193- 204.

5. Ghanaie chman abad, A., Garosi farshi, T., Ashayeri, H., Babapoor, J., & Moghimi, A. (2009). Effects of rhythmic movements training on working memory numerical of students with specific learning disorders . Studies of Psychology University of Mashhad. 149-165.

6. Ghanaie chman abad, A., & Kareshki , H. (2012). Impact dance exercise on concrete intelligence preschool children. Journal of clinical psychology and consulting research,1(1), 167-178.Givon , S (2013) . Using Figurative Language to Assess the Stage of Acceptance of Learnin Disability as a Springboard for Treatment of Students with Learning Disabilities. Creative Education. 4 (6) ,376-387.

7. Jalil abkenar, s.,& Ashori, m. (2014). The applications for teaching students with learning disabilities. Journal of exceptional education, 13(3), 31-40.

8. Jennifer L. Couper, MS. (2013). Dance Therapy Effects on Motor Performance of Children with Learning Disabilities. Physical therapy, 61, 23- 26.

9. Semrud–clikeman, M., & Ellison, P. A. T. (2009). Child neuropsychology (assessment and intervention for neurodevelopmental disorders). Springer press.

10. Seyf naraghi, m., & Mirmahdavi, R. (1999). Compare writing patterns in male students with dyslexia and dysgraphia the fourth and fifth grade. Research in the field of gifted children, 3(1), 75-92.

11. Soleyman nejad, a., & Shahraray, m. (1997). Connection between control and self-regulation and academic achievement . Journal of Psychology and Educational Sciences, 31, 175-198.

12. Tajik, s., Adel ghahraman, m.,Tahaie, a., Haji abolhasan, f., Jalilvand karimi, l., & Jalili, sh. (2013). Auditory temporal processing deficit in students with reading and writing problems . Journal of Audiology, 21(4), 73-86.

13. Toland, J., & Boyle, Ch. (2011). Applying cognitive behavioural methods to retrain children's attributions for success and failure in learning. School psychology international, 29, 286-302.

Table 1. Frequency misspelling (the percentage of different orthographical problems)

rank	Kind of misspelling	Percent
1	**Visual memory**	**41.13%**
2	**Accuracy**	**33.47%**
3	**Auditory sensitivity**	**7.87%**
4	**Visual sequences**	**7.87%**
5	**Education**	**5.57%**
6	**Insufficient writing**	**2.26%**
7	**Auditory memory**	**0.76%**

Table 2. The means and standard deviations of visual memory in the attribution retraining, and control groups

variable	Group	number	Pre-test		Post-test		The difference of pretest and posttest	
			Mean	standard deviation	Mean	standard deviation	Mean	standard deviation
Visual memory	attribution retraining	15	9.26	1.48	1.20	0.774	8.06	1.53
	Control	15	9	1.46	4.86	2.32	4.13	2.41

Table 3. The comparison of visual memory according to group

Dependent variable	Sum of squares	Degree of freedom	Mean square	Statistic f	Degree of probability	Eta square	Test power
Visual memory	116.03	1	116.03	28.33	<0.001	0.503	0.999

Farzane Saneie *et al.*

Table 4. The means and standard deviations of visual memory in the rhythmic movement training and control groups.

variable	Group	number	Pre-test		Post-test		The difference of pre-test and post-test	
			Mean standard deviation		Mean standard deviation		Mean standard deviation	
Visual memory	Rhythmic movement training	15	9.33	2.02	2.53	1.40	6.80	1.89

Table 5. The comparison of visual memory according to group

Dependent variable	Sum of squares	Degree of freedom	Mean square	Statistic f	Degree of probability	Eta square	Test power
Visual memory	53.33	1	53.33	11.30	<0.002	0.288	0.901

Table 6. The means and standard deviations of visual memory in the attribution retraining and rhythmic movement training groups

Variable	Group	number	Pre-test		Post-test		The difference of pre-test and post-test	
			Mean standard deviation		Mean standard deviation		Mean standard deviation	
Visual memory	attribution retraining	15	9.26	1.48	1.20	0.774	8.06	1.53
	Rhythmic movement training	15	9.33	2.02	2.53	1.40	6.80	1.89

Table 7. Pairwise comparison of the improvement of visual memory in attribution retraining, rhythmic movement training and control groups

The target group	Groups for comparison	Difference in mean	Degree of probability
Attribution retraining	Rhythmic movement training	1.26	0.199
	Control	3.93	<0.001
Rhythmic movement training	Control	2.66	0.002

RESEARCH ARTICLE

Evaluation Ofyield and Yield Componentsof Five Sunflower Genotypesunder Different Irrigation Treatments

Sina Mohammadi Aghdam[1]*, Bijan Kahrariyan[2] and Farideh Samadiyan[3].

[1] M.S. Plant Breeding, Faculty of Agriculture, University of Tabriz, Tabriz, Iran.
[2]Department of Agriculture, Miandoab Branch, Islamic Azad University, Miandoab, Iran
[3]M.S. Agronomy. Faculty of Agriculture, University of Azad Islamic Naragh, Iran.Young Researchers Club. .

*Address for correspondence
Sina Mohammadi Aghdam
M.S. Plant Breeding, Faculty of Agriculture,
University of Tabriz,
Tabriz, Iran.
E-mail: Sinaghdam@gmail.com

ABSTRACT

In order to study evaluation ofyield and yield componentsof five sunflower genotypesunder different irrigation treatmentsa study was conducted in experimental field of Kermanshah province in 2014. The main plot factor (stress treatment) included four levels (80, 130 and 180 mm evaporation from class A pan) and the sub-plot factor (genotypes) included Master, Lakomka, Euroflour, Hysun 33 and Azargol. Results showed that water deficit caused a significant reduction grain yield. The highest meantraits wereindrough stress treatmentson80 mm andthe lowest 180 mm evaporation from class A pan.Thehighestand the lowestgenotypes treatmentstraitsrespectivelywere in AzargolandLakomka. Therefore water could play a key role in yield and yield components of this plant.

Key words: Genotypes, Sunflower, Seed yield and Water stress.

INTRODUCTION

Adequate water and nutrient supply are important factors affecting optimal plant growth and successful crop production. Water stress is one of the severe limitations of crop growth especially in arid and semi-arid regions of the world as it has a vital role in plant growth and development at all growth stages. However, depending upon plant species, certain stages such as germination, seedling or flowering could be the most critical stages for water stress. Seed germination is first critical and the most sensitive stage in the life cycle of plants (Ashraf &Mehmood, 1990) and

the seeds exposed to unfavorable environmental conditions like water stress may have to compromise the seedlings establishment (Albuquerque &Carvalho, 2003).

