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Application of the New Modified Decomposition Method to the Regularized Long-Wave Equation

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Abstract: In this paper a new modified Adomian decomposition method (ADM) is applied to the regularized long-wave (RLW) equation which is the one of important soliton equations. The performance and the accuracy of the method are illustrated by solving some test examples. The obtained results are compared with the exact solutions.
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1. Introduction

Since Korteweg de Vries first obtained their equation(KdV) in 1885 to describe nonlinear dispersive long-wave, many other partial differential equations have been derived to model wave phenomena in diverse nonlinear systems. The (KdV) equation

$$u_t + u\,u_x - u_{xxx} = 0$$

describes propagation of shallow-water dispersive waves in the limit of small amplitudes and long waves. The (KdV) equation have been studied intensively over the last twenty years and shown to possess remarkable mathematical properties. They have a denumerable infinity of conservation laws and admit multisolitons solutions. These solutions describe the "elastic" collision of solitary waves- the so-called "soliton" property where any pair of unequal solitary remain unaltered after nonlinear interaction. For water waves, the underlying assumptions that led to the (KdV) equation, equally well justify the nonlinear wave equation

$$u_t + u_x + auu_x - bu_{xxt} = 0$$

This equation- known as the regularized long wave(RLW) or Benjamin Bona Mahony (BBM) equation- has been proposed as an alternative model governing the evolution of long waves in nonlinear dispersive system Parker, 1995 [8]. The (RLW) equation, at first, proposed by peregrine[9]. This equation plays a major role in the study of nonlinear dispersive waves Bona, 1985[3] because of its description to a larger number of important physical phenomena, such as shallow water waves and ion acoustic plasma waves. The aim goal of this paper is to solve the RLW equation by applying new modified of ADM. The ADM has been widely applied in solving nonlinear partial differential equations which represent various phenomena in engineering and physics. This method is easy to program and can be provide analytical solutions to the problems by utilizing the initial conditions. Since it was first presented in 1980's [1], ADM has led to several modifications on the method made by various researchers in an attempt to improve the accuracy or expand the application of the original method. One of the important modifications was proposed by Wazwaz[10], he divided the original function into two parts, then Wazwaz and El-Sayed, 2001 [11] presented new type of modification to ADM, the purpose of this new approach was to overcome the difficulties that arise when applying the standard ADM. Several other researchers have developed some modifications to the ADM [7,2,5]. In this work, a new modified ADM is used to solve the RLW. A comparative study between the modified ADM and the classical ADM will be presented.

2. Adomian Decomposition Method

For the purpose of illustration of the (ADM), we begin by consider Eq.(1) in the operator form

$$Lu + u_x - bR(u) + aN(u) = 0 \qquad (1)$$

Where ($L = \frac{\partial}{\partial t}$) is a linear operator and ***R*** its remainder of the linear operator. The nonlinear term is represented by ***N(u)***. Thus we get

$$Lu = -u_x + bR(u) - aN(u) = 0 \qquad (2)$$

Assuming the inverse operator L^{-1}exists and it can be taken as the definite integral with respect to ***t*** from t_0 to ***t***, i.e.

$$L^{-1} = \int_{t_0}^{t} (.)dt \qquad (4)$$

Then applying the inverse operator L^{-1} on both sides of equation (3) yields

$$u = f(x) + L^{-1}[u_x + bR(u) - aN(u)] \qquad (5)$$

Where $f(x)$ is the solution of the homogeneous equation $Lu = 0$, involving the constant of integration. The integration constants that involved in the solution of homogeneous equation are to be determined by the initial condition $u(x,0) = u_0 = f(x)$.

The ADM assumes that the unknown function $u(x,t)$ can be expressed by a sum of components defined by the decomposition series of the form

$$u(x,t) = \sum_{n=0}^{\infty} u_n(x,t) \qquad (6)$$

with u_0 defined as $u(x,0)$ where $u(x,t)$ will be determined recursively. The nonlinear operator $N(u)$ in eq. (3) can also be decomposed by an infinite series of polynomials given by

$$N(u) = \sum_{n=0}^{\infty} A_n(u_0, u_1, \ldots, u_n) \qquad (7)$$

where A_n are the appropriate Adomian's polynomials. These polynomials are defined as

$$A_n = \frac{1}{n!}\frac{d^n}{d\lambda^n}[N(\sum_{i=0}^{\infty}\lambda^i u_i)]_{\lambda=0} \qquad (8)$$

Approximate component $u_n(x,t)$ for $n \geq 1$, is computed as follows

$$u(x,0) = f(x)$$

$$u_{n+1}(x,t) = L^{-1}((u_n)_x + bRu_n - aA_n),\ n \geq 0 \qquad (9)$$

Applying the relations to (RLW) we get

$$u_0(x,t) = f(x)$$

$$u_{n+1}(x,t) = -L^{-1}(aA_n + (u_n)_x - b(u_n)_{xxt}),\ n \geq 0 \qquad (10)$$

Where A_n are given by

$$A_0 = u_{0x}u_0$$
$$A_1 = u_{0x}u_1 + u_{1x}u_0$$
$$A_2 = u_{0x}u_2 + u_{1x}u_1 + u_{2x}u_0$$

The scheme in eq. (10) can easily determine the components $u_n(x,t), n \geq 0$ and the first few components of $u_n(x,t)$ follows immediately upon setting

$$u_0(x,0) = f(x)$$
$$u_1(x,t) = -L^{-1}(aA_0 + (u_0)_x - b(u_0)_{xxt})$$
$$u_2(x,t) = -L^{-1}(aA_1 + (u_1)_x - b(u_1)_{xxt})$$
$$u_3(x,t) = -L^{-1}(aA_2 + (u_2)_x - b(u_2)_{xxt})$$

.

Consequently, one can recursively determine each individual term of the series $\sum_{n=0}^{\infty} u_n(x,t)$, and hence the solution $u(x,t)$ is readily obtained in a series form.

1. Modified Adomian Decomposition Method

(i) Reliable Modification

Wazwaz,1999 [10] proposed reliable modification form based on the assumption that the function $f(x)$ in (5)can be divided into two parts, i.e.

$$f(x) = f_0(x) + f_1(x)$$

Accordingly, a slight variation was proposed only on the components u_0 and u_1.

The suggestion was that only the parts f_0 be assigned to the component u_0,whereas the remaining part f_1 be combined with other terms given in (5)to define u_1. Consequently, the recursive relation,

$$u_0 = f_0$$
$$u_1(x,t) = f_1 - L^{-1}(aA_0 + (u_0)_x - b(u_0)_{xxt}) \qquad (11)$$

$$u_{n+2}(x,t) = -L^{-1}(aA_{n+1} + (u_{n+1})_x - b(u_{n+1})_{xxt})$$

Although this variation in the formation of u_0 and u_1 is slight, however it plays a major role in accelerating the convergence of the solution and in minimizing the size of calculations.

Furthermore, there is no need sometimes to evaluate the so-called Adomian polynomials required for nonlinear operators. Two important remarks related to the modified method were made by Wazwaz,1999 [10]. First, by proper selection of the function f_0 and

f_1 , the exact solution u may be obtained by using very few iterations, and sometimes by evaluating only two components. The success of this modification depends only on the choice of f_0 and f_1, and this can be made through trials, that are the only criteria which can be applied so far.

Second, if f consists of one term only, the standard decomposition method should be employed in this case.

(ii) The New Modification

As indicated earlier, although the modified decomposition method may provide the exact solution by using two iterations only, and sometimes without any need for Adomian polynomials, but its effectiveness depends on the proper choice of f_0 and f_1. In the new modification[11], Wazwaz replaces the process of dividing g into two components by a series of infinite components. He suggests that f be expressed in Taylor series

$$f - \sum_{n=0}^{\infty} f_n \qquad (12)$$

Moreover, he suggest a new recursive relationship expressed in the form

$$u_0 = f_0$$

$$u_{n+1}(x,t) = f_{n+1} - L^{-1}(aA_n + (u_n)_x - b(u_n)_{xxt}), n \geq 0 \quad (13)$$

It is important to note that if f consists of one term only, then scheme (13) reduces to relation (10). Moreover, if f consists of two terms, then relation (13) reduces to the modified relation (11). It is easily observed that algorithm (13) reduces the number of terms involved in each component, and hence the size of calculations is minimized compared to the standard Adomian decomposition method only. Moreover, this reduction of terms in each component facilitates the construction of Adomian polynomials for nonlinear operators.

3. Application and Numerical Results

In this section, the new modified ADM described earlier will be demonstrated on illustrative examples and we compare the approximate solution obtained for our RLW equation with known exact solutions. We define u_m to be m-term approximate solution, i.e.

$$u_m = \sum_{i=0}^{m} u_i \ (x,t) \qquad (13)$$

u_e the exact solution and e_m the absolute error between the exact solution and the approximate solution

$$e_m = |u_e - u_m| \qquad (14)$$

Example (1)

Consider the RLW equation(1) with the initial condition

$$u(x,0) = 3c\ sech^2\left(k(x - x_0)\right) \qquad (15)$$

Where k is an arbitrary constant and

$$k = \tfrac{1}{2}\left(\frac{c}{1+c}\right)^{\frac{1}{2}}.$$

The single solitary-wave solution of RLW equation is given by

$$u(x,t) = 3c\ sech^2(k(x - (1+c)t))$$

where $c > 0$ is constant.

We use the new modified ADM to solve this equation. Tables (1-4) show the numerical results for u_m in comparison with the analytical solution when $c = 0.05 \quad and \quad k = 0.109$.

Table(1): Absolute errors for example(1) with c=0.05 , k=0.109 and m=4 .

$x_i \setminus t_i$	0.01	0.03	0.05
0.1	5.33982×10^{-8}	5.33982×10^{-8}	4.32171×10^{-7}
0.2	4.10852×10^{-7}	4.10852×10^{-7}	5.56933×10^{-7}
0.3	7.63759×10^{-7}	7.63759×10^{-7}	6.83084×10^{-7}
0.4	1.11084×10^{-7}	1.11084×10^{-6}	8.11842×10^{-7}
0.5	1.45080×10^{-7}	1.45076×10^{-6}	9.44397×10^{-7}

Table(2): Absolute errors for example(1) with c=0.05 , k=0.109 and m=6 .

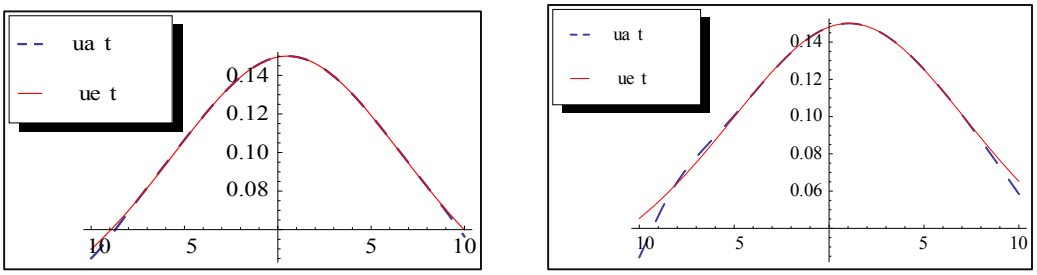
$x_i \setminus t_i$	0.01	0.03	0.05
0.1	3.74187 ×10-8	1.85816 ×10-7	4.32171 ×10-7
0.2	6.27457 ×10-8	2.61290 ×10-7	5.56933 ×10-7
0.3	8.85283 ×10-8	3.37863 ×10-7	6.83084 ×10-7
0.4	1.15012 ×10-7	4.16270 ×10-7	8.11842 ×10-7
0.5	1.42439 ×10-7	4.97230 ×10-7	9.44397 ×10-7

Table(3): Absolute errors for example(1) with c=0.05 , k=0.109 and m=10 .

t	$m = 4$	$m = 6$	$m = 10$
0.2	2.38564 ×10-5	7.52448 ×10-6	6.29652 ×10-7
0.4	7.60588 ×10-5	2.32311 ×10-5	3.11536 ×10-6
0.6	1.56281 ×10-4	4.71745 ×10-5	5.85957 ×10-6
0.8	2.64570 ×10-4	7.99948 ×10-5	6.80166 ×10-6
1.0	4.01613 ×10-4	1.23004 ×10-4	6.64784 ×10-6

Table(4): L_2 errors for example(1) with m=4,6 and 10

t	$m=4$	$m=6$	$m=10$
0.2	2.38564 ×10-5	7.52448 ×10-6	6.29652 ×10-7
0.4	7.60588 ×10-5	2.32311 ×10-5	3.11536 ×10-6
0.6	1.56281 ×10-4	4.71745 ×10-5	5.85957 ×10-6
0.8	2.64570 ×10-4	7.99948 ×10-5	6.80166 ×10-6
1.0	4.01613 ×10-4	1.23004 ×10-4	6.64784 ×10-6



(a) (b)

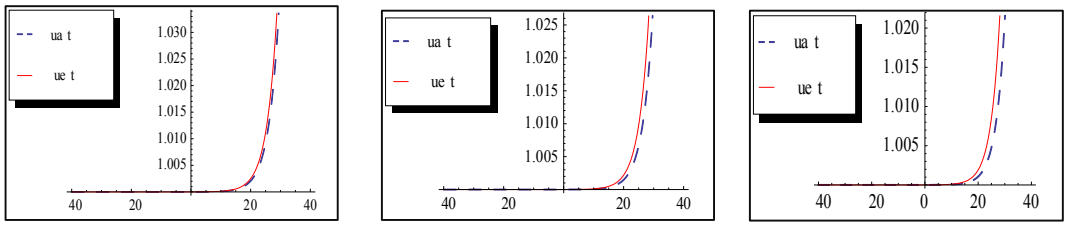
Fig.1. The exact solution and numerical solution with new modified ADM for Ex.1 , (a) for $t=0.5$ and (b) for $t=1.0$.

Table(5): Absolute errors for example(2) with c=0.1 and m=7 .

$x_i \setminus t_i$	0.5	1.0	1.5
0	1.07848 ×10-6	1.71574 ×10-6	2.05345 ×10-6
20	4.44170 ×10-4	7.08273 ×10-4	8.49419 ×10-4
40	4.06848 ×10-3	1.70003 ×10-2	4.09707 ×10-2
60	7.02596 ×10-4	1.76923 ×10-3	3.33876 ×10-3
80	1.72020 ×10-6	4.35845 ×10-6	8.28389 ×10-6

Table(6): L_2 errors for example(2) with c=0.1 and d=1.

$m \setminus t_i$	0.5	1.0	1.5
7	1.28255 ×10-6	2.04041 ×10-6	2.44203 ×10-6
5	1.28250 ×10-6	2.03736 ×10-6	2.47395 ×10-6
3	1.44136 ×10-6	3.01559 ×10-6	4.70583 ×10-6



(a) (b) (c)

Fig.2. The exact solution and numerical solution with new modified ADM for Ex.2 , (a) for $t=0.5$, (b) for $t=1.0$ and (c) for $t=1.5$.

5. Concluding remarks

In this paper, we presented the application of new modified ADM for solving RLW equation. An advantage of the method is that it displays a fast convergence of the solution. The numerical results obtained by this method have illustrated a high degree of accuracy compared with the exact solution. Tables (1-3) show the difference of analytical solution and numerical solution of the error of RLW equation. It is to be noted that numerical comparison were used in evaluating the approximate solutions of RLW equation with u_4 , u_6 and u_{10} . We achieved a good approximation with the exact solution of equation(1) with initial condition, also the results are found to be in good agreement with Kaya and El-sayed, 2003 [6]. Table (5) shows the absolute error for m=7 in example 2. From the numerical results we conclude that the method gives remarkable accuracy in comparison with the analytical solution especially for

small values of time t . the results are found to be in good agreement with El-Danaf et.al., 2005 [4].

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Impact of hemodialysis on the psychosocial state of patients with end-stage renal disease

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Abstract: Many psychiatric disorders can be seen in patients with chronic renal failure (CRF). Hemodialysis, which is a renal replacement treatment, causes various psychiatric and psychosocial problems. **Objectives:** The objectives of the current study were to investigate the prevalence of psychosocial problems in patients with end-stage renal disease.and to assess the prevalence of depression in patients with end-stage renal disease. **Methods:** A descriptive study design included **50** patients with end stage renal disease who were scheduled for hemodialysis at Prince Salman Hospital Riyadh Saudi Arabia, performed from February 2010 to April 2010. The patients were interviewed by using; sociodemographic information questionnaire sheet developed by the researchers; Beck Depression Inventory and SF-36 (Health Survey for dialysis Patients. **Results:** The result of the current study demonstrated that more than half of studied subjects(55.7%) mentioned that their health extremely interfere with their social activities.also there was no significant statistical deference between gender and depression. **Conclusion** The study findings indicated that hemodialysis severely interfere with social activities of patients & depression is a common psychological problem among the Saudi patients with ends stage renal disease.

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1. Introduction:

Chronic life-threatening and disabling conditions, such as end-stage renal disease (ESRD), introduce significant psychosocial stressors and adaptive demands. Chronic kidney disease (CKD) affects more than 19 million people in the United States, and prevalence of CKD is expected to double within 10 years [(1)], Statistics issued by the Saudi National Center for the Transplantation of organs has shown that there are 11,000 patients suffering from renal failure in the Kingdom [(2&3)], Hemodialysis, which is a renal replacement treatment, causes various psychiatric and psychosocial problems. In addition, strict diet and continuous treatment are other stress factors; people on dialysis continue to have many life changes. Quality of life is often compromised, for example, by fatigue, and challenges in planning meals and limiting fluids. In addition, patients' social and role responsibilities may be altered[4] Many authors indicate that a large percentage of dialyzed patients demonstrate their anxiety and worry about the future. Additional stressors associated with ESRD include biochemical imbalance, physiological changes, neurological disturbances, cognitive impairment, and sexual dysfunction. All can potentially play a role in depression.[5&6]

The patients who suffer from the end-stage renal disease comprise a very specific group. Their life as they know it undergoes a radical change. The necessity to observe a diet and to control the amounts of the intake of fluids emerges. In the case of dialysis patients, the necessity to visit the dialysis station about three times a week for a few hours at a time becomes burdensome, too [(3)]. The psychological problems which accompany dialysis treatments have many aspects.Mood reduction may result in willingness to give up treatment, Depressive symptoms are a significant early indication of bad prognosis [1, 2&5)]

Many authors has reported that the challenges for the next 30 years include understanding the relationship of psychosocial factors to demographic and medical factors in large ESRD patients populations and the refinement of associations between psychosocial factors and patient outcomes, including adjustment, compliance, morbidity, and mortality [(7,8&9)]

Aims of the Study

The aims of the current study are to:

- Assess the prevalence of psychosocial problems in patients with end-stage renal disease.
- Assess the prevalence of depression in patients with end-stage renal disease.

2. Material and Methods:

This study was conducted in the renal dialysis unit(RDU) at Prince Salman Hospital at Riyadh Saudi Arabia.Convenient non randomized sample were used.A total number of 50 Patients of end stage renal disease that were attending in the hemodialysis unit at Prince Salman Hospital. From February 2010 to April 2010.after obtaining institutional ethics committee approval and written informed consent. The following general exclusion criteria were applied :refusal or inability o give informed consent,patients diagnosed with diabetes mellitus,hypertension and/or depression

Data collection. Three tools were used in this study

1-An interview questionnaire was developed by the researcher after thorough review of literatures to gather demographic and clinical data which included, age,sex, marital status, numbers of dialysis and, years of dialysis. 2-**Beck Depression Inventory**[10] (BDI) which included 21-item test presented in multiple choice formats which purports to measure presence and degree of depression.Each of the 21-items of the BDI attempts to assess a specific symptom or attitude "which appear(s) to be specific to depressed patients.3-**SF-36=Health Survey for dialysis Patients** [11] : The UK format of the SF36 questionnaire was selected for use in this study as it is sensitive tool, with broad applicability

The SF-36 is a 36 item questionnaire that measures eight multi-item dimensions of health: physical functioning (10 items) social functioning (2 items) role limitations due to physical problems (4 items), role limitations due to emotional problems (3 items), mental health (5 items), energy/vitality (4 items), pain (2 items), and general health perception (5items). There is a further unscaled single item asking respondents about health change over the past year. For each dimension item scores are coded, summed, and transformed on to a scale from 0 (worst possible health state measured by the questionnaire) to 100 (best possible health state). The scores for each dimension can vary from 0–100; the higher the scores the better the quality of life.