Sunflower being an oil seed crop is particularly susceptible to water shortage at germination stage. El-Midaouietal., (2001) reported decrease in percent germination and biomass accumulation in sunflower with increasing osmotic stress in germinating media whereas mean germination time increased with increasing water deficit. Moreover, different genotypes of sunflower showed differential responses to all these stress treatments. Lenziet al., (1995) reported that mutant seeds of sunflower showed a higher resistance to osmotic stress, i.e., germinating at more negative osmotic potentials. Germination of sunflower was inhibited in presence of polyethylene glycol -6000, at osmotic pressure lower than -5 bars (Smoket al., 1993). The adverse effects of water shortage on germination and seedling growth had also been well reported in different crops such as wheat (Dhandaet al., 2004), sugar beet (Sadeghian&Yavari, 2004), sorghum (Gill et al., 2002), and sunflower (Mohammad et al., 2002).

Sunflower (Helianthus annuusL.) due to its significant share in vegetable oil production of Pakistan has emerged as an economically important crop of the country. But limited rainfall or shortage of water for irrigation during the growing season constraints its seed yield with significant reductions. Therefore, growing of drought tolerant cultivars will contribute to more stable sunflower production and the screening of the response of sunflower cultivars or breeding lines to drought stress can play a crucial role in breeding programmers. However, difficulties like uncontrolled climatic conditions, insufficient homogeneity of soil, large amount of plant material and time and labor consumption make field trials difficult for drought screening of genotypes. In this study, it was attempted to identify the of four sunflower cultivars to water deficit through evaluating the effects of water deficit on phenology, grain yield and yield components and to determine the role of water supply in improving the yield during these stages.

MATERIALS AND METHODS

The study was carried out as a split-plot experimentbased on a Randomized Complete Block Design with threereplications at Kermanshah (latitude 47°03′N, longitude 34°18′E, altitude 1360 m above sea level) province, Iran in 2014. The experimental design was factorial based on randomized completely block design in three replications. The climate of research area is characterized by mean annual precipitation of 270 mm, mean annual temperature of 9°C, mean annual maximum temperature of 15 °C and mean annual minimum temperature of 2.2°C. The soil is sandy loam with EC of 0.4 ds m-1, pH of 8 and field capacity of 29.5%.

The main plot factor (stress treatment) included four levels (80, 130 and 180 mm evaporation from class A pan) and the sub-plot factor (cultivars) included Master, Lakomka, Euroflour, Hysun 33and Azargol. Before planting, the field was fertilized as recommended according soil test. In this study, each sub-plot had 4 rows with in-row spacing of 60 cm, length of 5 m and an area of 12 m2. After planting, the field was irrigated once every 4-7 days up to plants establishment and then, it was carried out up to the end of season on the basis of 80 mm evaporation from the class A evaporation pan. In the stress treatment, the irrigation was stopped after 80-180 mm evaporation from the evaporation pan. The sampling was carried out at different stages. At harvest time, the traits measured included 1000-grain weight, biological yield, harvest index and grain yield. The data were statistically analyzed and the significant means were compared by Duncan's multiple range test (DMRT) at 5% probability level using the software MSTATC and Excel.

RESULTS AND DISCUSSION

Seed number: The analysis of variance of data showed that significant effects of irrigation, and genotypes on seed number. Interactions of irrigation × genotypes for seed number were no significant effects (Table 2). The highest seed number was obtained for Irrigation treatments80 mm evaporation from class A pan(I_1) (Table2). Maximum and

minimum seed number under all genotypes treatments was obtained from Azargol and Lakomka, respectively (Table 3).

Seed weight

1000-seed weight was significantly affected by irrigation and genotypes application (Table 2). The highest 1000-seed weight was obtained for Irrigation treatments 80 mm evaporation from class A pan (I_1) (Table 2). Maximum and minimum 1000-seed weight under all genotypes treatments was obtained from Azargol and Lakomka, respectively (Table 3). Banzigeret al. (2002) demonstrated that delay in leaf aging and availability of foodstuff at grain filling period increase grain weight. On the other hand, it has been specified that stem is counted as a little storage source of mobile non-building carbohydrates, which also transports them to grain after flowering. Occurrence of drought stress especially at growth period decreases the quantity of storage of non-building carbohydrates at stem via decreasing leaf area and photosynthesis; as a result for the reason of lack of storage nutrients at secondary source grain weight decreases (Andria et al., 1995; Angadi and Entz, 2002).

Biological yield

The results of combined ANOVA showed that significant effects of irrigation, and genotypes on biological yield. Interactions of irrigation × genotypes for biological yield were no significant effects (Table 2). The highest biological yield was obtained for Irrigation treatments 80 mm evaporation from class A pan (I_1) (Table 2). Maximum and minimum biological yieldunder all genotypes treatments was obtained from Azargol and Lakomka, respectively (Table 3).These results confirmed results of Radford (1986), Kalamianet al. (2006), Jassoet al. (2002) who also showed decreasing biological yield because of drought stress. The reason for increase in TDM (total dry matter) production in plants under optimum irrigation was the extension of leaf area and its higher durability that provided enough physiological resource to take advantage of received light and therefore produce more dry matter (Jassoet al., 2002).

Grain yield

The analysis of variance of data showed that significant effects of irrigation and genotypes on grain yield. Interactions of irrigation × genotypes for grain yieldwere no significant effects (Table 2). The highest grain yield was obtained for Irrigation treatments 80 mm evaporation from class A pan (I_1) (Table 2). Maximum and minimum grain yield,all genotypes treatments was obtained from Azargol and Lakomka, respectively (Table 3).The results indicated that Azargol had higher grain yield than the other cultivars under both stress and no-stress conditions and that the stress from head formation until the end of growing season had the highest effect on yield components, especially 1000-grain weight and head diameter because the plants were exposed to drought stress for a longer time. In this sense, MazaheriLaghabet al. (2001) reported that improper irrigation regime decreased grain yield in addition to decreasing leaf area and leading to early senescence. In a study on the effect of drought stress on sunflower yield, Roshdiet al. (2006) showed that the head diameter and yield were the highest (17.2 cm and 5124 kg/ha, respectively) under the treatment of 70-70-70 mm evaporation from the class A evaporation pan from plant establishment until head emergence, head emergence until head yellowing and head yellowing until physiological maturity, respectively. Also, two cultivars Record and High-sun 33 had higher grain yields in Khoy region, Iran. Negative effect of drought stress on yield component and grain in sunflower has been reported by other researchers (Human et al., 1998).

Harvest index

Harvest index was significantly affected by irrigation and genotypes application (Table 2). The highest harvest index was obtained for Irrigation treatments 80 mm evaporation from class A pan (I_1) (Table 2). Maximum and minimum harvest indexunder all genotypes treatments was obtained from Azargol and Lakomka, respectively (Table

Sina Mohammadi Aghdam *et al.*

3).Harvest index implies the relative distribution of photosynthesis products between economical sinks and other existing sinks in the plant. Setter (1990) stated that water deficit is one of the limiting factors of plant growth and development that not only reduces production of dry matter but also causes a disorder to the partitioning of carbohydrates to grain thus reducing the harvest index. Results of this study agree with findings of Cox and Julliff (1988) who reported that with reducing water consumption dry matter production decreased but the reduction of grain yield in response to water deficit was more than the reduction of biological yield. Pandey et al. (2000) suggested that the reason of harvest index reduction at severe drought stress is the higher sensitivity of reproductive growth to undesirable conditions in comparison with generative growth.

CONCLUSION

Results indicated that drought stress had a considerable effect onseed number, 100-seed weight, biological yield, grain yield and harvest indexwater stress also caused a reduction in these parameters. Also in between the genotypes, the highest meangrain yield was Azargol cultivar.

REFERENCES

1. Albuquerque, F. deian, M.C.andCarvalho, N.M. (2003). Effect of type of environmental stress on the emergence of sunflower (Helianthus annuusL.), soyabean (Glycine max (L.)Merril) and maize (Zea mays L.) seeds with different levels of vigor. Seed Sci. Technol., 31: 465-467.
2. Andria, R., Chiaranda, F.Q. Magliulo, V. and Mori, M. (1995). Yield and soil water uptake of sunflower sown in spring and summer. Agron. J. 87: 1122-1128.
3. Angadi, S.V. and Entz, M.H. (2002). Water relation of standard height and dwarf sunflower cultivars Crop Science. 42:125-159.
4. Ashraf, M. and Mehmood, S. (1990).Response of four Brassica species to drought stress.Environ. Expt. Bot., 30: 93-100.
5. Banziger, M., Edmeades, G.O. and Lafitte, H. R.(2002). Physiological mechanisms contributing to the increased N stress tolerance of tropical maize selected for drought tolerance. Field Crops Res. 75(2/3):223-233.
6. Cox, E., and Julliff, G.D. (1988).Growth and yield of sunflower and soybean under soil deficits.Agron. J. 78:226-230.
7. Dhanda, S.S., Sethi, G.S. andBehl, R.K. (2004). Indices of drought tolerance in wheat genotypes at early stages of plant growth.J. Agron. Crop Sci., 190:1-6.
8. El-Midaoui, M., Talouizte, A. Benbella, M. Serieys, H. Griveau, Y. and Berville, A. (2001). Effect of osmotic pressure on germination of sunflower seeds (Helianthus annuusL.). Helia, 24: 129-134.
9. Gill, R.K., Sharma, A.D. Singh P. and Bhullar, S.S. (2002). Osmotic stress-induced changes in germination, growth and soluble sugar content of Sorghum bicolor (L.) Moench seeds.Bulg. J.Plant Physiol., 28:12-25.
10. Human, J.J., Dutoit, D. BenzuidEnhout, H.D.andBruyn, L.P. (1998). The influence of plant water stress on net photosynthesis and yield of Sunflower.Agriculttural University of south Africa.Crop Science. 164(4):231-241.
11. Jasso de Rodriguez. D., Phillips, B.S. Rodrigues-Garcia, R. and Angulo Sanchez, J.L. (2002). Grain Yield and fatty acid composition of sunflower seed for cultivars developed under dry land conditions. Agron, 25: 132-142.
12. Kalamian, S., Modaressanavi, S.A.M. and Sepehri, A. (2006).Effect on of water deficit at vegetative and reproductive growth stages in leafy and commercial hybrids of maize. Agri. Res. Winter. 5(3): 38-53.
13. Lenzi, A., Fambrini, M. Barotti, PugliesiC.andVernieri, P. (1995). Seed germination and seedling growth in a wilty mutant of sunflower (Helianthus annuusL.): effect of absisic acid and osmotic potential. Environ. Exp. Bot., 35:427-434.
14. MazaheriLaghab, H., Noori, F. ZareieAbyaneh, H. and Vafaie, M.H. (2001).Study of effects of complementary irrigation on agronomical traits of three sunflower cultivars under rain-fed farming conditions.Scientific and Research Journal of Agronomy. 3(1): 31-44.

15. Mohammad, M.E, Benbella, M. and Talouizete, A. (2002).Effect of sodium chloride on sunflower (Helianthus annuusL.) seed germination.Helia, 37: 51-58.

16. Pandey, R.K., Marienville, J.W. andAdum, A. (2000). Deficit irrigation and nitrogen effect on maize in a sahelian environment. I. Grain yield components. Agric. Water Management. 46: 1-13.

17. Radford.P.J. (1986).Genetic variability in sunflower cultivars under drought. II. Growth and water relations. Aust. J. Res. 37:583-598.

18. Roshdi, M.H., Shrifabad, H. Karimi, M. Noormohammadi, G. andDarvishi, F. (2006). Scientific and Research Monograph of Agricultural Sciences.No. 1.Islamic Azad University.Science and Research Branch.Accessible at http://www.sid.ir.

19. Sadeghian, S.Y. and Yavari, N. (2004).Effect of water-deficit stress on germination and early seedling growth in sugar beet.J. Agron. Crop Sci., 190:138-144.

20. Setter, T.L. (1990). Transport / harvest index: Photosynthetic partitioning in stressed plants. P. 17-36. Stress responses in plant: Adaptation and accumulation mechanism. Wiley-Liss, Inc. New York. 14853.

21. Smok, M.A., Chojnowski, M. Corbineau, F. and Come, D. (1993). Effects of osmotic treatments on sunflower seed germination in relation with temperature and oxygen. In: Proc. 4th Intl.Workshop on seed: Basic and Applied Aspects of Seed Biology, (Eds.): D. Come and F. Corbineau. Angers, France, pp. 1033-1038.