Procedure:.The tool was filled by the researcher during dialysis hours, Clear instruction was given to the patients who voluntary agree to participate before questionnaires. The patients were interviewed at an individual bases.The time needed to fill out the questionnaire was 25 minutes.

Statistical analysis:

The collecting data was analyzed by using the SPSS 17program. Descriptive statistics and summary statistics, including: Means, SDs, and frequencies, were used to summarize patient_demographic,clinical characteristics and psychosocial status of patients. *P value*s were made on the basis of 2 tailed tests.Diferences were considered statistically significant at $p = 0.05$.

3. Results

The demographic and clinical data of hemodialysis patients are shown in table (1) that demonstrate near half [48%] of studied subject were in age group from 30-49(productive age).Regarding gender 62%of studied subjects were male concerning years of dialysis 48%from patients either less than 3 years or from 3 to 6 years treated with dialysis.while only 4% on dialysis more than 6 years.

SF36 scales as reported by the subjects in the study as demonstrated in table (2).Half of studied subjects mentioned that their general health is Fair,while only 2% mentioned that their general health is poor. More than one quarter (26%) said that their general health is somewhat worse compared with one year ago. while 32% mentioned that their health either the same or much worse compared with one year ago.

Nearly half of studied subjects(48%) mentioned that their health extremely interfere with their social activities.while only (8%)said that their health moderately interfere with their social activities as demonstrated in (figure 1).

More than half of studied subjects (58%) mentioned that pain severity in the last 4 weeks are very sever. While only (4%) said that their sensation of pain were mild (figure 1).

Concerning relationship between depression and gender as demonstrated in table (3)moderate depression is commonly reported in male patients 62.1%.there is no statistical significant differences Concerning correlation between total depression score, age and years of dialysis there is no statistical significant differences. as presented in table (4)

The total score of Rand SF-36 for Each Specific Area of Functional Health Status presented in table (5).General health area in SF36 was taken the highest score (56.3%,55.7% and 48.3%) followed by social functioning and fatigue respectively.

4. Discussion

This study was designed to assess the prevalence of psychosocial problems& depression in fifty patients on hemodialysis.

The current study findings demonstrate that the patients health extremely interfere with their social activities,this come in accordance with another study [12] findings who concluded that The physical health domain of (sf36) of the studied patients had lower mean score than that of emotional and social domains. However, **Baldree**[13] had categorized the physical activities as a psychosocial stressor. The dispute for the latter is that because the physiological complications of end-stage renal failure would progressively lead to renal bone disease, peripheral

neuropathy and cardiovascular alterations, these patients would experience limitation in their physical activities. This argument is supported by **Lok** [14] who has categorized "limitations of physical activities" as physical stressor. an, have more multi-faceted networks, and are more likely to mobilize their support networks than men [16].

Table (1) Demographic and clinical data of hemodialysis patients N=50

Age	Number	%
Less than 30	8	16
30 –	10	20
40 –	14	28
50 –	5	10
60 and up	13	26
Mean	**45.18**	
SD	**14.33**	
Gender		
Male	**31**	**62**
Female	**19**	**38**
Years of dialysis		
< 3	**24**	**48**
3 – 6	**24**	**48**
6 ➢	**2**	**4**
Number of Dialysis per week		
Three times	**50**	**100**

Table (2) SF36 scales as reported by the subjects in the study

	Number	Percent
General Health		
Excellent	**0**	**0**
Very good	**3**	**6**
Good	**21**	**42**
Fair	**25**	**50**
Poor	**1**	**2**
Rating health compare to one year ago	**2**	**4**
	3	**6**
Much better	**16**	**32**
Somewhat better	**13**	**26**
About the same	**16**	**32**
Somewhat worse		
Much worse		

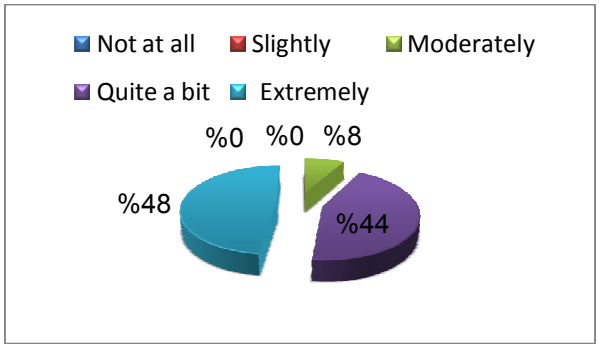

Figure (1) Health status interference with social activities of studied subjects

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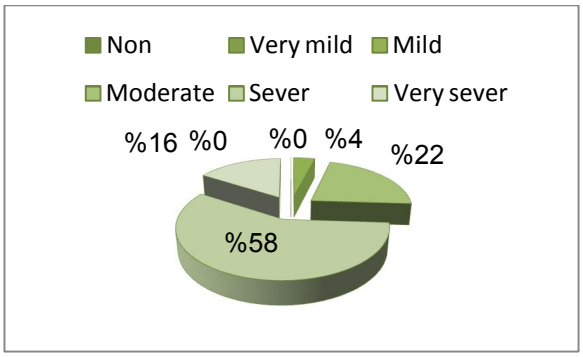

Figure (2) Pain severity in the last 4 weeks as experienced by studied subjects

Table (3) Relationship between Depression and gender

Gender	Depression						X	P
	No Depression		Moderate depression		Depression			
	No	%	No	%	No	%		
Male	4	80.0	18	62.1	9	56.2	**0.912**	
Female	1	20.0	11	37.9	7	43.8		
Total	5	100	29	100	16	100.		

Table (4) Correlation between total depression score age and years of dialysis

	Age		Years of dialysis	
	r	p	R	p
Total Depression Score	**0.218**	**0.128**	**0.155**	**0.281**

The score of Rand SF-36 for Each Specific Area of Functional Health Status

Scale	Mean score	SD
Physical Functioning	47.8	14.63
Role limitation due to physical problems	40	17.81
Role limitation due to emotional problems	32.6	15.22
Energy/ Fatigue	48.3	18.21
Emotional well being	42.6	16.39
Social functioning	55.7	15.77
Pain	18.7	19.83
General health	56.3	16.27

In Islamic culture as Saudi Arabia sources of support for dialysis patients are more obvious relates to transcendent values and relationships this is the way people find meaning, purpose, and hope in life and in the midst of suffering. **Dimond** study reveal that family support and a greater availability and involvement of the spouse were significantly associated with higher morale; family support and the availability of a confidant were associated with fewer illness exacerbations and difficulties in social functioning[17]. In contrast, **[Spiegel et al** [18] reported

that frequency of contact with friends and relatives increased psychological symptoms suggesting that frequent contacts may be stressful, perhaps due to issues of conflict and reciprocity. Social support has been consistently linked to improved health outcomes in numerous studies as well as in populations with varying chronic illnesses characterized by different geographic settings, socioeconomic status, and ethnic backgrounds [19]. Although the relationships are consistent, the mechanisms underlying the connection between social support and illness have not been clearly delineated[20]

Fatigue is a subjective symptom characterized by tiredness, weakness, and lack of energy21. Fatigue is also one of the most debilitating symptoms reported by hemodialysis patients, in the current study Approximately half (48.3%) complaining from fatigue as represented at SF36 score

This come in accordance with **Jhamb et al** who concluded that 60% to 97% of patients on HD experience some degree of fatigue.[22]

Also People with chronic renal disease, regardless of whether they are predialysis or receiving either hemodialysis or Peritoneal dialysis, are reported having high levels of fatigue and are often unable to engage in normal daily activities[23]. In addition, fatigue is positively correlated with depression [24&25]

Another author[19] assess the burdensome nature of an illness can be related to patient expectations and cultural factors, and can vary among patients of different ages. This later finding is inconsistent with the findings of the current study where it showed insignificant correlation between patient's age, years of dialysis and and total score of depression.Also This is similar to the observation of **Wolcott et** al[26], that duration on dialysis was not related to quality of life. Patients treated with heart disease often developed psychotic episodes and neuropsychiatric manifestations.

Bargielk 27 concluded that accompanying treatment with the use of dialyses have many aspects that are worth mentioning. The first one is mood reduction and resignation attitude.

Limitations resulting from the treatment procedure and a subjective perception of the situation may also have a negative influence on fulfilling social roles. Another author indicates that depression and anxiety are primary factors and contribute to the occurrence of disability more than the seriousness of somatic disorder [28].

End-stage renal disease has serious effects on the patient's QOL, negatively affecting their social, financial, and psychological well-being, It affects the QOL more intensely than heart failure, diabetes mellitus, chronic lung disease, and arthritis[25,26].

5. Conclusion

The study findings indicate hemodialysis severely interfere with social activities of patients.About half of studied subjects have moderate depression.Also there was no significant relationship between total depression score and years of dialysis

Recommendation

In the light of the current study findings, it is recommended to

1-The study should be replicated on different population & hospitals

2- Further researches must be done in this regard in order to assess possible forms of interventions adjusted to the needs of dialyzed patients & according to Saudi cultural customs

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Evaluating Consulting Firms Using VIKOR

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Abstract: Many companies usually ask for consulting firm service. Thus evaluating and selecting a suitable consulting firm becomes an important issue. In this article, a Multi-Criteria Decision Making (MCDM) problem is presented and a real-life international company is illustrated. The technique used in solution named *Vlse Kriterijumska Optimizacija I Kompromisno Resenje* in Serbian (VIKOR) is applied for ranking the consulting firms. Many quantitative criteria are considered to compare firms in order to rank them.
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Keywords: Consulting firms; Multi-Criteria Decision Making; VIKOR.

1. Introduction

A consulting firm is a firm of experts providing professional advice to an organization for a fee. A consulting firm consists of consultants who are experts in their field. For some global consulting firms, their employees represent from many nationality. Usually, a consulting firm provides its service which is in core business discipline, from marketing to operations.

The merit of MCDM techniques is that they consider both qualitative parameters as well as the quantitative ones, MCDM includes many solution techniques such as Simple Additive Weighting (SAW), Weighting Product(WP) [6], and Analytic Hierarchy Process (AHP) [9].

In this paper, a real-life problem existed in multi-national company is presented. The company is wiling to introduce a new product to the Egyptian market; so it needs consultations concerning pricing strategy, marketing, and operations. The technique used so-called *Vlse Kriterijumska Optimizacija I Kompromisno Resenje* in Serbian (VIKOR), a branch of MCDM methods, is applied to rank selected consulting firms for the multi-national company. The rest of the paper is structured as following; in section 2 the VIKOR method is illustrated, section 3 is made for the consulting firm selection problem, the case study is presented in section 4, and finally section 5 is for conclusion.

2. Consulting Firms

To survive in tight competition in today's business world, a company usually develops a new product which is different from, or better than, that of its competitors. A crucial factor such as pricing must be determined when introducing a new product to the market because it is very sensitive to customers. Wrong pricing strategy for a new product developed from a heavy investment can lead a company into loss or even bankruptcy. However, determining the best pricing strategy for a new product is difficult and many factors must be considered [2].

Creplets *et al.* [3] analyzed theoretically and empirically the differences between consultants and experts in the framework of the knowledge-based economy in order to introduce the central concepts of epistemic community and community of practice.

Many criteria must be considered when evaluating consulting firms, some of them are qualitative, such as reputation, some are quantitative, such as firm size; moreover, criteria may have different importance. Therefore, how to comprehensively aggregate these criteria and importance weights becomes a critical issue in effectively evaluating consulting firms.

Some relevant works have been studied in the evaluation of consulting firms. However they did not talk detail about the other criteria that are supposed to be considered by a consulting firm such as the implementation cost and its knowledge. Wang and Chen [12] presented how human inputs (top management, users, and external consultants) are linked to communication effectiveness and conflict resolution in the consulting process, as well as the effects of these factors on the quality of the system implemented.

Altman indicated what should company consider and give guidelines in choosing the right consultancy [1]. Saremi *et al.*[8] used Nominal Group Technique (NGT) in deciding criteria for selecting the best consultant firm.

3. VIKOR

A MCDM problem can be concisely expressed in a matrix format, in which columns indicate criteria (attributes) considered in a given problem; and in which rows list the competing alternatives. Specifically, a MCDM problem with m alternatives (A_1, A_2, ..., A_m) that are evaluated by n criteria (C_1, C_2, ..., C_n) can be viewed as a geometric system with m

points in *n*-dimensional space. An element x_{ij} of the matrix indicates the performance rating of the i^{th} alternative A_i, with respect to the j^{th} criterion C_j, as shown in Eq. (1):

$$D = \begin{array}{c} \\ A_1 \\ A_2 \\ A_3 \\ \vdots \\ A_m \end{array} \begin{array}{c} \begin{array}{cccccc} C_1 & C_2 & C_3 & \cdots & C_n \end{array} \\ \begin{bmatrix} x_{11} & x_{12} & x_{13} & \cdots & x_{1n} \\ x_{21} & x_{22} & x_{23} & \cdots & x_{2n} \\ x_{31} & x_{32} & x_{33} & \cdots & x_{3n} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ x_{m1} & x_{m2} & x_{m3} & \cdots & x_{mn} \end{bmatrix} \end{array} \quad (1)$$

The VIKOR method was introduced as an applicable technique to implement within MCDM [7]. It focuses on ranking and selecting from a set of alternatives in the presence of conflicting criteria. The compromise solution, whose foundation was established by Yu [13] and Zeleny [14] is a feasible solution, which is the closest to the ideal, and here "compromise" means an agreement established by mutual concessions.

The VIKOR method determines the compromise ranking list and the compromise solution by introducing the multi-criteria ranking index based on the particular measure of "closeness" to the "ideal" solution. The multi-criteria measure for compromise ranking is developed from the *Lp-metric* used as an aggregating function in a compromise programming method. The levels of regret in VIKOR can be defined as:

$$L_{p,i} = \{\sum_{j=1}^{n} [w_j (x_j^* - x_{ij}) / (x_j^* - x_j^-)]^p\}^{1/p}, \ 1 \le p \le \infty, \quad (2)$$

where $i = 1,2,\ldots,m$. $L_{1,i}$ is defined as the maximum group utility, and $L_{\infty,i}$ is defined as the minimum individual regret of the opponent.

The procedure of VIKOR for ranking alternatives can be described as the following steps [5]:

***Step 1*:** Determine that best x_j^* and the worst x_j^- values of all criterion functions, where $j = 1, 2,\ldots, n$. If the *jth* criterion represents a benefit then $x_j^* = \max_i f_{ij}$, $f_j^- = \min_i f_{ij}$.

***Step 2*:** Compute the S_i (the maximum group utility) and R_i (the minimum individual regret of the opponent) values, $i = 1, 2,\ldots, m$ by the relations:

$$S_i = L_{1,i} = \sum_{j=1}^{n} w_j (x_j^* - x_{ij}) / (x_j^* - x_j^-), \quad (3)$$

$$R_i = L_{\infty,i} = \max_j [\sum_{j=1}^{n} w_j (x_j^* - x_{ij}) / (x_j^* - x_j^-)], \quad (4)$$

where w_i is the weight of the j^{th} criterion which expresses the relative importance of criteria.

***Step 3*:** Compute the value Q_i, $i = 1,2,\ldots,m$, by the relation

$$Q_i = v(S_i - S^*) / (S^- - S^*) + (1-v)(R_i - R^*) / (R^- - R^*), \quad (5)$$

where $S^* = \min_i S_i$, $S^- = \max_i S_i$, $R^* = \min_i R_i$, $R^- = \max_i R_i$, and v is introduced weight of the strategy of S_i and R_i.

***Step 4*:** Rank the alternatives, sorting by the *S, R,* and *Q* values in decreasing order. The results are three ranking lists.

***Step 5*:** Propose as a compromise solution the alternative (A') which is ranked the best by the minimum *Q* if the following two conditions are satisfied:

C1. "Acceptable advantage":

$Q(A'') - Q(A') \ge DQ$, where A'' is the alternative with second position in the ranking list by *Q*, $DQ = 1/(m - 1)$ and *m* is the number of alternatives.

C2. "Acceptable stability in decision making":

Alternative A' must also be the best ranked by *S* or/and *R*. This compromise solution is stable within a decision making process, which could be: "voting by majority rule" (when $v > 0.5$ is needed), or "by consensus" ($v \approx 0.5$), or "with vote" ($v < 0.5$). Here, v is the weight of the decision making strategy "the majority of criteria" (or "the maximum group utility"). $v = 0.5$ is used in this paper. If one of the conditions is not satisfied, then a set of compromise solutions is proposed [5].

Recently, VIKOR has been widely applied for dealing with MCDM problems of various fields, such as environmental policy [10], data envelopment analysis [11], and personnel training selection [4].

4. Case Study

A multi-national manufacturing company must select a consulting firm to help determine the price for its new product. After preliminary screening, five alternative consulting firms are short-listed.

A committee is formed to conduct the evaluation and selection of the four alternative consulting firms. The committee set four criteria to be compared; three benefit criteria, the company size (C_1), potential profit (C_2), and expected growth (C_3). One cost criterion, the cost of the consulting (C_4) is also considered. All criteria considered are quantitative type. Table 1 shows the four criteria, their relevant weights assigned by the committee, and their computation units.

The management presented the data included in the decision matrix found in Table 2 showing the five firms, and their performance ratings with respect to all criteria.

Table 1. Criteria and their computation units

Criterion Index	Criterion Description	Computation Units	Weights
C_1	Company Size	No. of employees	0.35
C_2	Potential Profit	L.E.(Millions)	0.30
C_3	Expected Growth	Percentage	0.20
C_4	Cost	L.E.(Thousands)	0.15

Table 2. Decision matrix

	C_1	C_2	C_3	C_4
Firm1	1203	30.1	20%	842
Firm2	288	10.9	13%	905
Firm3	532	13.4	50%	767
Firm4	756	18.6	43%	792
Firm5	2897	50.4	18%	954

By applying the procedure of VIKOR, we can calculate the *S*, *R* and *Q* values as shown in Table 3 to derive the preference ranking of the candidates. Management should choose the third candidate because he has the minimum *S*, *R*, and *Q* values; also, the two conditions mentioned earlier in section 2 are satisfied.

Table 3. Ranking lists and scores

	S	***R***	***Q***	**Rank**
Firm1	0.6038	0.2273	0.3734	2
Firm2	0.9607	0.3500	1	5
Firm3	0.5983	0.3173	0.6234	4
Firm4	0.5866	0.2872	0.5294	3
Firm5	0.3230	0.1730	0	**1**

5. Conclusion

A VIKOR method is presented to evaluate and rank consulting firms introduced to a multi-national company. A real-life MCDM problem of a new manner is introduced. The VIKOR method is employed to rank the firms. The method might be combined to other techniques to solve this type of problems in further research.

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CV-VIKOR: A New Approach for Allocating Weights in Multi-Criteria Decision Making Problems

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Abstract: Multi-Criteria analysis, often called Multi-Criteria Decision-Making (MCDM) or Multi-Criteria Decision Aid methods (MCDA), is a branch of a general class of Operations Research (OR) models which deal with the process of making decisions in the presence of multiple objectives. These methods, which can handle both quantitative and qualitative criteria, share the common characteristics of conflict among criteria, incommensurable units, and difficulties in design/selection of alternatives. The technique used in this paper named *Vlse Kriterijumska Optimizacija I KOmpromisno Resenje* in Serbian (VIKOR) is combined to the Coefficient of Variation (CV) to constitute a new approach called CV-VIKOR. The Coefficient of Variation (CV) is employed to allocate weights when no preference existed among the criteria considered. Also, a given numerical example is solved to illustrate the proposed method.
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Keywords: Coefficient of Variation; Multi-Criteria Decision Making; VIKOR.

1. Introduction

Multi-criteria decision making (MCDM) methods can select the best solution from several alternatives. Each candidate solution has multiple attributes with

different effects; each attribute is relevant to some criterion. When conflicting criteria exist, even the best solution cannot satisfy all criteria. The merit of MCDM techniques is that they consider both qualitative parameters as well as the quantitative ones, MCDM includes many solution techniques such as Simple Additive Weighting (SAW), Weighting Product(WP) [4], and Analytic Hierarchy Process (AHP) [6].

The compromise solution is a feasible solution that is the closest to the ideal solution, and a compromise means an agreement established by mutual concession. The compromise solution method, also known as (VIKOR) the *Vlse Kriterijumska Optimizacija I KOmpromisno Resenje* in Serbian was introduced as one applicable technique to implement within MADM [1]. In probability theory and statistics, the coefficient of variation (CV) is a normalized measure of dispersion of a probability distribution. In this paper, we try to tackle the problem of the preference absence among criteria, by using the Coefficient of Variation (CV) statistical measure. First, the weights are assigned to criteria by using CV method. Then, after the alternatives are ranked by the VIKOR method. The rest of the paper is structured as following; in section 2 the VIKOR method is illustrated, section 3 is made for the Coefficient of Variation method, a numerical example is presented in section 4, and finally section 5 is for conclusion.

2. VIKOR

A MCDM problem can be concisely expressed in a matrix format, in which columns indicate criteria (attributes) considered in a given problem; and in which rows list the competing alternatives. Specifically, a MCDM problem with m alternatives (A_1, A_2, ..., A_m) that are evaluated by n criteria (C_1, C_2, ..., C_n) can be viewed as a geometric system with m points in n-dimensional space. An element x_{ij} of the matrix indicates the performance rating of the i^{th} alternative A_i, with respect to the j^{th} criterion C_j, as shown in Eq. (1):

$$D = \begin{array}{c} \\ A_1 \\ A_2 \\ A_3 \\ \vdots \\ A_m \end{array} \begin{array}{c} \begin{array}{cccccc} C_1 & C_2 & C_3 & \cdots & C_n \end{array} \\ \begin{bmatrix} x_{11} & x_{12} & x_{13} & \cdots & x_{1n} \\ x_{21} & x_{22} & x_{23} & \cdots & x_{2n} \\ x_{31} & x_{32} & x_{33} & \cdots & x_{3n} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ x_{m1} & x_{m2} & x_{m3} & \cdots & x_{mn} \end{bmatrix} \end{array} \quad (1)$$

The VIKOR method was introduced as an applicable technique to implement within MCDM [5]. It focuses on ranking and selecting from a set of alternatives in the presence of conflicting criteria. The compromise solution, whose foundation was established by Yu [9] and Zeleny [10] is a feasible solution, which is the closest to the ideal, and here "compromise" means an agreement established by mutual concessions.

The VIKOR method determines the compromise ranking list and the compromise solution by introducing the multi-criteria ranking index based on the particular measure of "closeness" to the "ideal"

solution. The multi-criteria measure for compromise ranking is developed from the *Lp-metric* used as an aggregating function in a compromise programming method. The levels of regret in VIKOR can be defined as:

$$L_{p,i} = \{\sum_{j=1}^{n}[w_j(x_j^* - x_{ij})/(x_j^* - x_j^-)]^p\}^{1/p},\ 1 \le p \le \infty, \qquad (2)$$

where $i = 1,2,\ldots,m$. $L_{1,i}$ is defined as the maximum group utility, and $L_{\infty,i}$ is defined as the minimum individual regret of the opponent.

The procedure of VIKOR for ranking alternatives can be described as the following steps [3]:

***Step 1*:** Determine that best x_j^* and the worst x_j^- values of all criterion functions, where $j = 1, 2,\ldots, n$. If the *jth* criterion represents a benefit then $x_j^* = \max_i f_{ij}$, $f_j^- = \min_i f_{ij}$.

***Step 2*:** Compute the S_i (the maximum group utility) and R_i (the minimum individual regret of the opponent) values, $i = 1, 2,\ldots, m$ by the relations:

$$S_i = L_{1,i} = \sum_{j=1}^{n} w_j(x_j^* - x_{ij})/(x_j^* - x_j^-), \qquad (3)$$

$$R_i = L_{\infty,i} = \max_j [\sum_{j=1}^{n} w_j(x_j^* - x_{ij})/(x_j^* - x_j^-)], \qquad (4)$$

where w_i is the weight of the j^{th} criterion which expresses the relative importance of criteria.

***Step 3*:** Compute the value Q_i, $i = 1,2,\ldots,m$, by the relation

$$Q_i = v(S_i - S^*)/(S^- - S^*) + (1-v)(R_i - R^*)/(R^- - R^*), \qquad (5)$$

where $S^* = \min_i S_i$, $S^- = \max_i S_i$, $R^* = \min_i R_i$, $R^- = \max_i R_i$, and v is introduced weight of the strategy of S_i and R_i.

***Step 4*:** Rank the alternatives, sorting by the *S, R,* and *Q* values in decreasing order. The results are three ranking lists.

***Step 5*:** Propose as a compromise solution the alternative (A') which is ranked the best by the minimum *Q* if the following two conditions are satisfied:

C1. "Acceptable advantage":

$Q(A'') - Q(A') \ge DQ$, where A'' is the alternative with second position in the ranking list by *Q*, $DQ = 1/(m - 1)$ and *m* is the number of alternatives.

C2. "Acceptable stability in decision making":

Alternative A' must also be the best ranked by *S* or/and *R*. This compromise solution is stable within a decision making process, which could be: "voting by majority rule" (when $v > 0.5$ is needed), or "by consensus" ($v \approx 0.5$), or "with vote" ($v < 0.5$). Here, v is the weight of the decision making strategy "the majority of criteria" (or "the maximum group utility"). $v = 0.5$ is used in this paper. If one of the conditions is not satisfied, then a set of compromise solutions is proposed [3].

Recently, VIKOR has been widely applied for dealing with MCDM problems of various fields, such as environmental policy [7], data envelopment analysis [8], and personnel training selection [2].

3. Coefficient of Variation

The weight of the criterion reflects its importance in MCDM. In this paper, a new method is proposed to allocate weights in MCDM problems with no preference. The new method rely on the well known Coefficient of Variation (CV) to allocate the weights of different criteria. Range standardization was done to transform different scales and units among various criteria into common measurable units in order to compare their weights.

$$x'_{ij} = \frac{x_{ij} - \min_{1\le j\le n} x_{ij}}{\max_{1\le j\le n} x_{ij} - \min_{1\le j\le n} x_{ij}} \qquad (6)$$

$D'=(x')_{mxn}$ is the matrix after range standardization; max x_{ij}, min x_{ij} are the maximum and the minimum values of the criterion (j) respectively, all values in D' are ($0 \le x'_{ij} \le 1$). So, according to the normalized matrix $D'= (x')_{mxn}$, the Standard Deviation (σ_j) is calculated for every criterion independently as shown in Eq. (7):

$$\sigma_j = \sqrt{\frac{1}{m}\sum_{i=1}^{m}(x'_{ij} - \bar{x}'_j)^2} \qquad (7)$$

where $\bar{x}'_j$ is the mean of the values of the j^{th} criterion after normalization and $j = 1,2,\ldots,n$.

After calculating (σ_j) for all criteria, the (CV) of the criterion (j) will be as shown in Eq.(8)

$$CV_j = \frac{\sigma_j}{\bar{x}'_j} \qquad (8)$$

The weight (W_j) of the criterion (j) can be defined as

$$W_j = \frac{CV_j}{\sum_{j=1}^{n} CV_j} \qquad (9)$$

where $j = 1,2,\ldots,n$.

4. Illustrative Example

In this section, an example of six alternatives to be ranked through comparing four criteria is presented in order to explain the method proposed. As shown in Table 1, the six alternatives and their performance ratings with respect to all criteria are presented. All criteria are from the maximization utility type (the maximum is better).

Table 1. Decision matrix

	C_1	C_2	C_3	C_4
Alternative 1	50	5	45	78
Alternative 2	32	8	60	56
Alternative 3	69	2	30	24
Alternative 4	54	7	86	56
Alternative 5	70	6	75	85
Alternative 6	92	1	62	22

In the above example, there is no preference among the criteria, no weights specified for them subjective by the decision maker, so the Coefficient of Variation (CV) method will be applied in this example. Table 2 illustrates the range standardization done to decision matrix as in Eq.(6).

Table 2. Range standardized decision matrix

	C_1	C_2	C_3	C_4
Alternative 1	0.3	0.5714	0.2679	0.8889
Alternative 2	0	1	0.5357	0.5397
Alternative 3	0.6167	0.1429	0	0.0317
Alternative 4	0.3667	0.8571	1	0.5397
Alternative 5	0.6333	0.7143	0.8036	1
Alternative 6	1	0	0.5714	0

Table 3 shows the values of Mean ($\bar{x}'_j$), Standard Deviaton (σ_j), the Coefficient of Variation (CV_j), and the weight assigned to each criterion (W_j) as shown in Eqs. (7-9).

Table 3. Weights assigned to criteria

	$\bar{x}'_j$	σ_j	CV_j	Weights
C_1	0.4861	0.3429	0.7055	0.239
C_2	0.5476	0.3981	0.7270	0.247
C_3	0.5298	0.3598	0.6791	0.230
C_4	0.5	0.4180	0.8360	0.284

By applying the procedure of VIKOR, we can calculate the *S*, *R* and *Q* values as shown in Table 4 in order to rank the alternatives. The fifth alternative should be selected because it has the minimum *S*, *R*, and *Q* values; also, the two conditions mentioned earlier in section 2 are satisfied.

Table 4. Ranking lists and scores

	S	***R***	***Q***	**Rank**
Alternative 1	0.47311	0.16839	0.42857	3
Alternative 2	0.47652	0.239	0.61117	4
Alternative 3	0.80832	0.27498	0.97704	6
Alternative 4	0.31738	0.15137	0.25651	2
Alternative 5	0.20338	0.08763	0	**1**
Alternative 6	0.62957	0.2840	0.85226	5

5. Conclusion

The Coefficient of Variation describes the dispersion of the values of criteria, giving the more dispersed values criteria much importance and more weight values. Also, being a normalized measure of dispersion, it suits the problem of allocating the weights in MCDM problems with no preference. In this paper, the CV-VIKOR proposed method is presented and illustrated. The new method employed the Coefficient of Variation to allocate the weights in MCDM problems. The proposed approach is illustrated by solving a numerical example, showing it is efficient and effective.

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A VIKOR Approach for Project Selection Problem

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Abstract: Profitable investments lead to the growth and prosperity of each corporation. Various objectives are usually taken into account when projects are analyzed, including economic desirability, technical issues, and environmental and social factors. Many conflicting criteria should be considered when comparing projects to choose among or rank them. The merit of MCDM techniques is that they consider both qualitative parameters as well as the quantitative ones. In this article, a MCDM project selection problem found in real-life international company is presented. The technique used named *Vlse Kriterijumska Optimizacija I Kompromisno Resenje* in Serbian (VIKOR) is applied for ranking the projects.
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Keywords: Multi-Criteria Decision Making; Project selection; VIKOR.

1. Introduction

Decision of selecting an engineering, construction or R&D project is often fundamental for business survival. Such decisions usually involve prediction of future outcomes considering different alternatives. Selection of a project or a portfolio of projects constitutes one of the main problems that managers are faced with. As the decision maker tries to maximize or minimize outcomes associated with each objective depending on its nature, so a Multi-Criteria Decision Making (MCDM) problem arises. It should be noticed that evaluation criteria could be of various nature. While financial measures (Net Present Value, Rate of Return, Payback Period, and Project Risk) are of quantitative type, the ones that reflect technical, environmental or social objectives are usually of qualitative nature [7].

MCDM includes many solution techniques such as Simple Additive Weighting (SAW), Weighting Product (WP) [5], and Analytic Hierarchy Process (AHP) [9]. In this paper, a project selection problem existing in a multi-national company is presented. The technique used in this paper named *Vlse Kriterijumska Optimizacija I Kompromisno Resenje* in Serbian (VIKOR) is applied for ranking the projects. The rest of this paper is organized as follows: Section 2 is made for the VIKOR approach, the project selection problem is illustrated in section 3, in section 4 the case study is described, and finally section 5 is made for conclusion.

2. VIKOR

A MCDM problem can be concisely expressed in a matrix format, in which columns indicate criteria (attributes) considered in a given problem; and in which rows list the competing alternatives. Specifically, a MCDM problem with m alternatives (A_1, A_2, ..., A_m) that are evaluated by n criteria (C_1, C_2, ..., C_n) can be viewed as a geometric system with m points in n-dimensional space. An element x_{ij} of the matrix indicates the performance rating of the i^{th} alternative A_i, with respect to the j^{th} criterion C_j, as shown in Eq. (1):

$$D = \begin{array}{c} \\ A_1 \\ A_2 \\ A_3 \\ \vdots \\ A_m \end{array} \begin{array}{c} \begin{array}{ccccc} C_1 & C_2 & C_3 & \cdots & C_n \end{array} \\ \begin{bmatrix} x_{11} & x_{12} & x_{13} & \cdots & x_{1n} \\ x_{21} & x_{22} & x_{23} & \cdots & x_{2n} \\ x_{31} & x_{32} & x_{33} & \cdots & x_{3n} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ x_{m1} & x_{m2} & x_{m3} & \cdots & x_{mn} \end{bmatrix} \end{array} \quad (1)$$

The VIKOR method was introduced as an applicable technique to implement within MCDM [8]. It focuses on ranking and selecting from a set of alternatives in the presence of conflicting criteria. The compromise solution, whose foundation was established by Yu [13] and Zeleny [14] is a feasible solution, which is the closest to the ideal, and here "compromise" means an agreement established by mutual concessions.

The VIKOR method determines the compromise ranking list and the compromise solution by introducing the multi-criteria ranking index based on the particular measure of "closeness" to the "ideal" solution. The multi-criteria measure for compromise ranking is developed from the *Lp-metric* used as an aggregating function in a compromise programming method. The levels of regret in VIKOR can be defined as:

$$L_{p,i} = \{\sum_{j=1}^{n} [w_j (x_j^* - x_{ij}) / (x_j^* - x_j^-)]^p\}^{1/p}, \; 1 \le p \le \infty, \quad (2)$$

where i = 1,2,…,m. $L_{1,i}$ is defined as the maximum group utility, and $L_{\infty,i}$ is defined as the minimum individual regret of the opponent.

The procedure of VIKOR for ranking alternatives can be described as the following steps [3]:

***Step 1*:** Determine that best x_j^* and the worst x_j^- values of all criterion functions, where$j$ = 1, 2,…, n. If the jth criterion represents a benefit then $x_j^* = \max_i f_{ij}$, $f_j^- = \min_i f_{ij}$.

***Step 2*:** Compute the S_i (the maximum group utility) and R_i (the minimum individual regret of the opponent) values, i = 1, 2,…, m by the relations:

$$S_i = L_{1,i} = \sum_{j=1}^{n} w_j (x_j^* - x_{ij}) / (x_j^* - x_j^-) , \quad (3)$$

$$R_i = L_{\infty,i} = \max_j [\sum_{j=1}^{n} w_j (x_j^* - x_{ij}) / (x_j^* - x_j^-)] , \quad (4)$$

where w_i is the weight of the j^{th} criterion which expresses the relative importance of criteria.

***Step 3*:** Compute the value Q_i , i = 1,2,…,m , by the relation

$$Q_i = v(S_i - S^*) / (S^- - S^*) + (1-v)(R_i - R^*) / (R^- - R^*) , \quad (5)$$

where $S^* = \min_i S_i$, $S^- = \max_i S_i$, $R^* = \min_i R_i$, $R^- = \max_i R_i$, and v is introduced weight of the strategy of S_i and R_i .

***Step 4*:** Rank the alternatives, sorting by the S, R, and Q values in decreasing order. The results are three ranking lists.

***Step 5*:** Propose as a compromise solution the alternative (A') which is ranked the best by the minimum Q if the following two conditions are satisfied:

C1. "Acceptable advantage":

$Q(A'') - Q(A') \geq DQ$, where A'' is the alternative with second position in the ranking list by Q, DQ = 1/(m − 1) and m is the number of alternatives.

C2. "Acceptable stability in decision making":

Alternative A' must also be the best ranked by S or/and R. This compromise solution is stable within a decision making process, which could be: "voting by majority rule" (when v > 0.5 is needed), or "by consensus" ($v \approx 0.5$) , or "with vote" (v < 0.5). Here, v is the weight of the decision making strategy "the majority of criteria" (or "the maximum group utility"). v = 0.5 is used in this paper. If one of the conditions is not satisfied, then a set of compromise solutions is proposed [3].

Recently, VIKOR has been widely applied for dealing with MCDM problems of various fields, such as environmental policy [10], data envelopment analysis [11], and personnel training selection [2].

3. Project Selection Problem

Numerous techniques have been proposed in recent years for solving project selection problems. Heidenberger and Stummer give a survey of quantitative techniques for R&D project selection and resource allocation problems [4]. Most of procedures listed in that paper can be applied for evaluating construction and engineering projects as well. Utility function approach is often employed for solving such a problem. E.g., in [6] and [12] this methodology is used.

Project selection problem is a typical MCDM problem which involves both quantitative and qualitative criteria to be considered. In the rest of this section, some of the quantitative criteria will be illustrated. Also, in our case study, we will limit comparison to these four criteria. The considered criteria are described in brief as following [1]:

First Net Present Value

The Net Present Value (NPV) is defined as the sum of the present values (PVs) of the individual cash flows. Actually, NPV is an indicator of how much value a project adds to the organization. Therefore, it is treated as the benefit criteria of the project. In financial theory, if there is a choice between two mutually exclusive alternatives, the one yielding the highest NPV should be selected.

Second Rate of Return

Rate of Return (ROR) is the ratio of money gained or lost on a project relative to the amount of money invested. ROR is usually expressed as a percentage. Therefore, ROR is also the benefit criteria for any project selection.

Third Payback Period

Payback period (PB) is the period required for the return on an investment or project. Any project yielding the quickest Payback Period should be selected.

Fourth Project Risk

There may be some external circumstances or event that cannot occur for the project to be successful. The external events are called Project Risks (PR). If such type event were likely to happen, then it would be a risk. The aim of project selection is to minimize the risk criteria. In the problem considered the risks associated to projects are scaled from 1 to100.

4. Case Study

In this section, a real-life project selection problem existing in multi-national company will be illustrated and solved by VIKOR method. The company's management limited the criteria compared to be eight. All the criteria are from the quantitative type (illustrated before in section 3), also have financial

aspects. The company made market research and feasibility studies to stand over the values and performance ratings with respect to the considered criteria. Some values are extracted from the company financial statements (like cash flow statement, balance sheet). The values of fourth criterion (project risk) are analyzed by specialized organization. The problem has eight projects to be ranked through comparing four criteria. As shown in Table 1, the considered criteria, their computational units, their utility type (Max or Min), and their relevant weights assigned by management are presented. After, Table 2 shows the eight projects and their performance ratings with respect to all criteria.