Table 1. Physical and chemical characteristics of research field soil

Soil	Sand (%)	Clay (%)	Silt (%)	EC (ds.m^{-1})	PH	OC (%)	Fe) (ppm	K (mg.kg^{-1})	P mg.kg$^-$) (^{1}	N (%)
Loamy	29	26	45	0.4	8	2	1.41	292	12.5	0.18

Table 3. Mean comparisonyield and yield componentsin different treatments

Treatment	Seed number	1000-seed weight (g)	Biological yield (kg.ha^{-1})	Grain yield (kg.ha^{-1})	HI (%)
Irrigation					
80 mm (I$_1$)	53 [a]	55.8 [a]	33514 [a]	4979 [a]	14.9 [a]
130 mm (I$_2$)	38 [b]	46.5 [b]	26249 [b]	3769 [b]	14.4 [b]
180 mm (I$_3$)	24 [c]	39.4 [c]	17433 [c]	2475 [c]	14.1 [c]
Genotypes					
Master	45 [b]	47.9 [b]	24765 [b]	3405 [c]	13.7 [c]
Lakomka	32 [d]	40.7 [d]	21098 [c]	2781 [d]	13.2 [d]
Euroflour	39 [c]	43.5 [c]	22427 [bc]	3325 [c]	14.8 [b]
Hysun 33	46 [b]	48.4 [b]	24984 [b]	3717 [b]	14.9 [b]
Azargol	55 [a]	53.4 [a]	26785 [a]	4163 [a]	15.5 [a]
Different letters at each column indicate significant difference at p≤ 0.05.					

Sina Mohammadi Aghdam *et al.*

S.O.V	df	Seed Number	1000-seed weight	Biological yield	Grain yield	HI
Table 2. Analysis of variance of the data of coriander under treatment.				MS		
Replication	2	22.1^{**}	16.88^{**}	125331^{**}	40102^{**}	86^{*}
Irrigation (I)	2	142.8^{**}	42839^{**}	1854591^{**}	5551^{**}	328^{**}
Ea	4	0.3	116	97414	9228	104
Genotype (G)	4	120.8^{**}	1103^{**}	1579640^{**}	7260^{**}	185^{**}
I×G	8	5.04^{ns}	20.14^{ns}	2975^{ns}	119^{ns}	24.1^{ns}
Eb	24	0. 01	66.3	21978	295	81
C.V (%)	-	11.1	10.5	12.9	9.6	8.8
ns, *,: No significant and significant at p≤0.05 and p≤0.01, respectively**						

RESEARCH ARTICLE

Evaluation of Drought Resistant Genotypes in Sunflower (Helianthus Annus L)

Sina Mohammadi Aghdam[1]* and Bijan Kahrariyan[2]

[1] M.S. Plant Breeding, Faculty of Agriculture, University of Tabriz, Tabriz, Iran.
[2] Department of Agriculture, Miandoab Branch, Islamic Azad University, Miandoab, Iran

*Address for correspondence
Sina Mohammadi Aghdam
M.S. Plant Breeding, Faculty of Agriculture,
University of Tabriz,
Tabriz, Iran.
E-mail: Sinaghdam@gmail.com

ABSTRACT

Sunflower (Helianthus annuusL.) is the world's fourth largest oil-seed crop and its growth is limited by moisture condition. Different varieties of sunflower depict differential response to drought. The objective of this work was to evaluation of drought resistant genotypes in Sunflowerunder different irrigation treatmentsa study was conducted in experimental field of Kermanshah province in 2014. The main plot factor (stress treatment) included four levels (80, 130 and 180 mm evaporation from class A pan) and the sub-plot factor (genotypes) included Master, Lakomka, Euroflour, Hysun 33 and Azargol. Results showed that a mildstress(irrigationon130 mmevaporation from pan A) and severestress(irrigation after 180mmevaporation from pan A) Azargol genotype has the highest stress tolerance index (STI), geometric meanproductivityindex (GMP) and meanproductivityindex (GMP) and lowest stress susceptibility index (SSI) and tolerance index(TOL). So in conditionmildandsevere stressAzargolgenotypeseemssuitable.

Key words: Drought resistant, Sunflower, Stress susceptibility indexand Water stress.

INTRODUCTION

In arid and semiarid regions with a Mediterranean climate, sunflower crops usually encounter droughtstress during the growth period (Darvishzadeh et al., 2011). Sunflower (Helianthus annuusL.) is one of the most important oil crops due to its high content of unsaturated fatty acids and a lack of cholesterol (Goksoyet al., 2004). Although sunflower is moderately tolerant to water stress, its production is greatly affected by drought. Evidence indicatesthat drought stress during the vegetative phase, flowering and seed-filling period in sunflower causes a considerable decrease in yield and oil content (Ali et al., 2009).

3980

Sina Mohammadi Aghdam and Bijan Kahrariyan

Risk management in agriculture, whichis very crucial in the investment and financing decisions for farmers in developing countries and in transition economies, includes choosing plant varieties againstadverse weather events (Robert, 2005). The optimum variety should exhibit superiority in environments withdifferent stress intensities. Some genotypes are only favorable in one specific environment, like landraces thathave been adapted to severe local stresses or bred cultivars which are genetically modified for high yield in full irrigation conditions. The introduction of improved varieties is one of the most powerful and cost-efficient means of enhancing crop productivity and farmers' income. The performance of a plant in diverse environments depends on the efficiency of developed varieties, which should match the production areas; and also implies an understanding of cropping systems in a targeted production zone. Multi-location testing is the main tool for understanding varietal responses to environments, but the process is time-consuming and expensive. The efficiency of this analytical process can be enhanced using recently developed statistical methods (Mohammadi et al., 2011). Understanding a plant's response in dry environments has great importance and is also a fundamental part of producing stress-tolerant crops (Zhao et al., 2008).

Different strategies have been suggested for selecting resistant and relatively resistant genotypes to drought stress. Several selection indices viz. geometric mean productivity (GMP) and stress tolerance index (STI) (FernJndez1992), mean productivity (MP) and tolerance index (TOL) (Rosielle and Hamblin 1981), stress susceptibility index (SSI) (Fischer and Maurer 1978), yield stability index (YSI) (Bouslama and Schapaugh, 1984) and yield index (YI) (Gavuzzi et al. 1997) have been suggested for screening drought resistant genotypes. The objectives of the present study were to evaluate several drought tolerance indices as well as to identify drought-tolerant sunflower cultivars.