Table 1. Criteria and their computation units

Criterion Index	Criterion Description	Units	Utility Type	Weight
C_1	Net Present Value (NPV)	L.E (Millions)	Max	0.5
C_2	Rate of Return (ROR)	L.E (Millions)	Max	0.1
C_3	Payback Period (PB)	Months	Min	0.25
C_4	Project Risk (PR)	Points (1-100)	Min	0.15

Table 2. Decision matrix

	C_1	C_2	C_3	C_4
Project 1	3.6	0.5	5	32
Project 2	4	0.8	8	25
Project 3	2.3	0.6	10	20
Project 4	1.5	0.2	16	15
Project 5	2.9	0.7	12	52
Project 6	4.5	1.2	30	60
Project 7	3.9	1.9	15	71
Project 8	1.5	0.3	7	8

By applying the procedure of VIKOR, we can calculate the *S*, *R* and *Q* values as shown in Table 3 to derive the preference ranking of the projects. Management should implement the second project. The second project has the minimum *S*, *R*, and *Q* values; also, the two conditions mentioned earlier in section 2 are satisfied.

Table 3. Ranking lists and scores

	S	*R*	*Q*	Rank
Project 1	0.2895	0.1500	0.149842	2
Project 2	0.2185	0.0833	0	**1**
Project 3	0.5217	0.3667	0.63833	6
Project 4	0.7267	0.5000	1	8
Project 5	0.5120	0.2667	0.508793	5
Project 6	0.4150	0.2500	0.393319	4
Project 7	0.3500	0.1500	0.209375	3
Project 8	0.6141	0.5000	0.889256	7

5. Conclusion

In this paper, the VIKOR method is presented and illustrated. A real-life project selection problem of a new manner existing in multi-national company is introduced. The VIKOR method is employed to rank the projects. It might be combined to other techniques in further research. The MCDM problem should be reformulated and solved if any parameter or alternative is added or deleted because of its sensitivity to any changes.

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A SDV-MOORA Technique for Solving Multi-Criteria Decision Making Problems with No Preference

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Abstract: The Standard Deviation (SDV) is a well known measure of dispersion, which suits the problem of allocating weights in MCDM. In this paper we try to address this problem by employing the Standard Deviation to allocate weights, then combining the proposed method to a well-known technique called Multi-Objective Optimization on the basis of Ratio Analysis (MOORA). The new approach so-called SDV-MOORA can be used when no preference among the criteria considered. Also, it is validated and illustrated by ranking the alternatives of a given numerical example.

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Keywords: Multi-Criteria Decision Making; MOORA; Standard Deviation.

1. Introduction

The merit of MCDM techniques is that they consider both qualitative parameters as well as the quantitative ones, MCDM includes many solution techniques such as Simple Additive Weighting (SAW), Weighting Product (WP) [5], and Analytic Hierarchy Process (AHP) [7]. The problem of allocating the weights of criteria when no preference is an open research area. Many scholars tried to tackle this problem by various techniques like Information Entropy Weight method, the weighted average operator (OWA), and other several methods [4].

The objective of the present paper is to enhance evaluation and selection methodology of the Multi-Objective Optimization on the basis of Ratio Analysis (MOORA) method. This paper attempts to explore the applicability of MOORA by employing the Standard Deviation to allocate weights, in order to solve different MCDM problems when no preference exist. The new method so-called SDV-MOORA is applied for ranking alternatives in numerical example given.

The rest of this paper is organized as follows: Section 2 is made for the MOORA approach, the proposed Standard Deviation method is illustrated in section 3, in section 4 a numerical example is given for validation, and finally section 5 is made for conclusion.

2. MOORA

A MCDM problem can be concisely expressed in a matrix format, in which columns indicate criteria (attributes) considered in a given problem; and in which rows list the competing alternatives. Specifically, a MCDM problem with m alternatives ($A_1, A_2, \ldots, A_m$) that are evaluated by n criteria ($C_1, C_2, \ldots, C_n$) can be viewed as a geometric system with m points in n-dimensional space. An element x_{ij} of the matrix indicates the performance rating of the i^{th} alternative A_i, with respect to the j^{th} criterion C_j, as shown in Eq. (1):

$$D = \begin{array}{c} \\ A_1 \\ A_2 \\ A_3 \\ \vdots \\ A_m \end{array} \begin{array}{c} \begin{array}{ccccc} C_1 & C_2 & C_3 & \cdots & C_n \end{array} \\ \begin{bmatrix} x_{11} & x_{12} & x_{13} & \cdots & x_{1n} \\ x_{21} & x_{22} & x_{23} & \cdots & x_{2n} \\ x_{31} & x_{32} & x_{33} & \cdots & x_{3n} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ x_{m1} & x_{m2} & x_{m3} & \cdots & x_{mn} \end{bmatrix} \end{array} \quad (1)$$

Brauers first introduced the MOORA method in order to solve various complex and conflicting decision making problems [3]. The MOORA method starts with a decision matrix as shown by Eq. (1). The procedure of MOORA for ranking alternatives can be described as following:

***Step 1*:** Compute the normalized decision matrix by vector method as shown in Eq. (2)

$$x_{ij}^{*} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^{2}}}, \quad i = 1,\ldots,m; j = 1,\ldots,n. \quad (2)$$

***Step 2*:** Calculate the composite score as illustrated in Eq. (3)

$$z_i = \sum_{j=1}^{b} x_{ij}^{*} - \sum_{j=b+1}^{n} x_{ij}^{*}, \quad i = 1,\ldots,m. \quad (3)$$

where $\sum_{j=1}^{b} x_{ij}^{*}$ and $\sum_{j=b+1}^{n} x_{ij}^{*}$ are for the benefit and non-benefit (cost) criteria, respectively. If there are some attributes more important than the others, the composite score becomes.

$$z_i = \sum_{j=1}^{b} w_j x_{ij}^* - \sum_{j=b+1}^{n} w_j x_{ij}^*, \; i = 1,...,m. \quad (4)$$

where W_j is the weight of j^{th} criterion.

***Step 3*:** Rank the alternative in descending order.

Recently, MOORA has been widely applied for dealing with MCDM problems of various fields, such as economy control [2], contractor selection [1], and inner climate evaluation [6].

3. Standard Deviation for allocating weights

In this paper, the well known standard deviation (*SDV*) is applied to allocate the weights of different criteria. The weight of the criterion reflects its importance in MCDM. Range standardization was done to transform different scales and units among various criteria into common measurable units in order to compare their weights.

$$x'_{ij} = \frac{x_{ij} - \min\limits_{1\le j\le n} x_{ij}}{\max\limits_{1\le j\le n} x_{ij} - \min\limits_{1\le j\le n} x_{ij}} \quad (5)$$

$D'=(x')_{mxn}$ is the matrix after range standardization; max x_{ij}, min x_{ij} are the maximum and the minimum values of the criterion (j) respectively, all values in D' are ($0 \le x'_{ij} \le 1$). So, according to the normalized matrix $D'= (x')_{mxn}$ the standard deviation is calculated for every criterion independently as shown in Eq. (6):

$$SDV_j = \sqrt{\frac{1}{m}\sum_{i=1}^{m}(x'_{ij} - \bar{x}'_j)^2} \quad (6)$$

where $\bar{x}'_j$ is the mean of the values of the j^{th} criterion after normalization and $j = 1,2,\ldots,n$.

After calculating (*SDV*) for all criteria, the weight (W_j) of the criterion (j) can be defined as:

$$W_j = \frac{SDV_j}{\sum_{j=1}^{n} SDV_j} \quad (7)$$

where $j = 1,2,\ldots,n$.

4. Numerical Example

In this section, an example of four alternatives to be ranked through comparing five criteria is presented to explain the method proposed. In the provided example, no pretence exists among criteria, the absence of weights allocated to criteria is tackled by applying the Standard Deviation to assign weights to criteria. As shown in Table 1, the four alternatives, their performance ratings with respect to all criteria, and the utility types of all criteria are presented.

Table 1. Decision matrix

	C_1	C_2	C_3	C_4	C_5
Utility type	Max	Max	Max	Min	Min
Alternative 1	50	10	12	40	16
Alternative 2	45	20	20	43	28
Alternative 3	30	25	11	29	20
Alternative 4	42	12	18	20	34

In the above example, there is no preference among the criteria, no weights specified for them subjective by the decision maker, so the Standard Deviation method will be applied in this problem. Table 2 illustrates the range standardization done to decision matrix as in Eq.(5).

Table 2. Range standardized decision matrix

	C_1	C_2	C_3	C_4	C_5
Alternative 1	1	0	0.111	0.87	0
Alternative 2	0.75	0.667	1	1	0.6667
Alternative 3	0	1	0	0.39	0.2222
Alternative 4	0.6	0.133	0.778	0	1

Table 3 shows the values of the Standard Deviation (SDV_j), and the weight assigned to each criterion (W_j) as shown in Eqs. (6 and 7). The weights' assignment process is very sensitive which will be reflected on the final ranking of the alternatives.

Table 3. Weights assigned to criteria

	SDV_j	W_j
C_1	0.4250	0.1856
C_2	0.4663	0.2036
C_3	0.4917	0.2148
C_4	0.4588	0.2004
C_5	0.4479	0.1956

By applying the procedure of MOORA, the normalized decision matrix found in Table 2 is used. In Table 4, the benefit, cost, and composite scores are listed for all alternatives. The second alternative should be selected because it has the maximum composite score.

Table 4. Ranking lists and scores

	Benefit criteria	Cost criteria	Composite score	Rank
Alternative1	0.1526	0.1261	0.0265	4
Alternative2	0.3815	0.2517	0.1298	**1**
Alternative3	0.1684	0.0923	0.0761	2
Alternative4	0.2341	0.1600	0.0741	3

5. Conclusion

In this paper, the standard deviation describes the dispersion of the values of criteria, giving the more dispersed values criteria more importance and much weights. The MOORA method is combined to the proposed method to constitute a new approach called SDV-MOORA in order to rank the alternatives when no preference found (i.e. no weights are provided for criteria).

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Plan to design Policies For Science , Technology and innovation in the field of obesity Prevention and control measures in 20 years national vision.

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Abstract: Obesity is an epidemic in a century, and developed and developing countries as a major problem in health care is a serious concern. Prevalence of overweight and obesity between the ages of 50 to 70 percent over twenty years In Tehran, 50% were overweight and 15 to 20 percent are obese. Obesity is directly or indirectly more than 10 percent of the cost of a country it covers. Obesity is also directly both through the development of diabetes, heart disease and various cancers are caused by damage to healthy humans. The increasing prevalence of this disease in children and adolescents countries is a serious concern. In most developed countries and some developing countries, the national program for prevention and control of obesity are defined in which to develop strategies and action plans and the role of all governmental agencies and non-governmental organizations also play a role (NGO) families and society are discussed. Of these countries can the U.S. and other countries like Canada, Australia, Europe and the Association of Southeast Asian Nations, cited. In the industrialized world and developing countries like the United States of America, several states, including Ohio, New Jersey, New York, a program designed to prevent obesity and its implementation are being. Survey accomplished only by acting within the scope of national policies and programs to prevent and control obesity, Obesity Disease Control and Prevention's National Center for Disease Control of the Ministry of Health was developed in 1384, but unfortunately has not been applied.
[Shahram alamdari, Farhad hossein panah, Parisa amiri, Azam alamdari, Fereidon azizi. **Plan to design Policies For Science , Technology and innovation in the field of obesity Prevention and control measures in 20 years national vision.** *Life Sci J* 2012;9(4):5884-5889] (ISSN:1097-8135). http://www.lifesciencesite.com. 880

Keywords: model design, document, policy, science, technology and innovation, prevention and control measures of obesity, 1404

Method:

This study is a comparative analysis which documents the study and analysis of upstream science and technology policy, and national policy documents in ten countries, the World Health Organization, Centers for Disease Control and Prevention and the National Institutes of Health in the area of obesity This study is a comparative analysis which documents the study and analysis of upstream science and technology policy, and national policy documents in ten countries World Health Organization, Centers for Disease Control and Prevention and the National Institutes of Health in the field of obesity, including twenty-six of the original model's Plan And questionnaire design, content validity and reliability of the model obtained by ten experts in the field of science and technology were reviewed.

Research objectives

The main purpose

The National Plan of mining policy, science, technology and innovation in the field of obesity prevention and control in 1404

Secondary objectives of the study

Secondary objectives of the study are:

A - Mining index compilation national document

B - Mining macroeconomic indices of national documents such as vision and mission

C - Derived indicators to measure national document

D -Extracting performance indicators, monitoring and evaluation of national documents

Assumptions

A -General of the national document includes general topics such as members of the policy committee, risk maps, and definitions are used in the document.

B -The national instrument of macroeconomic indicators, including vision and mission and goals are.

C -Direction indicator of the direction of national policy and strategy documents is implementation.

D -The index of implementation, monitoring and evaluation of national document contains index performance, how to monitor and evaluate the national document.

Review of literature:

Obesity is a disorder of the body's physical composition, which increases the relative or absolute amount of body fat is defined, is very common. The prevalence of obesity in all age groups and in most developing countries is increasing. So that the current epidemic of obesity can be as comprehensive in the world, the growth rate is high, that is. At present, the prevalence of obesity in adults in different countries, between 10 to 40 percent. Prevalence of overweight and obesity in Iranian adults, 23% and 40% respectively have been reported Obesity is a risk of various diseases, including some types of cancer, type 2 diabetes mellitus and cardiovascular disease and increase life expectancy is reduced. (3, 4, 5 and 9)

According to the Center for Disease Control and Prevention (CDC), obesity in adults by body mass index (BMI) is calculated

Overweight: A person who has a BMI equal to or greater than 25 and less than 30 is overweight.

Obesity is defined as a person who has a BMI equal to or higher than 30. Another definition of overweight and obesity in children and adolescents are either overweight or at risk for overweight is defined. Also, the amount of body fat in boys and girls at different ages. In children and adolescents 2 to 19 years old, overweight and obesity based on BMI for age than is stated. Overweight: a BMI above the 85th percentile and below the 95th percentile, I am Obesity: BMI equal to or above the 95 th percentile.

Complications of Obesity

Statistics show that every year 6/2 million people worldwide lose their lives due to weight gain or obesity. Obese individuals are at risk for high blood pressure, elevated lipid diseases, type 2 diabetes, coronary heart disease, stroke, gallbladder disease, respiratory disorders, stroke (CVA), heart disorders, stroke (MI), gout and arthritis it caused, osteoarthritis, sleep apnea, certain types of cancer and courier syndrome (with symptoms of obesity, red face and bloodshot, drowsiness and poor breathing) are. Also, diseases that obese patients are suffering more than ordinary people, including hypertension, type 2 diabetes, angina, cardiac arrest and increased costs resulting from the treatment of osteoarthritis is.

Complications of obesity in children and adolescents

We all know that obesity is a complex, multifaceted health outcomes by genetic, metabolic efficiency, level of physical activity, dietary intake, and psychosocial and environmental factors are affected. Kids in the short and long term complications of the disease Overweight adolescents compared with their peers who have a good weight At higher risk of developing hyperlipidemia, hypertension, insulin resistance and type 2 diabetes are This group of adolescents should be screened for secondary level to include information on family history Blood pressure, cholesterol levels and changes in BMI and weight changes may be referred concerns.

The impact of obesity on stress and mental health problems in children and adolescents

In 1381 a study by Hashemi M, et al (1384)on the phenomenon of anxiety in students of 12 to 18 years were overweight or obese. The study shows**.**

Between parental employment status and student anxiety score is associated **.**So that students have a mother or father of the employee or of cultural anxiety levels have lower education levels are more favorable Although many studies have been conducted in Western societies show higher anxiety in obese adolescents The lack of significant of anxiety in the present study may be because In our society, yet obesity is regarded as a measure of health anxiety and therefore teenagers are overweight Obesity is linked to anxiety, depression and weight gain, but the relationship is not seen. The findings also show that there is a direct relationship between obesity and fear of society**.**

Obesity is associated with cardiovascular disease in children and adolescents.

Studies in Iran (Tehran Lipid and Glucose Study) shows that in obese adolescents, the mean systolic and diastolic blood pressure, BMI and TG and increases with age Levels of HDL - C and LDL - C and serum cholesterol in individuals older than 12 years increased and then decreased with increasing age. Obese girls at greater risk of increased TG, LDL - C, total cholesterol, systolic and diastolic blood pressure and lower HDL - C compared to the other girls are. Thus we can say that the prevalence of cardiovascular disease risk factors in obese girls increased in Tehran (1, 2, 3 and 4).

The cost of obesity

The latest Ministry of Health research in the field of measuring the burden of disease in 1382, has been published Indirect costs such as the number of days that a person due to illness or disease relapse or even obesity and heart problems, loses his job. Problems as well as deaths due to obesity is estimated to cost £ 4 billion in one year alone can lead to (5).

In a project entitled LIPGENE, the prevalence of obesity in Europe of 15 member states were examined, the results of this project show, in 2002, in both men and women at least half of the 15 member states of Europe, the prevalence of obesity was higher than 20%. Also this year, the total direct and indirect costs of obesity in the state is estimated at EUR 32800106 (5)

Range in 2007 and the results of the economic impact of obesity as an investigation were conducted. The study examined the costs of obesity. One of the complications of obesity, diabetes. Based on this study, 6% incidence of diabetes is directly related to overweight and obesity. Currently, about 1 billion people worldwide are overweight with 850 million people around the world suffer from weight loss. Estimates based on the survey, 175 million people with diabetes worldwide in 2000 will reach 353 million in 2030 to over 24% in India and China by 2050 this figure will have.

Overweight fees are 3 levels:

1. Individual level, obesity causes a person is restricted in many ways, some of these can be measured.
2. At work, many people look fatter because the cost of insurance, low levels of

functional. The total cost is high, they are not hiring.

3. Obesity costs the state and national programs and ... Increases, because the personal cost of illness and unemployment cover individuals (5). Studies by the World Health Organization, the economic costs of obesity are extracted are shown in the table below (25).

Table 1 shows the estimated economic costs of obesity in the country, according to World Health Organization (25) The following chart spending in Britain for against obesity drugs have been shown (25) (Figure 1).

Table 3.1. Estimated economic costs of obesity according to available studies

Country (study)	Year of estimate	BMI criterion (kg/m²)	Cost			
			Type	Per capita (in US$ at PPP[a])	Share of total current expenditure on health (%)	Share of GDP[b] (%)
In the WHO European Region						
Belgium *(1)*	1999	≥30	Direct	69	3	–
France (range) *(2)*	1992	≥30	Direct	71–148	0.6–1.3	–
France *(3)*	1992	≥27	Direct	202	1.8	0.9
Germany (range) *(4)*	2001	≥30	Direct	17–35	1.2–2.6	0.1–0.3
			Indirect	17–38	–	
Netherlands *(5,6)*	1993	≥30	Direct	32	1.7	
Sweden *(7)*	2003	≥30	Direct	45	1.8	0.7
			Indirect	157	–	
Switzerland *(4)*	2001	≥25	Direct + indirect	186	–	0.6
United Kingdom (England, range) *(8)*	2002	≥30	Direct	NA[c]	2.3–2.6	
EU (15 countries) *(9)*	2002	≥30	Direct + indirect	NA	NA	0.3
Outside the WHO European Region						
Australia (range) *(10)*	1995–1996	≥30	Direct	28–51	1.7–3.2	–
Canada *(11)*	1997	≥27	Direct	49	2.4	–
Canada *(12)*	2001	≥30	Direct	41	1.6	0.4
			Indirect	70	–	
Japan *(13)*	1995–1998	≥30	Direct	55	0.2	–
New Zealand *(14)*	1991	≥30	Direct	26	NA	–
United States *(15)*	1994	≥30	Direct	92	2.7	–
United States *(16)*	1995	≥30	Direct	263	7.3	–
United States *(17)*	1995	≥29	Direct	194	5.4	–
			Direct + indirect	371	–	1.4
United States *(18)*	1998	≥25	Direct	285	7.1	–
United States *(19)*	2000	≥30	Direct	199	4.8	1.2
			Indirect	183	–	

[a] PPP = purchasing power parity. PPP controls for differences in purchasing power, which means that a dollar may have more value in terms of consumption in one country than in another.
[b] When both direct and indirect costs have been calculated in the same study, the total cost as percentage of gross domestic product (GDP) is the sum of both direct and indirect costs.
[c] NA = not available.