MATERIALS AND METHODS

The study was carried out as a split-plot experiment based on a Randomized Complete Block Design with three replications at Kermanshah (latitude 47°03′N, longitude 34°18′E, altitude 1360 m above sea level) province, Iran in 2014. The experimental design was factorial based on randomized completely block design in three replications. The climate of research area is characterized by mean annual precipitation of 270 mm, mean annual temperature of 9°C, mean annual maximum temperature of 15 °C and mean annual minimum temperature of 2.2°C. The soil is sandy loam with EC of 0.4 ds m-1, pH of 8 and field capacity of 29.5%.

The main plot factor (stress treatment) included four levels (80, 130 and 180 mm evaporation from class A pan) and the sub-plot factor (cultivars) included Master, Lakomka, Euroflour, Hysun 33 and Azargol. Before planting, the field was fertilized as recommended according soil test. In this study, each sub-plot had 4 rows with in-row spacing of 60 cm, length of 5 m and an area of 12 m2. After planting, the field was irrigated once every 4-7 days up to plants establishment and then, it was carried out up to the end of season on the basis of 80 mm evaporation from the class A evaporation pan. In the stress treatment, the irrigation was stopped after 80-180 mm evaporation from the evaporation pan.

By using genotypes seed yield under non stress (Yp) and stress in bothfloweringand grain fillingstage (Ys) and The meanyield ofall genotypesundernon stress (☐p) and stress (☐s)droughttolerance indicesis calculatedwithfollowingformulas:

STI= Stress tolerance index

GMP=Geometric meanproductivityindex

MP=Meanproductivityindex

Sina Mohammadi Aghdam and Bijan Kahrariyan

TOL=Tolerance index

SSI=Stress susceptibility index

$$SSI = \left[1 - (y_s / y_p)\right] / SI \;\; SI = \left[1 - (y_s / y_p)\right]$$

$$(MP) = \frac{(y_s + y_p)}{2} \;\; (TOL) = \left[y_p - y_s\right]$$

$$(GMP) = \sqrt{(y_s \times y_p)} \;\; (STI) = \left(\frac{y_p}{y_{\overline{p}}}\right)\left(\frac{y_s}{y_{\overline{s}}}\right) = \frac{(y_p)(y_s)}{(y_{\overline{p}})^2}$$

RESULTS AND DISCUSSION

STI

The valueofthisindexindicates thatavarietyis higherstress toleranceandyield potential. So the index selects genotypes that arehighestyieldin stress andnon-stress. The resultsshowed thata mildstress(irrigationon130 mmevaporation from pan A) Azargolvariety thathigheststress tolerance index (STI) (Table 2). Inconditions ofseverestress(irrigation after 180mmevaporation from pan A), also Azargol genotype has the highest variety stress tolerance index (Table 3). In conditionmildandsevere stressAzargolgenotypeseemssuitable.EbrahimzadehBanayjedi et al. (2012) introduced STI, MP and GMP as the best indices for yield predicting. Dehghaniet al. (2009) reported that GMP, MP STI were significantly and positively correlated with stress yield. Farshadfaret al. (2001) showed that the most appropriate index for selecting stress tolerant cultivars is an index which has partly high correlation with grain yield under stress and non-stressed conditions. There were negative and significant correlations between YP and YSI in moderate and severe drought stressed conditions.

GMP

Inthiscasetheindexis greater thanthe value obtainedforeachgenotypeare moreresistanttodrought. The resultsshowed thata mildstress(irrigationon130 mmevaporation from pan A) Azargolvariety thathighestgeometric meanproductivityindex (GMP) (Table 2). Inconditions ofseverestress(irrigation after 180mmevaporation from pan A), also Azargol genotype has the highest variety geometric meanproductivityindex(Table 3). In conditionmildandsevere stressAzargolgenotypeseemssuitable.GMP is more powerful than MP in separating group A genotypes and has a lower susceptibility to different amounts of YS and YP. Therefore MP, which is based on the arithmetic mean, will be biased when the difference between YS and YP is high. The geometric mean is often used by breeders interested in relative performance since drought stress can vary in severity in field environments and over years (Fernandez, 1992).

MP

The valueofthisindexindicates thatavarietyis higherstress toleranceandyield potential. So the indexs elects genotypes that arehighestyieldin stress andnon-stress. The resultsshowed thata mildstress(irrigationon130 mmevaporation from pan A) Azargolvariety thathighestmeanproductivityindex (MP) (Table 2). Inconditions ofseverestress(irrigation after 180mmevaporation from pan A), also Azargol genotype has the highest variety meanproductivityindex(Table 3). In

conditionmildandsevere stressAzargolgenotypeseemssuitable.The observed relationship between YP, MP, STI, YS, MP and STI are in consistent with those reported by Fernansez (1992) in mungbean and Farshadfaret al. (2013) in wheat. Toorchiet al. (2012) showed that correlation between MP, GMP and YS and YP is positive.

TOL

Inthiscasetheindexis lowest thanthe value obtainedforeachgenotypeare moreresistanttodrought. The resultsshowed thata mildstress(irrigationon130 mmevaporation from pan A) Azargolvariety thatlowestgeometric meanproductivityindex (TOL) (Table 2). Inconditions ofseverestress(irrigation after 180mmevaporation from pan A), also Azargol genotype has the lowest variety geometric meanproductivityindex(Table 3). In conditionmildandsevere stressAzargolgenotypeseemssuitable.

SSI

The valueofthisindexindicates thatavarietyis loweststress toleranceandyield potential. So theindexselects genotypesthatarelowestyieldin stress andnon-stress. The resultsshowed thata mildstress(irrigationon130 mmevaporation from pan A) Azargolvariety thatloweststress tolerance index (STI) (Table 2). Inconditions ofseverestress(irrigation after 180mmevaporation from pan A), also Azargol genotype has the lowest variety stress tolerance index (Table 3). In conditionmildandsevere stressAzargolgenotypeseemssuitable.

REFERENCES

1. Ali, Q., Ashraf, M. Anwar F.(2009). Physico-chemical attributes of seed oil from drought stressed sunflower (Helianthus annuusL.) plants. Grasas y Aceites 60, 475-481.
2. Bouslama, M.,Schapugh, W.T.(1984). Stress tolerance in soybean. Part 1: evaluation of three screening techniques for heat and drought tolerance. Crop Sci. 24, 933-937.
3. Darvishzadeh, R.,Pirzad, A.Bernousi, I.Abdollahimandoulakani, B.Azizi, H.Akhondi, N.Poormohammadkiani, S.Sarrafi, A.(2011). Genetic properties of drought tolerance indices in sunflower.ActaAgriculturaeScandinavica Section B — Soil and Plant Science, 61, 593-601.
4. Dehghani, G.H.,Malekshhi, F.Alizadeh, B. (2009). A study of drought tolerance indices in canola (Brassica napusL.) genotypes. Journal of Science and Technology of Agriculture and Natural Resources 13(48):77-90.
5. Farshadfar, E.,Ghannadha, M.Zahravi, M.Sutka, J, (2001). Genetic analysis of drought tolerance in wheat. Plant Breeding 114:542-544.
6. Farshadfar, E.,Poursiahbidi, M.M.Safavi, S.M. (2013). Assessment of drought tolerance in land races of bread wheat based on resistance/tolerance indices. International Journal of Advanced Biological and Biomedical Research 1(2):143-158.Fernandez, G.CJ.,(1992). Effective selection criteria for assessing plant stress tolerance. Proc. Intl Symp Adaptation of Vegetables and Other Food Crops in Temperature and Water Stress. AVRDC Publ, Tainan, Taiwan, 13-18 August. pp. 257-270.
7. Gavuzzi, P.,Rizza, F. Palumbo, M.Campaline, R.G.Ricciardi, G.L.Borghi, B.(1997). Evaluation of field and laboratory predictors of drought and heat tolerance in winter cereals. Can. J. Plant Sci. 77, 523-531.
8. Goksoy, A.T.,Demir, A.O.Turan, Z.M.Dagüstü, N.(2004). Responses of sunflower (Helianthus annuusL.) to full and limited irrigation at different growth stages. Field Crops Res. 87, 167–178.
9. Mohammadi, M.,Karimizadeh, R.Abdipour, M.(2011).Evaluation of drought tolerance in bread wheat genotypes under dryland and supplemental irrigation conditions.Aus J Crop Sci. 5, 4, 487-493.
10. Roberts, R.(2005). Insurance of crops in developing countries.FAO. Rome.
11. Rosielle, A.A.Hambling, J.(1981). Theoretical aspects of selection for yield in stress and non-stress environments. Crop Sci. 21, 943-946.

Sina Mohammadi Aghdam and Bijan Kahrariyan

12. Zhao, C.X.,Guo, L.Y.Jaleel, C.A.Shaol, H.B. Yang, H.B.(2008). Prospects for dissecting plantadaptive molecular mechanisms to improve wheat cultivars in drought environments.Compt Rend Biol J. 331, 579-586.

Table 1. Physical and chemical characteristics of research field soil									
Soil	Sand (%)	Clay (%)	Silt (%)	EC (ds.m^{-1})	PH	OC (%)	Fe) (ppm	K (mg.kg^{-1})	P mg.kg$^{-)}$ (^{1}	N (%)
Loamy	29	26	45	0.4	8	2	1.41	292	12.5	0.18

Table 2. Mean of different drought tolerance indices of sunflowergenotypes under 130 mm evaporation from class A pan					
Genotypes	SSI	TOL	MP	GMP	STI
Master	1.15	1166.25	4600	4562.75	0.85
Azargol	0.50	483.5	4808.25	4802.5	0.94
Hysun 33	1.18	1233.5	4700	4659.6	0.88
Euroflour	0.79	766.66	4500	4483.6	0.81
Lakomka	1.42	1185	3625.85	3577.25	0.51

Table 2. Mean of different drought tolerance indices of sunflowergenotypes under 180 mm evaporation from class A pan					
Genotypes	SSI	TOL	MP	GMP	STI
Master	0.98	1984.3	3751	3771.6	0.52
Azargol	0.85	1800	4191.6	4016.4	0.69
Hysun 33	1.12	2834.3	3900	3634.5	0.55
Euroflour	1.01	2050	3709.3	3518.2	0.51
Lakomka	1.2	2419.3	3208.1	3047.3	0.39

RESEARCH ARTICLE

The Effect of Drought Stressonsome Oftraits in Sunflower genotypes

Sina Mohammadi Aghdam[1*], Bijan Kahrariyan[2] and Farideh Samadiyan[3]

[1] M.S. Plant Breeding, Faculty of Agriculture, University of Tabriz, Tabriz, Iran.
[2] Department of Agriculture, Miandoab Branch, Islamic Azad University, Miandoab, Iran
[3] M.S. Agronomy.Faculty of Agriculture, University of Azad Islamic Naragh, Iran.Young Researchers Club.

*Address for correspondence
Sina Mohammadi Aghdam
M.S. Plant Breeding, Faculty of Agriculture,
University of Tabriz,
Tabriz, Iran.
E-mail: Sinaghdam@gmail.com

ABSTRACT

In order to study effect of drought stressonsome oftraits insunflowergenotypes a study was conducted in experimental field of Kermanshah province in 2014. The main plot factor (stress treatment) included four levels (80, 130 and 180 mm evaporation from class A pan) and the sub-plot factor (genotypes) included Master, Lakomka, Euroflour, Hysun 33 and Azargol. Results showed that water deficit caused a significant reduction the traits. The highest meantraits wereindrough stress treatmentson80 mm andthe lowest 180 mm evaporation from class A pan.Thehighestand the lowestgenotypes treatmentstraitsrespectively were in Azargol andLakomka. Also Water availability is one of the major agronomy factors that can influence the production and quality of sunflower oil.

Key words: Genotypes,Head diameter, Leaf area, Sunflower, Seed oil contentand Water stress.

INTRODUCTION

Sunflower being an oil seed crop is particularly susceptible to water shortage at germination stage. El-Midaouietal., (2001) reported decrease in percent germination and biomass accumulation in sunflower with increasing osmotic stress in germinating media whereas mean germination time increased with increasing water deficit. Moreover, different genotypes of sunflower showed differential responses to all these stress treatments. Lenziet al., (1995) reported that mutant seeds of sunflower showed a higher resistance to osmotic stress, i.e., germinating at more negative osmotic potentials. Germination of sunflower was inhibited in presence of polyethylene glycol -6000, at osmotic pressure lower than -5 bars (Smoket al., 1993). The adverse effects of water shortage on germination and

Sina Mohammadi Aghdam *et al.*

seedling growth had also been well reported in different crops such as wheat (Dhandaet al., 2004), sugar beet (Sadeghian&Yavari, 2004), sorghum (Gill et al., 2002), and sunflower (Mohammad et al., 2002).