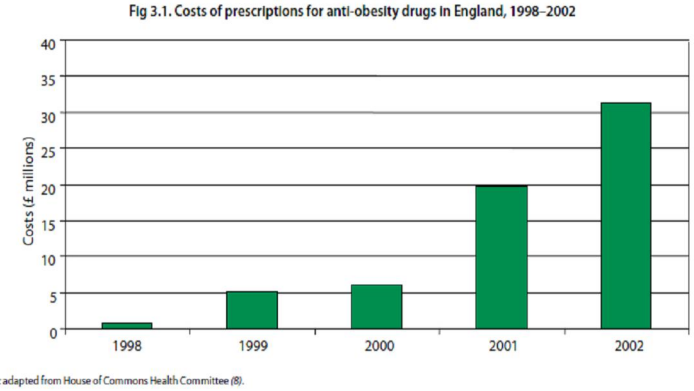


Figure 1 - The cost to purchase the anti-obesity drugs in Britain

Variables

Twenty-six variables in this study are:

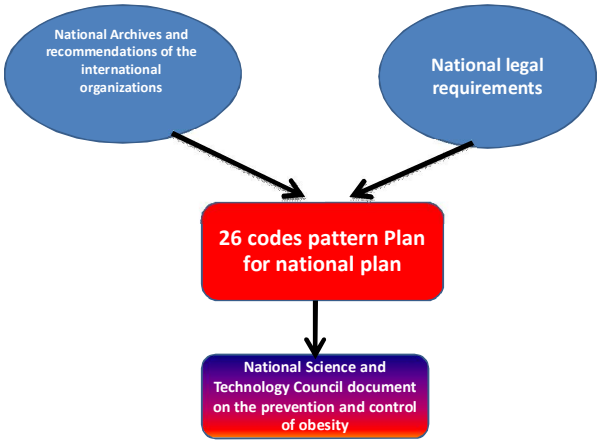
- Code1-Introduction to obesity prevention and control of science and technology policy committee
- Code2-Definitions of terms used in the policy document, the National Science, Technology and Innovation in 1404 to prevent and control obesity.
- Code3-The need for the formulation of national policy document Science, Technology and Innovation in 1404 to prevent and control obesity. Code4- A looks at the current status of overweight and obesity in the country. Code5- A looks at the science, technology and innovation in the field of obesity prevention and control
- Code 6 - the formulation of a national policy document Science, Technology and Innovation in 1404 to prevent and control obesity.
- Code 7 - Audience of the document
- Code 8 - A national perspective on science, technology and innovation in the field of obesity prevention and control in 1404
- Code 9 - The mission of the National System of Science, Technology and Innovation in the area of prevention and control of obesity in 1404
- Code 10 - implications for national development of science, technology and innovation in the field of obesity prevention and control in 1404
- Code 11 - the fundamental values of science, technology and innovation in the field of obesity prevention and control in 1404
- Code 12 - the major goals of science, technology and innovation in the field of obesity prevention and control in 1404
- Code 13 - Development of science and technology innovation system in the constitution to prevent and control obesity.
- Code 14 - for policy-making, management and legislation
- Code 15 - For making the allocation of financial resources, facilitating increased investment
- Code 16 - for the production of knowledge
- Code 17 - for the dissemination and sharing of knowledge produced
- Code 18 - HR Orientation
- Code 19 - directed by facilitating increased production of goods and services
- Code 20 - entrepreneurial orientation
- Code 21 - To promote the norms and culture
- Code 22 - for making connections
- Code 23 - the custodian of the document
- Code 24 - the duties of National Committee of Science and Technology Policy to prevent and control obesity Code

25 - System of Evaluation Code

26 - Graduate Studies

Analytical framework and research model

This study is a comparative analysis which documents the study and analysis of upstream science and technology policy, and national policy documents in ten countries, the World Health Organization, Centers for Disease Control and National Institutes of Health, Prevention and Control of Obesity. The initial model consists of twenty-six index Plan reached, then questionnaires designed pattern obtained in terms of content validity and its reliability has been examined.



Methods of research and data analysis

Twenty-six of the code pattern obtained was tested for validity and repeatability. To investigate the validity (validity) of validity (content validity) were used.

Validity

The purpose of the narrative proper, meaningful and special benefits derived from the tales of an index or scale a model to follow.(30). Content validity (Content validity) The content of the questionnaire by experts as one of the best ways to assess the validity of a measuring instrument. In order to ensure that the content validity of the test content represents structures or structures that can be claimed that the measures, the test content is considered (30). The content validity of an instrument definitions are:

1. Degree of fit index is a tool to measure the structure.

2. Developing indicators in whether a tool for representing content measurements are adequate or not?

To assess content validity, face validity as well, there are two proven methods of qualitative and quantitative.

The content validity of qualitative interviews conducted with a number of experts and asked them to study the exact tool to detail in the views of the experts and their writing. Quantitative methods used in the formula, the validity are calculated. (30) Validity of quantitative

To investigate the validity of the quantitative indicators, the validity (CVR) and the content validity index (CVI) there. CVR index requires an index of statements and CVI, relevance, clarity and relevance of the research to see items experts suggest.

Calculate the relative validity (CVR)

Calculation of the CVR is to select the most important research content to ensure statistically.

1 - is essential. 2 - It is helpful, but not necessary. 3 - not necessary.

National policy document proposed five indicators of science, technology and innovation in the field of prevention, the overall appeal were:

- Code 5 - A look at the science, technology and innovation in the field of obesity prevention and control
- Code 9 - The mission of the National System of Science, Technology and Innovation in the area of prevention and control of obesity in 1404
- Code 11 - the fundamental values of science, technology and innovation in the field of obesity prevention and control in 1404
- Code 17 - for the dissemination and sharing of knowledge produced
- Code 20 - entrepreneurial orientation
- Eleven indicators that require further explanation or document with minor changes:
- Code 1 - Introduction and Plenipotentiary Representative to the Strategic Committee
- Code 4 - A look at the current status of overweight and obesity in the country.
- Code 6 - the formulation of a national policy document Science, Technology and Innovation in 1404 to prevent and control obesity.
- Code 7 - Audience of the document
- Code 8 - The prospect of a national system of science, technology and innovation in the field of obesity prevention and control in 1404.
- Code 10 - implications for national development of science, technology and innovation in the field of obesity prevention and control in 1404
- Code 16 - for the production of knowledge
- Code 19 - directed by facilitating increased production of goods and services
- Code 21 - To promote the norms and culture
- Code 22 - for making connections
- Code 26 - Graduate Studies

Suggestions

A. Before the implementation of the third stage, the content validity of the model proposed in this paper after changes, once again, by experts from the fields of health management and policy committee members is stipulated in the code of a template.

• B - track the administrative process for the third and fourth stages of the implementation of the National Plan

• First, to identify requirements indisputable, policies twenty-two countries and international organizations in the field of science and technology to prevent and control obesity

• Second stage: the design of national policy document editing paradigm of science, technology and innovation in the field of prevention and control of obesity in the country in 1404

• Second stage: the design of national policy document editing paradigm of science, technology and innovation in the field of prevention and control of obesity in the country in 1404

• Step Four: Review draft document and editing the final document

The results:

As a result of the 26 indicators presented as a model for a national document, the five index points to the importance of the acquisition were not, and revise. Eleven indicators of relevance, simplicity and clarity of the problem and should be clarification on the model. The two main recommendations from the study include:

A. Before entering the third phase of the project, patterned after the content validity of the proposed changes in the research By experts from the fields of health management and policy committee members outside of other health indicators included in a model to study.

B. The first and second stages of this study establish a national document, the document following the third and fourth stages of the National (third stage involves the formation of a panel of executives obesity prevention and control, and develop a draft document and the fourth stage document review and editing of the draft final document) should be performed. Proportion, simplicity and clarity, difficulty and need more explanation about the pattern can be.

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12/12/2012

Study on Co-Administration of Erythropoietin and Nandrolone Decanoate against Injury Induced By Ischemia-Reperfusion in Rats

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Abstract: Erythropoietin which is a cytokine has been known for a long time as a hematopoietic hormone. Its effectiveness mechanism is to reduce apoptosis in cells making erythroblast in bone marrow. Its artificial form is available, too. The hormone is used to improve anemia in patients with renal failure. With regard to high rate of renal patients, high cost of renal treatment with erythropoietin, and unavailability of the drug versus easy availability of nandrolone even as an OTC combination in drugstores, we decided to study the coincident effects of both drugs for using nandrolone in place of erythropoietin in case of obtaining suitable results. For this purpose 24 Vistar male rats with weight of 200-250 gram were divided randomly in to four groups, each group consisted of 6 rats: the first group was Sham (6 Vistar male rats), the second one was control group in which vascular pedicles were blocked, the third group received 500 IU/kg peritoneally every week, two weeks before ischemia via injection, the fourth group received 3 mg/kg nandrolone decanoate intramuscularly and 500 IU/kg peritoneally every week, two weeks before ischemia. The data were reported as mean+SEM. ANOVA statistical method was used for data analysis and Tokay comparative tests was used to compare the difference among groups. The rate of $p<0.05$ has been considered as a meaningful level among groups. The obtained results demonstrated that erythropoietin had a positive effect on renal function by itself and administration of the drug without nandrolone could decrease and improve degeneration of tubule cells, decrease the hyaline cast and decrease the necrosis of tubule cells. Also, in functional phase all changes associate to serum keratinin level showed that administrating of erythropoietin by itself as well as coincidently with nandrolone had not a meaningful effect on serum keratinin level but it was observed that EPO singularly and coincident with nandrolone, the blood urea level decreased meaningfully. It is clear that the effect of EPO on the changes of blood urea is more meaningful compared its effect on serum keratinin level. The present study demonstrated that EPO singularly and without any other medical additions like nandrolone can be used effectively in ARF that ischemia is one of ARF cases also it promotes renal function and decrease the rate mortality among ARF patients.

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Key words: kidney, nandrolone, ischemia-reperfusion, EPO, Rats

1. Introduction

Ischemic acute renal failure (ARF) is a clinical syndrome that can occur following the interruption or reduction of renal blood flow. Despite preventive and therapeutic measures, this disease is still associated with high mortality (Liano et al., 1998). Tissue damage begins from the ischemic phase. Reperfusion after ischemia in the early phase leads to a new damages in the organ, so, these actions are called Ischemic Reperfusion (Sheridan and Bonventre, 2001).

Erythropoietin (EPO) is a cytokine that has been known as a hematopoietic hormone. Its mechanism is reduction of apoptosis in Erythroblasts in the bone marrow. It is also available in synthetic form and is used for correction of anemia in patients with renal failure frequently (Juul, 2002). Studies have shown that EPO has anti-apoptotic effects in kidney, nervous system and heart damages. EPO in renal tubule cells inhibits apoptosis by increasing the activity of nuclear factor-kβ. This action appears to be due to an increase in anti-apoptotic factors such as heat shock proteins (HSP70), BCL-XL, XIAP, BCL-2 that inhibits apoptosis pathway by stabilization of inner membrane of mitochondria and inhibition of entrance of cytochrome c into the cytoplasm and prevention of Kaspaz's initiating apoptosis (Juul, 2002; Patel and Sharples, 2004). Anti-apoptotic effects of erythropoietin and its protective role against ischemic injury is one of the novel fields of research and many studies have been done in this field during recent years. Anabolic steroids, which are synthetic compounds with testosterone in their structure, are used in treatment of reproductive disorders, cancer and anemia widely (Lubna et al., 2010). Almost all tissues have androgen receptors so; these compounds can affect the entire body (Lubna et al., 2010). The hematopoietic effects of Nandrolone Decanoate seem

to be direct stimulation of kidneys to produce erythropoietin or by increasing the sensitivity of erythroid precursors of bone marrow to erythropoietin (Teruel et al., 1995). Researchers have shown that nandrolone may enhance the effects of erythropoietin in dialysis patients (Gonzalez et al., 1988). Considering the high renal disease occurrence and high cost of treatment by erythropoietin, Lack of easy access to the compound and easy access to the nandrolone as OTC in the pharmacies, in this study, we aimed to assay the protective role of nandrolone compared with erythropoietin in terms of reduction of inflammation and cell damage following the ischemia-reperfusion, and in order to obtain optimum results, we recommend it as an appropriate alternative for erythropoietin.

2. Materials and Methods

Twenty four wistar rats (200-250g) were divided into the 4 groups of 6. Group 1 considered as sham, group 2 considered as ischemia-reperfusion, group 3 considered as ischemia-reperfusion + treatment with erythropoietin and group 4 considered as ischemia-reperfusion + concomitant treatment with erythropoietin and nandrolone decanoate. Rats of group 3 received erithropoitn at the dose of 500 IU/kg intraperitoneally weekly and two weeks prior the induction the ischemia (Chevalier et al., 1996, Gonzalez et al., 1988, Kiris et al., 2008). After 2 weeks, animals were anesthetized using the ketamine and then pedicles of kidneys were obstructed and after 45 min were released (Gonzalez et al., 1988, Kiris et al., 2008). After 2 hours, left kidney nephrectomy was applied (Aggarwal et al., 2005). Rats of group 4 received 3 mg/kg nandrolone weekly intramuscularly two weeks prior the induction the ischemia (Chevalier et al., 1996) and erythropoietin at the dose of 500 IU/kg intraperitoneally (Gonzalez et al., 1988, Kiris et al., 2008). After 2 weeks, animals were anesthetized using the ketamine and then pedicles of kidneys were obstructed and after 45 min were released (Gonzalez et al., 1988, Kiris et al., 2008). After 2 hours, left kidney nephrectomy was applied (Aggarwal et al., 2005).

2.1. Blood Sampling

On days 0 (before administration of nandrolone decanoate) and at the end of the period, blood samples were collected and the values of serum urea and creatinine were measured.

2.2. Histopathological evaluations

After euthanization of animals, left kidneys were harvested and were fixed in the formalin 10% and were sent to histopathology laboratory for evaluation the pathological events. In the laboratory, slides were prepared and were stained by Hematoxylin Eosin method.

2.3. Statistical analysis

Data were presented as Mean±SEM. Data were analysed by SPSS software using the ANOVA following the post-tukey multiple test for assessment the difference between groups. $P<0.05$ considered as significant difference.

3. Results

Histopathological changes in groups are shown in the figures 1-4. Also, severity of changes is given in table 1. In control group, kidney tissues structure was normal and no certain pathological changes was observed. In group 2, degenerative changes of tubular cells, acute tubular necrosis, edema, hyperemia and interstitial bleeding were observed. Glomerular hyperemia and hemorrhage were obvious. In group 3, erythropoietin showed healing of pathological changes significantly so that; the severity of pathological changes was reduced. In group 4, slight healing in the pathological changes was observed. Pathological damages observed in this group include edema, moderate hyperemia and hemorrhage in renal glomeruli and interstitial tissue and mild degenerative changes with necrosis of tubular epithelial cells in the cortex and medulla.

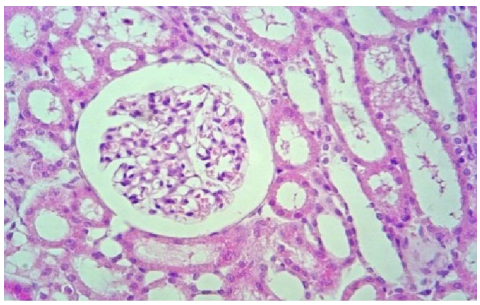


Fig 1: microscopic view of kidneys of rats of control group. Renal structure is normal. H&E, 40x.

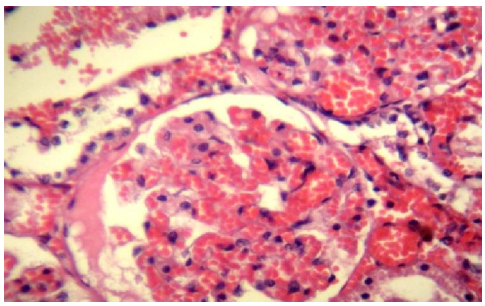
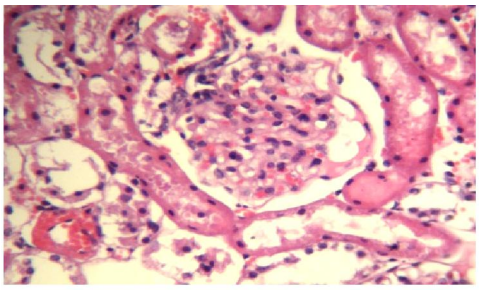


Fig 2: microscopic view of kidneys of rats of group 2. Interstitial and glomerular hemorrhage and tubular necrosis of tubules with protein deposition in the Bowman capsule is obvious. H&E, 40x.



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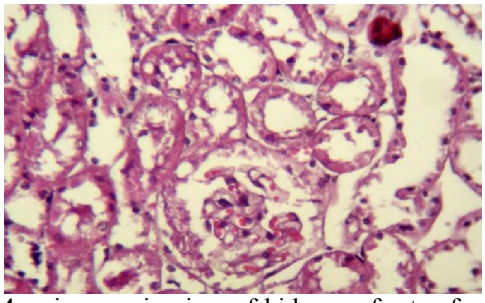

Fig 4: microscopic view of kidneys of rats of group 4. Degenerative changes and tubular and parietal membrane of Bowman's capsule necrosis with mild hyperemia and basal membrane thickness is obvious. H&E, 40x.

3.1. Results of biochemical parameters

Changes in biochemical parameters of serum in all groups are given in table 2.

Table 2: comparison of biochemical parameters changes in groups

Parameter / Group	Serum creatinine (mg/dl)	Urea (mg/dl)
SHAM	1.66±0.09	60.32±5.6
IR	4.34±0.21[a]	139.95±12.71[a]
EPO	1.96±0.08[c]	71.35±4.1[c]
NAN+EPO	2.71±0.11[b]	101.95±7.27[b]

a: P<0.001 in compared with control group;
b: P<0.05; c: P<0.01 in compared with group 2.

4. Discussion and Conclusion

The results of this study indicate a positive effect of erythropoietin (EPO) alone administration on renal function and it could prevent renal pathological damages. Also, in the functional phase, all changes in serum creatinine levels showed that administration of erythropoietin alone and in co-administration with nandrolone, significant effects on serum creatinine levels were not observed however, the level of BUN significantly decreased in both route of administration.

Table 1: comparison of pathological changes in groups

Groups	*Tubular Cell Necrosis*	*Tubular Cell Degeration*	*Podocyte Necrosis*	*Fibrin Depostion on Glomerulat Space*	*Haemorrahage*	*Protein Cast*
SHAM	0	0	0	0	0	0
IR	++++	++++	+++	++++	++++	++++
EPO	++	++	++	++	++	++
NAN+EPO	++++	+++	+++	+++	+++	+++

SCORE Information: Normal and without of pathologic changes(0), Minimal pathologic changes(+), mild pathologic changes(++), moderate pathologic changes (+++) and Sever pathologic changes(++++).

Obviously, the effect of EPO on changes in blood urea was more significantly than serum creatinine levels. However, serum creatinine level is more valuable than blood urea in then interpretation of renal disease and its performance because BUN levels beside of kidneys function are affected by the saliva and gut secretions and animal nutrition. However, in this research we can claim that EPO and its co-administration with nandrolone decreased BUN levels and didn't affect serum creatinine levels.

In this study also we found that EPO alone and in co-administrated with nandrolone can increase leucocytes particularly lymphocytes levels. But, more notably, EPO as alone increased lymphocytes more than EPO + nandrolone. Also, EPO + nandrolone increased neutrophils more than group IR but, this changes was not observed in the EPO alone administration. Perhaps, this is due to increased damage to kidneys in co-administration of EPO+ nandrolone. So, in terms of increased neutrophils, its infiltration into the renal interstitial also increased and may cause induction of necrosis in tubules and glomeruli. Fortunately, the results of this study are compatible with other studies that are referred to some of them.

In a research by Kiris et al., (2008) they found that aortic IR significantly increased the levels of MDA and superoxide dismutase (P<0.05 versus

control). Erythropoietin significantly decreased the levels of MDA, superoxide dismutase, and catalase ($P < 0.05$ versus aortic IR). Histological evaluation showed that aortic IR significantly increased ($P < 0.05$ versus control), whereas erythropoietin significantly decreased ($P < 0.05$ versus aortic IR) the focal glomerular necrosis, dilation of Bowman's capsule, degeneration of tubular epithelium, necrosis in tubular epithelium, interstitial inflammatory infiltration, and congestion of blood vessels. Their results indicate that erythropoietin has protective effects on renal injury induced by aortic IR in rats.

Yazihan et al., (2008) showed that renal TNF-alpha and caspase-3 levels were decreased in both glibenclamide and EPO-treated IR rats compared to untreated rats. The protection afforded by the pretreatment with EPO alone was greater than that of administering glibenclamide alone. Application of glibenclamide at the same time partly abolished the cytoprotective effect of EPO treatment. They concluded that K-ATP mediated cytoprotection is not the main mechanism of protective effect of EPO.

Nakazawa et al., (2010) demonstrated that Ischaemia-reperfusion injury of diabetic kidney resulted in significantly low protein expression levels of bcl-2, an anti-apoptotic molecule, and bone morphogenetic protein-7 (BMP-7), an anti-fibrotic and pro-regenerative factor, compared with non-diabetic kidneys. Diabetic kidney subsequently showed severe damage including increased tubular cell apoptosis, tubulointerstitial fibrosis and decreased tubular proliferation, compared with non-diabetic kidney. Treatment with asialoerythropoietin induced bcl-2 and BMP-7 expression in diabetic kidney and decreased tubular cell apoptosis, tubulointerstitial fibrosis and accelerated tubular proliferation. They concluded that reduced induction bcl-2 and BMP-7 may play a role in the acceleration of renal damage after ischemia-reperfusion injury in diabetic kidney. Also, they declared that the renoprotective effects of asialoerythropoietin on acute kidney injury may be mediated through the induction of bcl-2 and BMP-7.

Prokai et al., (2011) conducted a study and showed that EPO cause improve the renal function by increasing the HSP-72.

Credible mechanisms of the protective effects of EPO have been identified through the application of an ATP-dependent potassium channels. ATP-dependent potassium channels play an important role in the occurrence of injury and the induction of apoptotic death in kidney tissue. So, inhibit these channels enhance caspase-3 and TNF-a levels thus, destructive effects are began. While, EPO acts effecting on ATP-dependent potassium channels.

Another mechanism seems that EPO with their can apply its protective effects on the kidney tissue are induction the bcl-2 and Bone Morphogenic Protein- 7 that these are precursor of anti-apoptotic, anti-fibrotic and Pro-regenerative molecules respectively.

Another EPO protective direction is explained by Yang et al., (2011), especially in kidney transplant patients, they found that EPO can be done via caspase-3 and interleukin (IL-1b) and cause enhancement of apoptosis of inflammatory cells and reduces inflammation in the interstitial tissue of the kidney and renal Remodeling.

Ates et al., (2005) suggested that EPO is effective in attenuating renal ischemia/reperfusion injury, and this effect may be related to inhibition of tyrosine kinase activity by genistein.

However, the EPO is effective in the treatment of kidney disease and controlling of anemia resulted from the use of chemotherapy and other disorders affecting the kidneys that improve quality of life. EPO acts by reaction with itself receptors on non-hematopoietic tissues and performs its protective effects such as mitogenesis, angiogenesis and inhibition of apoptosis. Present research showed that EPO is useful in treatment of patients with renal disorders alone and without using the other adjuvants such as nandrolone.

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12/18/2012

Effect of consumption of fermented milk with Lactobacillus Casei and Lactobacillus Plantarum isolated from Ligvan Cheese against E.Coli O157:H7 Induced Infections in BALB/C Mice

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Abstract: In the recent years, association of *E.coli O157:H7* with hemorrhagic Colitis has been reported and this strain is known as causative agent of bloody diarrhea and predominant cause of hemolytic uremic syndrome (HUS). The aim of present study was to assess prevention role of fermented milk on *E.coli* O157:H7 infection which prepared by adding isolated *L.plantarum* (MLp)and *L.casei* (MlLc) from local Ligvan cheese either with only one probiotic or combined form of them (MLpc). In this study, 40 male mice (BALB/c strain) with an average of 6-8 weeks old were categorized in 4 groups. During a week, 1 (MLp), 2 (MLc), and 3 (MLpc) test groups were prescribed daily by 0.5 ml milk that were fermented by one of probiotic, the last group, was control group with normal nutrition. All of groups were fed by *Escherichia coli* O157:H7 equal 0.5 McFarland standards by using gavages, after 24 h from last treatments. The stool samples were taken from all of the group in days 1, 3, 5, and 7 in order to assess the excretion rate of *Escherichia coli* O157:H7. Five mice from each group were autopsied in 3rd and 7th day for evaluation of the colonization rate. So, 5cm of large intestine of mice were cut and serial dilutions of stool samples were prepared and cultured in Sorbitol Mac Conkey agar. White colonies (Sorbitol negative) in Sorbitol Mac Conkey agar were counted. Based on the statistical tests, there were significant difference ($P<0.05$) between test groups. The results of present study were shown that the consumption of fermented milk by probiotics could reduce significantly the exertion and colonization of *Escherichia coli* O157:H7 in the intestine of the mice.
[Hamid Mirzaei, Hamed Shahirfar, Haedeh Mobaiyen. **Effect of consumption of fermented milk with Lactobacillus Casei and Lactobacillus Plantarum isolated from Ligvan Cheese against E.Coli O157:H7 Induced Infections in BALB/C Mice.** *Life Sci J* 2012;9(4):5895-5898] (ISSN:1097-8135). http://www.lifesciencesite.com. 882

Keywords: Lighvan cheese, milk fermented by probiotic, *Lactobacillus plantarum, Lactobacillus casei*, *E.coli O157:H7*

1. Introduction

Escherichia genus consists of 6 species which *E.coli* has more importance. In the recent years the incidence of hemorrhagic colitis was associated with strains of *E.coli* O157:H7 so this strain is known as the cause of dysentery and hemolytic-uremic syndrome (HUS) (1, 2). The most important virulence factor for *E.coli* O157:H7 primarily is production of one or more Shiga-toxin which is called verotoxin (3, 4). Various medicines are used for treatment of *E.coli* O157:H7 infection, but this is a real fact that, application of drugs against Shiga-toxin producing bacteria, not only does not treat complication but increase toxin releasing and renal failures. So, hemolytic uremic syndrome occurs most commonly (2). In recent decades, according to several studies about probiotics that carried out in- vitro and in-vivo on human populations and laboratory animals showed very valuable properties such as treatment of intestinal resistance pathogens, prevention of viral and bacterial diarrhea, inhibitory effect on colon cancer, prevention of bladder cancer, improving the immune system, inhibit bacteria growth in small intestine, treatment of urogenital tract infections, treatment of Helicobacter pylori infections, improve lactose intolerance, reduce cholesterol (5-10). According the latest definition about probiotics, they are alive non-pathogen microorganisms in the foods that if they taken into the body in sufficient amounts can have positive impacts on the host (11, 12). The first food containing microorganisms probably was fermented milk (13) which Mechennkof found it. He observed that Bolgarian farmers had long life probably because of they drunk fermented milk (14). Consumption of probiotics can associate with normal flora survive and balance in the gut and prevent intestinal infection (15, 16). Based on researches, *Lactobacillus plantarum* and *L.casei* are the most important species of *Lactobacillus* which play an important role in cheese processing (17). Thus, acquired some information about normal lactic flora of the traditional cheese is necessary for preparing the safe and standard starter with best quality by maintaining the essential features of the product (18). The main objective of present

study was assessed the effect of fermented milk consumption against *E.coli* O157:H7 Infections Induced in BALB/C mice which prepared by *L. Casei* and *L. plantarum* singly and along each other isolated from Ligvan Cheese.

2. Materials and methods

Forty healthy male 6-8 weeks-old BALB/c mice (about 30±5 g body weight) were purchased from Razi Institute, Karaj, Iran. All of them were maintained at room temperature at a natural photoperiod for 1 week before experiment execution. A commercial balanced diet and tap water were provided. Management and husbandry conditions were identical in all groups with 12/12 h light/dark cycle at 21±2°C. The mice were randomly divided into 4 groups (10 mice each) as following:

Control group (C): In this group, animals were contaminated with *E.coli* O157: H7 and then feeding by sterile milk and water.

Treatment group 1 (MLc): Infected like control group then treated with fermented milk by *Lactobacillus casei.*

Treatment group 2 (MLp): Infected like control group then treated with fermented milk by *Lactobacillus plantarum.*

Treatment group 3 (MLcp): Infected like control group then treated with fermented milk by both of *L. plantarum* and *L. casei* .

L. plantarum and *L.casei* strains were provided from traditional Ligvan cheese which already has been approved by phenotypic and genotypic methods. To activate these bacteria, the probiotics were cultured separately in MRS broth and was incubated for 48 h at 37 °C. Then, fermented milk prepared in 3 separate Erlenmeyer with 250 ml sterile milk by adding 5 CC of *L.plantarum,* 5 CC of *L.casei* and 5 CC of *L.plantarum* and *L.casei* (2.5 CC of each) into the Erlenmeyers, respectively. Then, samples were incubated in a incubator with 100rpm shakeing at 37˚C until the pH reaches to 80 degree of Dornic. These milks used as primary starter. Fermented milk with *L.plantarum* and *L.casei* and combinative of them, were prepared by adding 10 ml of each primary starter which surcharge into the 100CC sterile milk then incubated at 37°C to reach it's acidity to 80 degree Dornic. Each of milks fermented by mentioned method was gavaged to treatment groups at the dose of 0.5ml for 7 days (30). Microbial suspension of E.coli O157: H7 corresponded to a 0.5 McFarland standard ($1.5*10^8$ CFU/ml) were prepared. In the 8th day, all groups feeding by E.coil O157: H7 by the same way.

E. coli O157:H7 were achieved from microbiology laboratory of veterinary medicine faculty of Islamic Azad University Tabriz branch. It was confirmed by sub cultured in nutrient agar and Mac Conkey Sorbitol Agar, IMViC tests, and O157 antiserum.

Counting of fecal-excreted E. colis O157:H7

In this term, on days 1, 3, 5 and 7 fecal samples were obtained from mice. Serial dilution of 10^{-1}- 10^{-6} of samples was prepared and surface plate count method were done from 3 last dilutions in the MacCONKEY sorbitol agar and were inocubated at 37˚C for 24 h (Zhao et al., 1998). The number of negative sorbitol colonies were counted and total number of E. coli O157:H7 were measured as following formula.

N= No. of suspicious colonies × reverse of the related dilution × Proportion of positive colonies revealed by antiserum

For assessment of colonization of E. coli O157:H7, it was carried on 5 mice in each group. For this, 5 cm of large intestine was took and after cleaning of its content, it sliced into the small spaces then washed in the 5cc normal saline and serial dilution were prepared and cultured like above method. They were incubated for 24-48 hours at 37°C. In addition to the above test, each group of mice was evaluated daily from clinical signs.

Statistical analysis

The statistical package for social sciences (SPSS Inc., Chicago, IL, USA), was used for statistical analysis. Data obtained were tested by ANOVA followed by Tukey's post-hoc multiple comparison test

3. Results

Results of the mean number of excreted *E.coli O157: H7* in different days of study are shown in Table 1. Based on results, it seen that the excretion of *E.coli O157: H7* in the treatment groups has decreased significantly in compared with control groups. Also, it shown that maximum excretion rate on days 1, 3, 5 and 7 is related to control group. Minimum rate on day 7 was associated with group treated by MLp and on days 1, 3, and 5 was related to group treated with MLc.

Results of the mean number of colonized *E.coli O157: H7* on 3rd and 7th days is shown in Table 2. Based on the obtained results it was observed that the colonization rate of E.coli O157: H7 in treated groups has decreased significantly than control groups. There was also observed that, the maximum colonization rate of *E.coli O157: H7* on days 3 and 7 is in the control group (C) and minimum rate on 3rd day was associated with group treated with MLc and on 7th day was related to group treated with MLp. It should be noted that there was no clinical signs observation in all groups.

Control group without fermented milk, MLc; Treamented group by fermented milk prepared by L. casei, MLp; Treamented group by fermented milk

prepared by L. plantrum, MLcp, Treamented group by fermented milk prepared by L. casei, and L. plantrum.

Table 1: Results of mean number of excretion rate of *E.coli O157: H7* on days 1, 3, 5 and 7 of study in terms of CFU / gr in the stool

Group \ Day	1	3	5	7
C	$36\pm0.37\times10^{7\,a}$	$170\pm0.14\times10^{6\,a}$	$190\pm0.04\times10^{5\,a}$	$300\pm0.23\times10^{4\,a}$
MLc	$2.2\pm0.23\times10^{7\,b}$	$2.3\pm0.35\times10^{6\,b}$	$3.3\pm0.67\times10^{5\,b}$	$4.2\pm0.19\times10^{4\,b}$
MLp	$3.1\pm0.28\times10^{7\,b}$	$4\pm0.64\times10^{6\,b}$	$13\pm0.71\times10^{5\,b}$	$1.8\pm0.14\times10^{4\,b}$
MLcp	$2.2\pm0.24\times10^{7\,b}$	$2.8\pm0.34\times10^{6\,b}$	$6.2\pm0.32\times10^{5\,b}$	$2.6\pm0.36\times10^{4\,b}$

a,b,c: Dissimilar letters indicate significant differences in each column ($P<0.05$).C; Control group without fermented milk, MLc; Treamented group by fermented milk prepared by L. casei, MLp; Treamented group by fermented milk prepared by L. plantrum, MLcp, Treamented group by fermented milk prepared by L. casei, and L. plantrum

Table 2: Results of mean colonized rate of *E.coli O157: H7* in the large intestine based on CFU/cm^2

Day \ Group	C	MLc	MLp	MLcp
3	$500\pm0.28\times10^{7\,a}$	$2.9\pm1\times10^{7\,b}$	$3.7\pm0.11\times10^{7\,b}$	$19\pm0.1\times10^{7\,b}$
7	$3.2\pm1.2\times10^{8\,a}$	$12\pm0.42\times10^{5\,b}$	$0.69\pm1.3\times10^{5\,b}$	$6.3\pm0.46\times10^{5\,b}$

a, b: Dissimilar letters indicate significant differences in each column ($P<0.05$).

4. Discussion and conclusion

The use of probiotics is back to when that people were starting to take fermented foods (19, 20). When the probiotics used as alive microorganisms, they can counteract with pathogenic microbial agent, can be immunized a person against the pathogens (21). Also, the previous studies in animals have shown that some commercial probiotic strains can be increased resistant against colonization and infection by pathogenic bacteria (22). In the present study, the effect of isolated *Lactobacillus plantarum* and *Lactobacillus casei* from Ligvan cheese were examined on excreting and colonization rate of *E.coli O157: H7* by using either with single probiotic or combined form of them, in BALB/c mice. Based on our results, fermented milk had inhibitory effects on colonization and excreting of *E.coli O157: H7* and could decrease severity and period of infection. The result of our study is compatible with other researches results. In Midolo et al., 1995 study which were done on the *Lactobacillus acidophilus*, *Lactobacillus casei* subspecies *rhamnosus*, showed that the probiotics can inhibit *Helicobacter pylori* growth isolated from clinical samples in in-vitro conditions (23). Kabir et al., 1997 studied on Inhibitory effects of *Lactobacillus salivarius* on *H. pylori* colonization in BALB/c mice and have concluded that *L. salivarius* has preventing effect on colonization of H. pylori in the stomach of the mice (24). Melanie et al during a research were studied inhibitory effects of some strains *Bifidobacteria* on *E.coli O157: H7*. Their results indicated that the inhibitory factor of *Bifidobacteria* was prevented of *E.coli* binding to Caco-2 cells (25). Gagnon et al., 2006 investigated about the effects of probiotic *B. thermoacidophiles* RBL-71 on *E.coli O157:H7* infection on BALB/c mouse. They found that consumption of probiotic can greatly reduce infections (26). Ota et al., 1999 reported that consumption of yogurt makes up more Lactobacillus colonization in the intestine which prevented colonization of Enterohemorrhagic E.coli (27). Lee et al., 2003 during an experiment found that *L.casei* of Vata milk prevents attachment of gastrointestinal bacteria to Caco-2 cells surface in 46% of cases. They also showed that maximum inhibitory effect was on *E.coli* TG1, *S.typhimurium* E10, *E.coli* ATCC 1775 and *S.typhimurium* ATCC 14028(>30%) (28). Aiba et al., 1998 showed that *lactobacillis* can reduce the colonization rate of *H.pylori* in the gastrointestinal tract (29). Carey et al., 2008 showed that probiotics have inhibitory effect on gene expression of Shiga-toxin 2 produced by *E.coli O157:H7* (30). Hirano et al., 2003 demonstrate that *Lactobacillus rhamnosus* has inhibitory effect in- vitro on enterohemorrhagic *E.coli* infection which were studied on human intestinal cells (31). The study of Lema et al., 2001 indicates that supplementing infected with E. coli O157:H7 lambs with Streptococus. *faecium* or a mixture of *S. faecium*, *L. acidophilus*, *L. casei*, *L. fermentum* and *L. plantarum* in the diet can reduce total number of *E. coli O157:H7* shedding in the feces and improve animal meat production performance as well (32). Based on present study can claim that consumption of fermented milk with probiotics has inhibitory effects on excretion and duration of disease caused by E.coli O157:H7.

Considering the results of present study, can be conclude that consumption of milk fermented with

L.plantarum and *L.casei* as single or combinative, results in decreasing of excretion and colonization rate of *E.coli O157:H7* in mice; that indicates we can apply some changes in the these two strains which made them as best quality starter in the production of local cheese.

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Effects of Turbines and Governing Systems on System Stability

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Abstract: Turbines and Governing Systems are ancillary controllers in power plants. In a power system, the generators are generally driven by turbines and each turbine is equipped with a governing system to control of frequency. In this paper effect of turbines and governing system on dynamic stability of power system is investigated.

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1. Introduction

Turbines and Governing Systems are important component in power system to control of frequency and also stability [1-20]. In a power system, the synchronous generators are normally driven by steam turbines, gas turbines or hydro turbines and each turbine is equipped with a governing system to provide a means by which the turbine can be started, run up to the operating speed and operate on load with the required power output. The proposed turbines work based on different theories.