The vital role of the sunflower crop depends mainly on the characteristics of the oil produced, which can be used directly or after processing in food and non-food industries (Vermeercsh, 1996). Sunflower oil contains four important fatty acids, namely palmitic (16:0), stearic (18:0), oleic (18:1), and linoleic (18:2) acids (Baydar and Erbas, 2005). In common varieties, oleic acid is transformed into linoleic acid by the _-12 desaturase (Monotti, 2003), so the differential transformation can cause differential accumulation of oleic acid in different varieties. One potential reason for variability in oleic acid content may be water stress soon after the initiation of flowering (Monotti, 2003).

Adequate water and nutrient supply are important factors affecting optimal plant growth and successful crop production. Water stress is one of the severe limitations of crop growth especially in arid and semi-arid regions of the world as it has a vital role in plant growth and development at all growth stages. However, depending upon plant species, certain stages such as germination, seedling or flowering could be the most critical stages for water stress. Seed germination is first critical and the most sensitive stage in the life cycle of plants (Ashraf &Mehmood, 1990) and the seeds exposed to unfavorable environmental conditions like water stress may have to compromise the seedlings establishment (Albuquerque &Carvalho, 2003).

Sunflower (Helianthus annuusL.) due to its significant share in vegetable oil production of Pakistan has emerged as an economically important crop of the country. But limited rainfall or shortage of water for irrigation during the growing season constraints its seed yield with significant reductions. Therefore, growing of drought tolerant cultivars will contribute to more stable sunflower production and the screening of the response of sunflower cultivars or breeding lines to drought stress can play a crucial role in breeding programmers. However, difficulties like uncontrolled climatic conditions, insufficient homogeneity of soil, large amount of plant material and time and labor consumption make field trials difficult for drought screening of genotypes. The objective of this experiment was to effect of drought stressonsome oftraits insunflowergenotypes.

MATERIALS AND METHODS

The study was carried out as a split-plot experiment based on a Randomized Complete Block Design with three replications at Kermanshah (latitude 47°03′N, longitude 34°18′E, altitude 1360 m above sea level) province, Iran in 2014. The experimental design was factorial based on randomized completely block design in three replications. The climate of research area is characterized by mean annual precipitation of 270 mm, mean annual temperature of 9°C, mean annual maximum temperature of 15 °C and mean annual minimum temperature of 2.2°C. The soil is sandy loam with EC of 0.4 ds m-1, pH of 8 and field capacity of 29.5%.

The main plot factor (stress treatment) included four levels (80, 130 and 180 mm evaporation from class A pan) and the sub-plot factor (cultivars) included Master, Lakomka, Euroflour, Hysun 33 and Azargol. Before planting, the field was fertilized as recommended according soil test. In this study, each sub-plot had 4 rows with in-row spacing of 60 cm, length of 5 m and an area of 12 m2. After planting, the field was irrigated once every 4-7 days up to plants establishment and then, it was carried out up to the end of season on the basis of 80 mm evaporation from the class A evaporation pan. In the stress treatment, the irrigation was stopped after 80-180 mm evaporation from the evaporation pan. The sampling was carried out at different stages. At primary harvest time, the traits measured included plant height, stem diameter, head diameter, leaf area and seed oil content (Plant height, LA, base stem diameter and head size were recorded at the end of the growth period and before harvest). The data were statistically analyzed and the significant means were compared by Duncan's multiple range test (DMRT) at 5% probability level using the software MSTATC and Excel.

RESULTS AND DISCUSSION

Plant height

The analysis of variance of data showed that significant effects of irrigation and genotypes on plant height. Interactions of irrigation × genotypes for Plant heightwere no significant effects (Table 2). The highest Plant heightwas obtained for Irrigation treatments 80 mm evaporation from class A pan (I_1) (Table 2). Maximum and minimum Plant height all genotypes treatments were obtained from Azargol and Master, respectively (Table 3). Riahinia (2003) in his experiment on sunflower, cotton, bean and maize also came to similar results. D´Andriaetal.,(1995) in a two-year experiment on sunflower observed that plant height was increased in the first year by increasing the irrigation frequency, whereas no significant difference was observed during the second year among irrigation treatments. In a study by Moriondoet al.,(2003) on defoliation of sunflower also no significant difference was observed in terms of plant height.

Stem diameter

Stem diameter was significantly affected by irrigation and genotypes application (Table 2). The highest stem diameter was obtained for Irrigation treatments 80 mm evaporation from class A pan (I_1) (Table 2). Maximum and minimum stem diameterunder all genotypes treatments was obtained from Azargol and Lakomka, respectively (Table 3). Molze and Klepper (1973) reported that in field conditions, one of the effects of low water availability is the reduction of stem diameter due to lower radius growth of stem. In this condition, the main stem and lateral branch growth are suppressed and thus a lower stem dry matter will be obtained.

Head diameter

The results of combined ANOVA showed that significant effects of irrigation, and genotypes on head diameter. Interactions of irrigation × genotypes for head diameterwere no significant effects (Table 2). The highest head diameterwas obtained for Irrigation treatments 80 mm evaporation from class A pan (I_1) (Table 2). Maximum and minimum head diameter under all genotypes treatments was obtained from Azargol and Lakomka, respectively (Table 3).In an experiment on influence of water stress on net photosynthesis and yield of sunflower Human et al. (1990), observed that head size was, significantly reduced as water stress increased. Also, Razi and Asad (1998) showed that irrigation resulted in greater head and stem diameter, plant height and yield in sunflower.

Leaf area

The analysis of variance of data showed that significant effects of irrigation, and genotypes on leaf area. Interactions of irrigation × genotypes for leaf areawere no significant effects (Table 2). The highest leaf areawas obtained for Irrigation treatments 80 mm evaporation from class A pan (I_1) (Table 2). Maximum and minimum leaf areaunder all genotypes treatments was obtained from Azargol and Lakomka, respectively (Table 3).Bieloria and Hopmans (1975) reported that drought stress via stomatal closure, reduction in leaf area and photosynthesis and also a shortening of the seed filling period limited the carbohydrate supply for seeds.

Oil content

Oil content was significantly affected by irrigation and genotypes application (Table 2). The highest oil content was obtained for Irrigation treatments 80 mm evaporation from class A pan (I_1) (Table 2). Maximum and minimum oil content under all genotypes treatments was obtained from Azargol and Lakomka, respectively (Table 3). Water availability is one of the major agronomy factors that can influence the production and quality of sunflower oil. In the

present study, water stress caused a reduction in the oil content of both cultivars, which is in agreement with the results of Talha and Osman (1975) for sunflowers (Helianthus annuus L.).