In coal-burn, oil-burn and nuclear power plants the energy contained in the fuel is used to produce high-pressure, high-temperature steam in the boiler. The energy in the steam is then converted to mechanical energy in axial flow steam turbines. Each turbine consists of a number of stationary and rotating blades concentrated into groups, or stages. As the high-pressure steam enters the fixed set of stationary blades it is accelerated and acquires increased kinetic energy as it expands to a lower pressure. The stream of fluid is then guided onto the rotating blades where it experiences a change in momentum and direction thereby exerting a tangential force on the turbine blade and output torque on the turbine shaft. As the steam passes axially along the turbine shaft its pressure reduces, so its volume increases and the length of the blades must increase from the steam entrance to the exhaust to accommodate this change. Typically a complete steam turbine will be divided into three or more stages, with each turbine stage being connected in tandem on a common shaft. Dividing the turbine into stages in this way allows the steam to be reheated between stages to increase its enthalpy and consequently increase the overall efficiency of the steam cycle. Modern coal-fired steam turbines have thermal efficiency reaching 45%. Steam turbines can be classified as non-reheat, single-reheat or double-reheat systems. Non-reheat turbines have one turbine stage and are usually built for use in units of below 100 MW.

Unlike steam turbines, gas turbines do not require an intermediate working fluid and instead the fuel thermal energy is converted into mechanical energy using the hot turbine exhaust gases. Air is normally used as the working fluid with the fuel being natural gas or heavy/medium fuel oil. The most popular system for gas turbines is the open regenerative cycle and consists of a compressor, combustion chamber and turbine. The fuel is supplied through the governor valve to the combustion chamber to be burnt in the presence of air supplied by the compressor. The hot, compressed air, mixed with the combustion products, is then directed into the turbine where it expands and transfers its energy to the moving blades in much the same way as in the steam turbine. The exhaust gases are then used to heat the air delivered by the compressor. There are also other, more complicated cycles that use either compressor inter cooling and reheating, or inter cooling with regeneration and reheating. The typical efficiency of a gas turbine plant is about 35%.

A significant technological step forward in the use of gas turbines came with the introduction of the combined cycle gas turbine (CCGT). In this system the exhaust heat from the gas turbine is directed into a heat-recovery boiler (HRB) to raise steam, which is then used to generate more electricity in a steam-driven generating unit. Generally the temperature of the gas turbine exhaust gases is quite high, typically around 535 ◦C, so by adding a steam turbine cycle at the bottom end of the gas cycle the otherwise wasted heat can be utilized and the overall cycle efficiency significantly increased. Modern

CCGT plant can have an efficiency approaching, or even exceeding, 60%. Usually CCGT power stations utilize the exhaust gases from two or three gas turbines to raise steam for one steam turbine with both types of turbines driving separate generators. More recently single-shaft modes have become popular where both the gas and the steam turbines are mounted on the same shaft and drive the same generator. In some CCGT designs the HRB may be equipped with supplementary firing to increase the temperature of the HP steam. In addition, some combined cycle plants are designed to produce steam for district heating or for use in the process industry. CCGT plants, apart from higher thermal efficiency, also have other important advantages over more traditional coal-fired plants. They have a short construction time and low capital construction cost, both about half that of the equivalent coal-fired plant, they are relatively clean with almost no SO2 emission, they require little staffing, and the materials handling problem of gas versus coal and ash is much simpler.

The oldest form of power generation is by the use of water power. Hydraulic turbines derive power from the force exerted by water as it falls from an upper to a lower reservoir. The vertical distance between the upper reservoir and the level of the turbine is called the head. The size of the head is used to classify hydroelectric power plants as high-head, medium-head and low-head (run-of-river) plants, although there is no strict demarcation line [21].

2. Turbine Governing Systems

For many years turbine governing systems were of a mechanical–hydraulic type and used the Watt centrifugal mechanism as the speed governor. The original Watt mechanism used two fly-balls as the speed-responsive device, but on new machines the Watt governor has been replaced by an electro-hydraulic governor. The main disadvantages of the Watt centrifugal governor are the presence of dead-bands and a relatively low accuracy. The size of the dead-bands also tends to increase with time due to wear in the moving mechanical elements. Newer solutions replace the Watt centrifugal mechanism with an electronic regulator. In these systems the turbine rotor speed is measured electronically, with high accuracy, using a toothed wheel and a probe. The resulting electrical signal is amplified and acts on the pilot valve via an electro-hydraulic converter [21].

3. Turbine Characteristics

For stable operation the turbine must have a power–speed characteristic such that as the speed increases the mechanical input power reduces. Similarly, a decrease in speed should result in an increase in the mechanical power. This will restore the balance between the electrical output power and mechanical input power [21].

To examine how such a characteristic can be achieved, Figure 1 shows the idealized power–speed characteristics for an unregulated and a regulated turbine. Point A is the rated point which corresponds to the optimal steam flow through the turbine, as determined by the turbine designers. Consider first the unregulated characteristic and assume that the turbine is initially operating at point A with the turbine control valve fully open. The generator is assumed to be synchronized with the system and its speed can only change if the system frequency changes. If the system frequency rises, then the speed of the rotor is raised. As the main valve is fully open the speed increase causes additional losses in the turbine and the efficiency of the steam flow drops (with respect to the optimal point A) with a corresponding reduction in power as shown by the dashed curve 1. Similarly, a decrease in the system frequency causes the rotor speed to drop with a corresponding drop in power as shown by curve 2. The rapid reduction in turbine power with reduction in system frequency can be explained as follows. The steam flow through the turbine depends on the performance of the boiler and the boiler feed pumps. As the performance of these pumps is strongly dependent on frequency, a reduction in system frequency (and rotor speed) reduces their performance. This causes a decrease in the amount of steam flowing through the turbine and a further drop in the turbine torque. The task of the turbine governor is to set a characteristic corresponding to line 3 which has a small droop. As explained below, such a characteristic is necessary to achieve stable operation of the turbine.

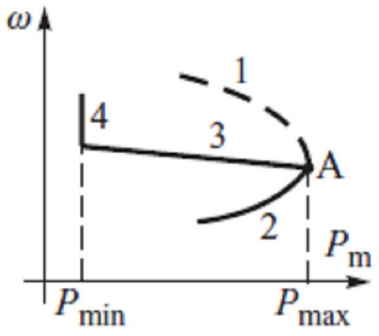

Figure 1. Turbine power–speed characteristic for the unregulated turbine (lines 1, 2) and the regulated turbine (lines 3-2-4) [21].

A simplified block diagram of elector hydraulic governors is shown in Figure 2-a. The

coefficient KA corresponds to the amplification gain of the servomotor, while coefficient R corresponds to the gain of the feedback loop. Transformation of the block diagram allows R to be eliminated from the feedback loop by moving it into the main loop to obtain the block diagram shown in Figure 2-b where TG = 1/(KAR) and is the effective governor time constant. The block diagram of Figure 2-b allows an approximate analysis of the static and dynamic properties of the turbine–governor system. In the steady state $t\to\infty$, $s \to 0$ and the turbine block diagram can be simplified to that shown in Figure 2-c where P_{ref} is the load reference set point expressed as a fraction of the nominal or rated power, P_n. If the valve position c is assumed to vary between 0 (fully closed) and 1 (fully open) then a small change in turbine speed $\Delta\omega=\omega-\omega_{ref}$ will produce a corresponding change in valve position $\Delta c = -\Delta\omega/R$. normally $\Delta\omega$ is expressed as a fraction of rated speed ω_n so that:

$$\Delta c = -\frac{1}{\rho}\frac{\Delta\omega}{\omega_n} \quad \text{or} \quad \frac{\Delta\omega}{\omega_n} = -\rho\Delta c$$

4. System under Study

In order to show effect of turbine governing systems on stability, a typical power system is considered as test case. The turbine governing systems parameters are changed to show effect of them on stability. Figure 3 shows the test system and its data are given in [22].

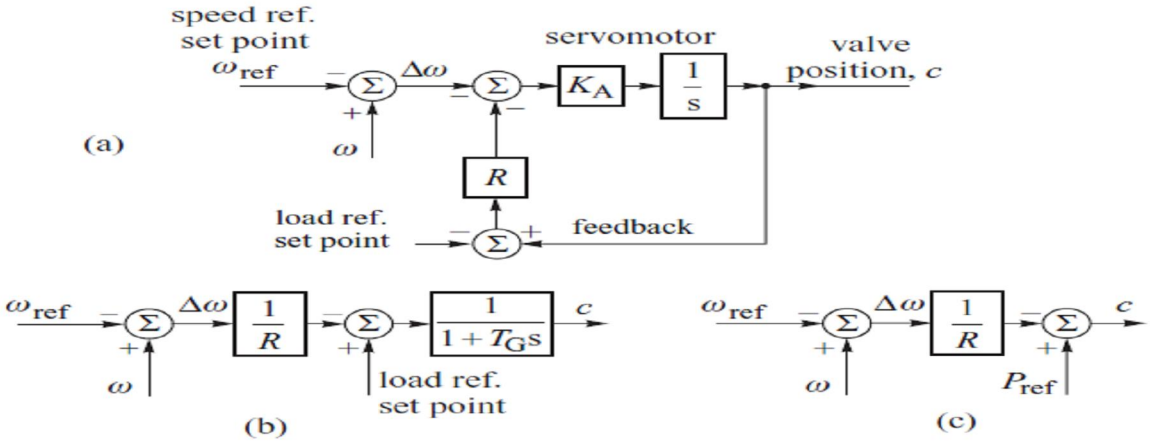

Figure 2. Simplified model of the steam turbine governing system: (a) block diagram with negative feedback; (b) equivalent block diagram; (c) equivalent block diagram for the steady state [21].

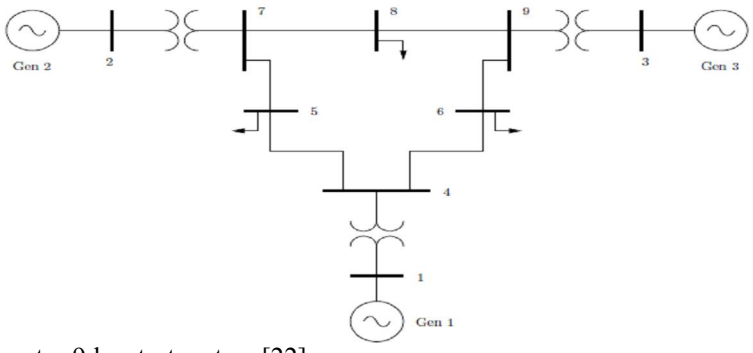

Figure 3. WSCC 3-generator 9-bus test system [22]

Table 1. Turbine governing systems parameters

	Droop R	Pole time constant	Zero time constant
Case 1	0.02	10	1
Case 2	0.04	10	1
Case 3	0.02	20	1
Case 4	0.02	10	0.1

5. Simulation results

Four cases are considered for simulation in the Table 1, where the case 1 is the nominal condition.

The simulation results for the proposed system are depicted in Figures 4-12.The simulation results show the effect of turbine governing systems parameters on stability of power system. It is clearly seen that the system stability is a function of turbine governing systems parameters. The system oscillation depends to turbine governing systems tuning and with changing turbine governing systems parameters the oscillations are changed. The effect of turbine governing systems parameters on stability denotes the importance of turbine governing systems sitting in power systems. An optimal and good tuned turbine governing systems can improve power system stability, while a non-tuned turbine governing systems can greatly affect on stability and would lead to instability.

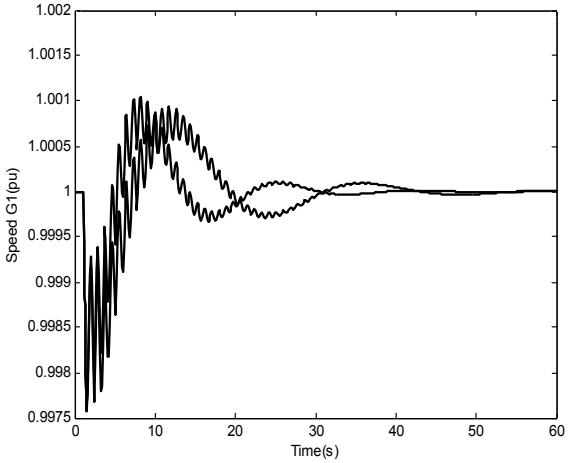

Figure 4 Speed G_1 (solid: case 1; dashed: case 2)

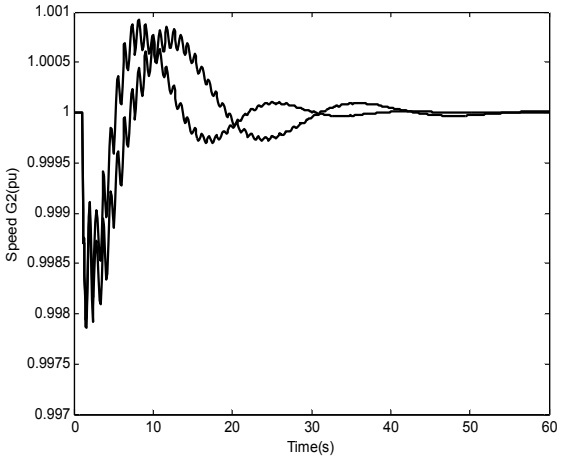

Figure 5. Speed G_2 (solid: case 1; dashed: case 2)

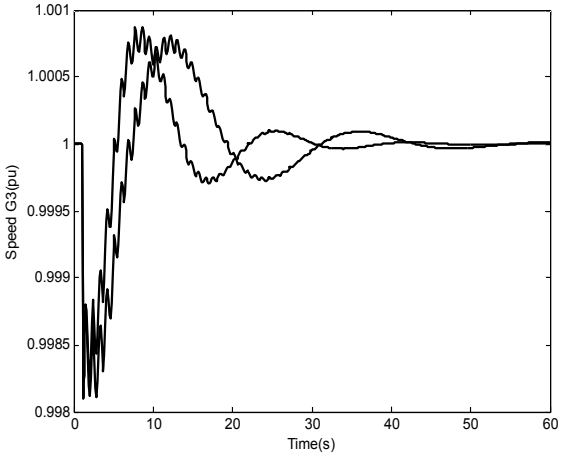

Figure 6. Speed G_3 (solid: case 1; dashed: case 2)

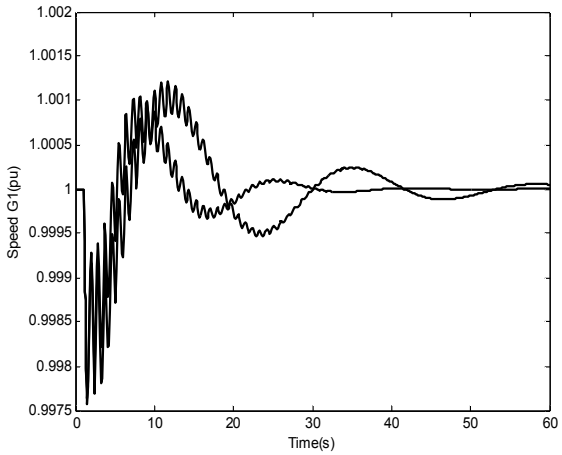

Figure 7. Speed G1 (solid: case 1; dashed: case 3)

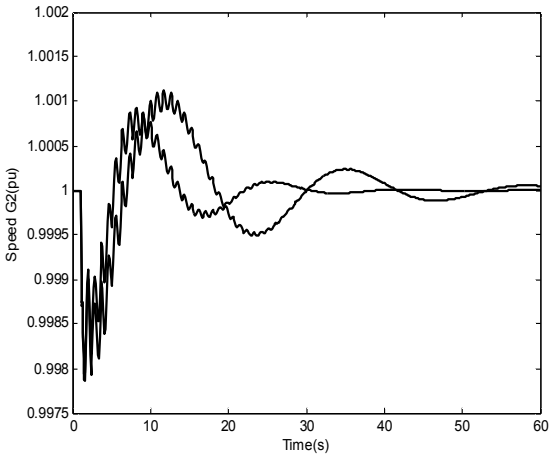

Figure 8. Speed G_2 (solid: case 1; dashed: case 3)

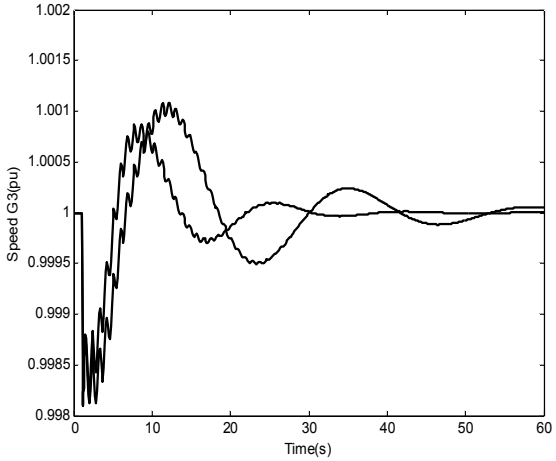

Figure 9. Speed G_3 (solid: case 1; dashed: case 3)

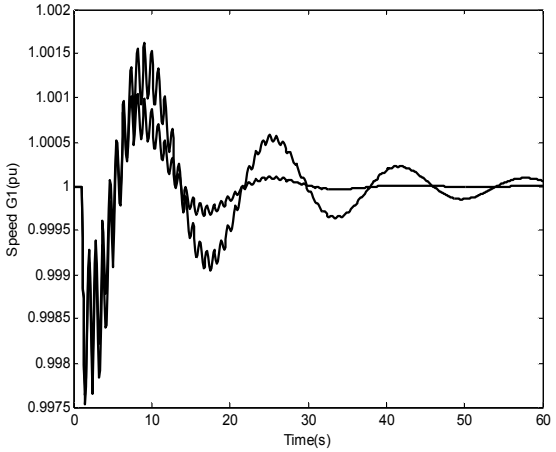

Figure 10. Speed G_1 (solid: case 1; dashed: case 4)

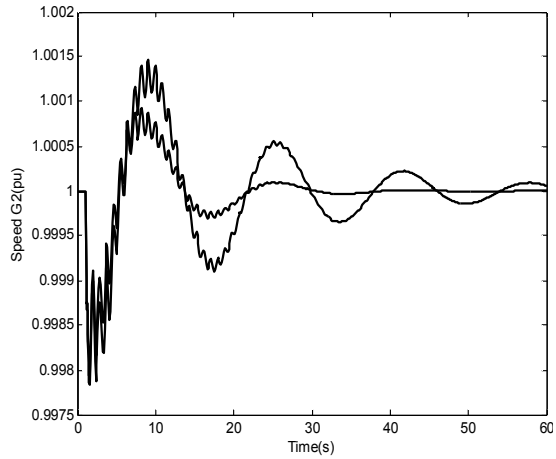

Figure 11. Speed G_2 (solid: case 1; dashed: case 4)

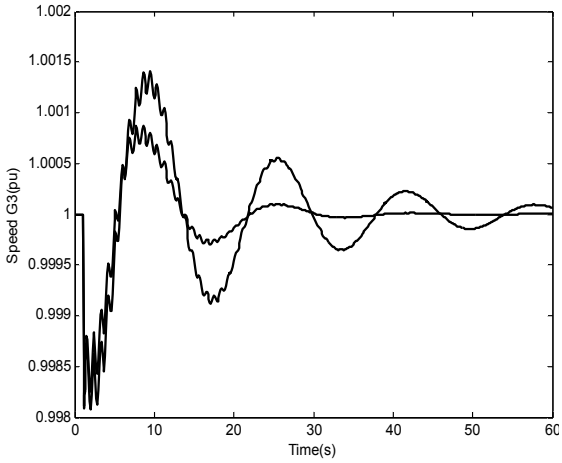

Figure 12. Speed G_3 (solid: case 1; dashed: case 4)

6. Conclusion

Effect of turbine governing systems on stability and oscillations was investigated in this paper. A typical power system equipped with turbine governing systems on all generators was chosen as case study and effect of turbine governing systems parameters was investigated on test system. The simulation results showed the great effect of turbine governing systems parameters on power system stability. The power system stability is associated with turbine governing systems good sitting and non-tuned turbine governing systems may lead to instability.