CONCLUSION

Results indicated that drought stress had a considerable effect onplant height, stem diameter, head diameter, leaf area and seed oil contentwater stress also caused a reduction in these parameters. Also in between the genotypes, the highest meangrain yield was Azargol cultivar.

REFERENCES

1. Albuquerque, F. deian, M.C.andCarvalho, N.M. (2003). Effect of type of environmental stress on the emergence of sunflower (Helianthus annuusL.), soyabean (Glycine max (L.)Merril) and maize (Zea mays L.) seeds with different levels of vigor. Seed Sci. Technol., 31: 465-467.
2. Ashraf, M. and Mehmood, S. (1990).Response of four Brassica species to drought stress.Environ. Expt. Bot., 30: 93-100.
3. Baydar , H. and Erbas, S. (2005). Influence of seed development and seed position on oil, fatty acids and total tocopherol contents in sunflower (Helianthus annuus L.). Turk.J. Agric. Forest. 9, 179-186.
4. Bieloria, H. and Hopmans, P.A.M. (1975).Recovery of leaf water potential, transpiration and photosynthesis of cotton during irrigation cycles. Agronomy Journal, 67: 629-632.
5. D'Andria, R., Chiaranda, F.Q. Magliulo, V. and Mori, M. (1995). Yield and soil water uptake of sunflower sown in spring and summer. Agronomy Journal, 87:1122- 1128.
6. Dhanda, S.S., Sethi, G.S. andBehl, R.K. (2004). Indices of drought tolerance in wheat genotypes at early stages of plant growth.J. Agron. Crop Sci., 190:1-6.
7. El-Midaoui, M., Talouizte, A. Benbella, M. Serieys, H. Griveau, Y. and Berville, A. (2001). Effect of osmotic pressure on germination of sunflower seeds (Helianthus annuusL.). Helia, 24: 129-134.
8. Lenzi, A., Fambrini, M. Barotti, PugliesiC.andVernieri, P. (1995). Seed germination and seedling growth in a wilty mutant of sunflower (Helianthus annuusL.): effect of absisic acid and osmotic potential. Environ. Exp. Bot., 35:427-434.
9. Mohammad, M.E, Benbella, M. and Talouizete, A. (2002).Effect of sodium chloride on sunflower (Helianthus annuusL.) seed germination.Helia, 37: 51-58.
10. Molz, F.J. and Klepper, B. (1973). On the mechanism of water stress induced stem deformation. Agronomy Journal, 65: 304-306.
11. Monotti, M. (2003).Growing non-food sunflower in dryland conditions. Ital. J. Agron. 8, 3-8.
12. Moriondo, M., Orlandini, S. and Villalobos, F.J. (2003).Modelling compensatory effects of defoliation on leaf area growth and biomass of sunflower (HelianthusannuusL.).Europian Journal of Agronomy, 19: 161- 171.
13. Razi, H. and Asad, M.T. (1998).Evaluation of variation of agronomic traits and water stress tolerant in sunflower conditions. Agricultural and Natural Resources Sciences, 2: 31-43.
14. Riahinia, S.H. (2003).Evaluation of water stress in corn, sunflower, cotton and bean.M.Sc. thesis of agronomy, Faculty of Agriculture, Ferdowsi University of Mashhad.
15. Sadeghian, S.Y. and Yavari, N. (2004).Effect of water-deficit stress on germination and early seedling growth in sugar beet.J. Agron. Crop Sci., 190:138-144.
16. Smok, M.A., Chojnowski, M. Corbineau, F. and Come, D. (1993). Effects of osmotic treatments on sunflower seed germination in relation with temperature and oxygen. In: Proc. 4th Intl.Workshop on seed: Basic and Applied Aspects of Seed Biology, (Eds.): D. Come and F. Corbineau. Angers, France, pp. 1033-1038.
17. Talha M, and Osman, F. (1975).Effect of soil water stress on water economy and oil composition in sunflower (Helianthus annuus L.). J. Agric. Sci. 84, 49-56.

Table 1. Physical and chemical characteristics of research field soil

Soil	Sand (%)	Clay (%)	Silt (%)	EC (ds.m^{-1})	PH	OC (%)	Fe ppm) (	K (mg.kg^{-1})	P mg.kg^{-}) (^{1}	N (%)
Loamy	29	26	45	0.4	8	2	1.41	292	12.5	0.18

Table 2. Analysis of variance of the data of coriander under treatment.

S.O.V	df	MS				
		Plant height	Stem diameter	Head diameter	Leaf area	Oil content
Replication	2	1145.1**	0.08^{ns}	9.51^{ns}	0.1^{ns}	0.250^{ns}
Irrigation (I)	2	659.5**	0.741**	91.16**	3.524**	184.19**
Ea	4	120.4	0.125	5.28	0.045	2.364
Genotype (G)	4	786.3**	0.921**	15.77**	7.287**	200.3**
I×G	8	15.2^{ns}	0.12^{ns}	1.9^{ns}	0.191^{ns}	29.2^{ns}
Eb	24	45.7	0.102	2.14	0.002	0.76
C.V (%)	-	9.8	11.3	10.2	8.7	9.4
ns, *,: No significant and significant at p≤0.05 and p≤0.01, respectively**						

Table 2. Mean comparisonsome of treats sunflowerin different treatments

Treatment	Plant height (cm)	Stem diameter(mm)	Head diameter(mm)	Leaf area	Oil content (%)
Irrigation					
80 mm (I$_1$)	123^a	1.985^a	15.20^a	4979 ^{a}	3.95^a
130 mm (I$_2$)	118^b	1.67.5 ^{b}	13.44^b	3769 ^{b}	3.67^b
180 mm (I$_3$)	109^c	1.412^c	11.75^c	2475 ^{c}	3.2^c
Genotypes					
Master	115^c	1.834^b	13.7^c	3405 ^{c}	3.52^b
Lakomka	116^c	1.495^c	12.42^d	2781 ^{d}	3.29^c
Euroflour	118^b	1.695^c	14.5^b	3325 ^{c}	3.50^b
Hysun 33	119^b	1.801^b	14.66^b	3717 ^{b}	3.60 ^{b}
Azargol	122^a	1.970^a	15.35^a	4163 ^{a}	3.83^a
Different letters at each column indicate significant difference at p≤ 0.05.					