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Darboux Helices in Minkowski space R_1^3

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Abstract: In the present study, we give the conditions for a curve in the Minkowski space to be a Darboux helix. We show that α is a Darboux helix if there exists a fixed direction d in R_1^3 such that the function $\langle W(s), d\rangle$ is constant. We give the relation between slant helice and Darboux helice. As a particular case, if we take $\|w\| = \text{constant}$, the curves are constant precession. Some more particular cases of constant precession curves are studied.

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1. Introduction

Let R_1^3 denote the 3-dimensional Lorentz space (Minkowski 3-space), i.e. the Euclidean 3-space R^3 with Lorentzian inner product defined by $\langle x, y\rangle = x_1y_1 + x_2y_2 - x_3y_3$ where $x, y \in R^3$.

A vector $x = (x_1, x_2, x_3) \in R_1^3$ is called space-like if $\langle x, x\rangle > 0$ or $x = 0$, time-like if $\langle x, x\rangle < 0$ and null if $\langle x, x\rangle = 0$ for non-zero x.

A curve $\alpha : I \subset R \to R_1^3$ is said to be spacelike, timelike and null if all of its velocity vectors $\alpha'(t)$ are spacelike, timelike and null. When $|\alpha'(s)| = 1$, α is arc-lenght parameterized or unit speed curve.

Let α be a unit speed curve in Minkowski space R_1^3. Then, it is possible to define a Frenet frame $\{T(s), N(s), B(s)\}$ at every point s [5,6,8]. Here T, N and B are the tangent, normal and binormal vector field, respectively. The geometry of the curve α can be described by the differentiation of the Frenet frame, which leads to the corresponding Frenet equations.

The norm of vector x is defined as

$$\|x\| = \sqrt{|\langle x, x\rangle|}$$

The Lorentzian sphere and hyperbolic sphere of radius 1 in R_1^3 are given by

$$S_1^2 = \{x = (x_1, x_2, x_3) \in R_1^3 \ / \ \langle x, x\rangle = 1\}$$

and

$$H_0^2 = \{x = (x_1, x_2, x_3) \in R_1^3 \ / \ \langle x, x\rangle = -1\}$$

respectively. In differential geometry, a curve of constant slope or general helix in Euclidean 3-space R^3 is defined by the property that the tangent makes a constant angle with a fixed straight line (the axis of general helix). Helices are characterized by the fact that the ratio $\frac{\tau}{\kappa}$ is constant along the curve, where τ and $\kappa \neq 0$ denote the torsion and curvature, respectively [2] · In Minkowski space R_1^3, one defines a helix in a similar fashion. Several authors introduce different types of helices and investigate their properties. For instance, Izumiya and Takeuchi define in [3] slant helices by the property that the principal normal makes a constant angle with a fixed direction. Moreover, they have characterized that α is a slant helix if and only if the function $\frac{\kappa^2}{(\kappa^2+\tau^2)^{3/2}}\left(\frac{\tau}{\kappa}\right)'$ is constant. Kula &Yayl investigate spherical images of tangent indicatrix of binormal indicatrix of slant helix and they have shown that spherical images are spherical helix [7]. In [9], we give that α is Darboux helix with $\frac{\tau}{\kappa} \neq 0$ if its Darboux vector makes a constant angle with a fixed direction d. That means $\langle W, d\rangle$ is constant along the curve, where d is a unit vector field in R_1^3, $W = \tau T + \kappa B$ and the direction of the vector d is the axis of the Darboux helix. We have characterized that a curve is a Darboux helix if and only if the

function $\frac{\left(\tau^2+\kappa^2\right)^{\frac{3}{2}}}{\kappa^2}\frac{1}{\left(\frac{\tau}{\kappa}\right)'}$ is constant. A unit speed curve α is called a slant helix if there exist a non-zero constant vector field U in R_1^3 such that the function $\langle N(s),U\rangle$ is constant [1]. On the other hand, Ali&Lopez give the following characterization of slant helices.

Theorem 1. Let α be a unit speed time-like curve in R_1^3. Then α is a slant helix if and only if either one the next two functions

$$\frac{\kappa^2}{\left(\tau^2-\kappa^2\right)^{3/2}}\left(\frac{\tau}{\kappa}\right)' \text{ or } \frac{\kappa^2}{\left(\kappa^2-\tau^2\right)^{3/2}}\left(\frac{\tau}{\kappa}\right)'$$

is constant everywhere $\tau^2-\kappa^2$ does not vanish [1].

Theorem 2. Let α be a unit speed space-like curve in R_1^3.

i) if the normal vector of α is space-like, then α is a slant helix if and only if either one the next two functions

$$\frac{\kappa^2}{\left(\tau^2-\kappa^2\right)^{\frac{3}{2}}}\left(\frac{\tau}{\kappa}\right)' \text{ or } \frac{\kappa^2}{\left(\kappa^2-\tau^2\right)^{\frac{3}{2}}}\left(\frac{\tau}{\kappa}\right)'$$

is constant everywhere $\tau^2-\kappa^2$ does not vanish.

ii) If the normal vector of α is time-like, then α is a slant helix if and only if the function

$$\frac{\kappa^2}{\left(\tau^2+\kappa^2\right)^{3/2}}\left(\frac{\tau}{\kappa}\right)'$$

is constant [1].

The purpose of the present paper is to give a similar characterization for Darboux helices in Minkowski 3-space. As a byproduct, we show that a curve in R_1^3 is a slant helix if and only if it is a Darboux helix.

2. Time-Like Darboux helices

Let α be a unit speed timelike curve in R_1^3. The Frenet frame $\{T,N,B\}$ of α is given by

$$T(s)=\alpha'(s),\quad N(s)=\frac{\alpha''(s)}{\|\alpha''(s)\|},\quad B(s)=T(s)\Lambda N(s)$$

where Λ is the Lorentzian cross product. In this trihedro, T is timelike vector, N and B are spacelike vectors. For these vectors, we have $T\Lambda N=B$, $N\Lambda B=-T$, $B\Lambda T=N$. Then we will use the Frenet equations

$$T'(s)=\kappa(s).N(s)$$
$$N'(s)=\kappa(s).T(s)+\tau(s).B(s)$$
$$B'(s)=-\tau(s).N(s)$$

where κ and τ stand for the curvature and torsion of the curve, respectively. When the curve α is timelike, we define the Darboux vector W as $W=\tau T+\kappa B$ when $\langle W,W\rangle=\kappa^2-\tau^2$. If we take the norm of the Darboux vector, we find $\|W\|=\sqrt{\left|\kappa^2-\tau^2\right|}$ satisfying $W\Lambda T=T',W\Lambda N=N',W\Lambda B=B'$.

Case 1. We assume that W is spacelike then, $\kappa^2-\tau^2>0$. Now we write the unit Darboux vector W_0

$$W_0=\frac{W}{\|W\|}=\frac{\tau}{\sqrt{\kappa^2-\tau^2}}T+\frac{\kappa}{\sqrt{\kappa^2-\tau^2}}B$$
$$W_0=\mathrm{sh}\phi T+\mathrm{ch}\phi B$$

Since $\langle W_0,W_0\rangle>0$, W_0 is spacelike vector. If we take W_0 as unit space-like vector, then it defines a curve on the Lorentzian unit sphere S_1^2.

If we called the spherical image as β, $\beta(s_c)=W_0(s)=\mathrm{sh}\phi T+\mathrm{ch}\phi B$ where s_c is the arc parameter of β.

$$\frac{d\beta}{ds_c}=\frac{d\beta}{ds}\frac{ds}{ds_c}$$

By taking the derivative on both sides with respect to s, we can write:

$$\frac{d\beta}{ds_c}=\left(\phi'\mathrm{ch}\phi T+\phi'\mathrm{sh}\phi B+\kappa\mathrm{sh}\phi N-\tau\mathrm{ch}\phi N\right)\frac{ds}{ds_c}$$
$$\beta_{s_c}=\frac{d\beta}{ds_c}=\left(\phi'\mathrm{ch}\phi T+\phi'\mathrm{sh}\phi B\right)\frac{ds}{ds_c}$$

And by taking the norm β_{s_c}, we

$$\left\|\beta_{s_c}\right\|=\left\|\left(\phi'\mathrm{ch}\,\phi T+\phi'\mathrm{sh}\,\phi B\right)\frac{ds}{ds_c}\right\|$$
$$\frac{ds}{ds_c}=\frac{1}{\phi'}$$
$$\beta_{s_c}=\mathrm{ch}\phi T+\mathrm{sh}\phi' B \qquad (2.1)$$

so, β_{s_c} is a timelike curve since $\langle\beta_{s_c},\beta_{s_c}\rangle=-ch^2\phi+sh^2\phi=-1$, Hence since the tangent $T_c=\beta_{s_c}$ of the indicatrix curve β is timelike, the curve β is timelikle. Now, we will find the curvature κ_β of the curve $\beta(s_c)$:

$$\kappa_\beta=\|\beta''\|=\left\|\beta'_{s_c}\right\|$$
$$\beta'_{s_c}=\frac{d\beta'}{dS_c}=\frac{d\beta'}{dS_c}\frac{ds}{ds_c}$$

$$\beta'_{s_c} = \left(\phi' \mathrm{sh}\phi T + \phi' \mathrm{ch}\phi B + \kappa \mathrm{ch}\phi N - \tau \mathrm{sh}\phi' N\right)\frac{1}{\phi'}$$

$$\beta'_{s_c} = \left(\mathrm{sh}\phi T + \mathrm{ch}\phi B + \frac{\|w\|}{\phi} N\right) \qquad (2.2)$$

$$\kappa_\beta = \left\|\beta'_{s_c}\right\| = \sqrt{1 + \left(\frac{\|w\|}{\phi'}\right)^2} \qquad (2.3)$$

For the curve β, $V_2 = \frac{\beta'_{s_c}}{\left\|\beta'_{s_c}\right\|} = \frac{\beta'_{s_c}}{\kappa_\beta}$ and so, we get:

$$\left\langle V_2, V_2 \right\rangle = \left\langle \frac{\beta'_{s_c}}{\kappa_\beta}, \frac{\beta'_{s_c}}{\kappa_\beta} \right\rangle = \frac{1}{\kappa_\beta^2}\left\langle \beta'_{s_c}, \beta'_{s_c} \right\rangle$$

$$= \frac{1}{\kappa_\beta^2}\left[1 + \left(\frac{\|w\|}{\phi'}\right)^2\right]$$

Since $\left\langle V_2, V_2 \right\rangle \geq 0$, V_2 must be spacelike. And so,

$$\kappa_\beta^2 = 1 + \left(\frac{\|w\|}{\phi'}\right)^2$$

Curvatures of curve on surface satisfy the following relation

$$\kappa_\beta^2 = \kappa_g^2 + 1$$

Then

$$\kappa_g = \frac{\|w\|}{\phi'} \qquad (2.4)$$

On the other hand, taking the derivative of th

$$\phi = \frac{\tau}{\kappa},\ \phi'.\left(1 - \mathrm{th}^2\phi\right) = \left(\frac{\tau}{\kappa}\right)',$$

$$\phi' = \left(\frac{\kappa^2}{\kappa^2 - \tau^2}\right)\left(\frac{\tau}{\kappa}\right)' \qquad (2.5)$$

Hence, by using the equations (2.4) and (2.5), we get:

$$\kappa_g = \frac{\sqrt{\kappa^2 - \tau^2}}{\left(\frac{\kappa^2}{\kappa^2 - \tau^2}\right)\left(\frac{\tau}{\kappa}\right)'},\ \kappa_g = \frac{\left(\kappa^2 - \tau^2\right)^{3/2}}{\kappa^2}\frac{1}{\left(\frac{\tau}{\kappa}\right)'},$$

where $\|w\| = \sqrt{\kappa^2 - \tau^2}$.

If the spherical indicatrix of the darboux vector W is a Lorentzian circle or a part of Lorentzian circle, then the curve α is a darboux helis.

Case 2. We assume that W is **timelike** then $\kappa^2 - \tau^2 < 0$**.** Now we write the unit Darboux vector W_0:

$$W_0 = \frac{W}{\|W\|} = \frac{\tau}{\sqrt{\tau^2 - \kappa^2}} T + \frac{\kappa}{\sqrt{\tau^2 - \kappa^2}} B$$

$$W_0 = \mathrm{ch}\phi T + \mathrm{sh}\phi B$$

Since $\left\langle W_0, W_0 \right\rangle < 0$, W_0 is time-like vector. If we take W_0 as unit time-like vector, then it defines a curve on the hyperbolic unit sphere H_0^2. If we called the spherical image as β, $\beta(s_c) = W_0(s) = \mathrm{ch}\phi T + \mathrm{sh}\phi B$

where s_c is the arc parameter of β .

$$\frac{d\beta}{ds_c} = \frac{d\beta}{ds}\frac{ds}{ds_c}$$

By taking the derivative on both sides with respect to s , we can write:

$$\frac{d\beta}{ds_c} = \left(\phi' \mathrm{sh}\phi T + \phi' \mathrm{ch}\phi B + \kappa \mathrm{ch}\phi N - \tau \mathrm{sh}\phi N\right)\frac{ds}{ds_c}$$

$\beta_{s_c} = \frac{d\beta}{ds_c} = \left(\phi' \mathrm{sh}\phi T + \phi' \mathrm{ch}\phi' B\right)\frac{ds}{ds_c}$ and by taking the norm β_{s_c}, we have,

$$\left\|\beta_{s_c}\right\| = \left\|\left(\phi' \mathrm{ch}\phi T - \phi' \mathrm{sh}\phi B\right)\frac{ds}{ds_c}\right\|$$

$$\frac{ds}{ds_c} = \frac{1}{\phi'},$$

$$\beta_{s_c} = \mathrm{sh}\phi T + \mathrm{ch}\phi B \qquad (2.6)$$

so, β_{s_c} is a spacelike curve since $\left\langle \beta_{s_c}, \beta_{s_c} \right\rangle = -sh^2\phi + ch^2\phi = 1$, Hence since the tangent $T_c = \beta_{s_c}$ of the indicatrix curve β is spacelike, the curve β is spacelike. Now, we will find the curvature κ_β of the curve $\beta(s_c)$:

$$\kappa_\beta = \left\|\beta'_{s_c}\right\|$$

$$\beta'_{s_c} = \frac{d\beta}{ds_c} = \frac{d\beta}{ds}\frac{ds}{ds_c}$$

$$\beta'_{s_c} = \left(\phi' \mathrm{ch}\phi T + \phi' \mathrm{sh}\phi B + \kappa \mathrm{sh}\phi N - \tau \mathrm{ch}\phi' N\right)\frac{1}{\phi'}$$

$$\beta'_{s_c} = \left(\mathrm{ch}\phi T + \mathrm{sh}\Phi B - \frac{\|w\|}{\phi} N\right) \qquad (2.7)$$

$$\kappa_\beta = \left\|\beta'_{s_c}\right\| = \sqrt{-1 + \left(\frac{\|w\|}{\phi'}\right)^2} \qquad (2.8)$$

For the curve β , $V_2 = \frac{\beta'_{s_c}}{\left\|\beta'_{s_c}\right\|} = \frac{\beta'_{s_c}}{\kappa_\beta}$ and so, we get:

$$\langle V_2, V_2\rangle = \left\langle \frac{\beta'_{s_c}}{\kappa_\beta}, \frac{\beta'_{s_c}}{\kappa_\beta} \right\rangle = \frac{1}{\kappa_\beta^2}\langle \beta'_{s_c}, \beta'_{s_c}\rangle$$

$$= \frac{1}{\kappa_\beta^2}\left[-1+\left(\frac{\|w\|}{\phi'}\right)^2\right]$$

Assume that V_2 is a spacelike,

$$\kappa_\beta^2 = -1+\left(\frac{\|w\|}{\phi'}\right)^2$$

Curvatures of curve on surface satisfy the following relation

$$\kappa_\beta^2 = \kappa_g^2 - 1$$

Then

$$\kappa_g = \frac{\|w\|}{\phi'} \qquad (2.9)$$

On the other hand, taking the derivative of $\coth\phi = \frac{\tau}{\kappa}$,

$$\phi'.\left(1-\coth^2\phi\right) = \left(\frac{\tau}{\kappa}\right)'$$

$$\phi' = \left(\frac{\kappa^2}{\kappa^2-\tau^2}\right)\left(\frac{\tau}{\kappa}\right)' \qquad (2.10)$$

Hence, by using the equations (2.9) and (2.10), we get:

$$\kappa_g = \frac{\sqrt{\tau^2-\kappa^2}}{\left|\left(\frac{\kappa^2}{\kappa^2-\tau^2}\right)\left(\frac{\tau}{\kappa}\right)'\right|},\quad \kappa_g = \frac{\left(\tau^2-\kappa^2\right)^{3/2}}{\kappa^2}\frac{1}{\left(\frac{\tau}{\kappa}\right)'},$$

where $\|w\| = \sqrt{\tau^2-\kappa^2}$.

If the spherical indicatrix of the darboux vector W is a Lorentzian circle or a part of Lorentzian circle, then the curve α is a darboux helis.

Theorem 3. Let α be a unit speed **time-like** curve in R_1^3. Then α is a Darboux helix if and only if either one the next two functions

$$\frac{\left(\kappa^2-\tau^2\right)^{3/2}}{\kappa^2}\frac{1}{\left(\frac{\tau}{\kappa}\right)'} \text{ or } \frac{\left(\tau^2-\kappa^2\right)^{3/2}}{\kappa^2}\frac{1}{\left(\frac{\tau}{\kappa}\right)'} \text{ is constant,}$$

with $\frac{\tau}{\kappa} \neq 0$.

Similarly, when α is a space-like , the following results can be obtained easily.

Theorem 4. Let α be a unit speed **space-like** curve in R_1^3.

i) if the normal vector of α is **space-like**, then α is a Darboux helix if and only if either one the next two functions

$$\frac{\left(\tau^2-\kappa^2\right)^{3/2}}{\kappa^2}\frac{1}{\left(\frac{\tau}{\kappa}\right)'} \text{ or } \frac{\left(\kappa^2-\tau^2\right)^{3/2}}{\kappa^2}\frac{1}{\left(\frac{\tau}{\kappa}\right)'} \text{ is constant,}$$

with $\frac{\tau}{\kappa} \neq 0$.

ii) If the normal vector of α is **time-like**, then α is a Darboux helix if and only if the function $\frac{\left(\tau^2+\kappa^2\right)^{3/2}}{\kappa^2}\frac{1}{\left(\frac{\tau}{\kappa}\right)'}$ is constant, with $\frac{\tau}{\kappa} \neq 0$.

As a cosequence of our main results together with the characterization of slant helices given in [1] , we easily obtain the following resuts.

Theorem 5. Let $\alpha : I \to \mathrm{R}_1^3$ be a curve such that $\frac{\kappa}{\tau}$ is not constant, where κ and τ are curvature of α. Then, α is a slant helice if and only if α is a Darboux helice From the previous theorem, firstly we are going to find the axis of the slant helices since a slant helice is also a darboux helice.

3. The axis of the Darboux helice (Time-Like)

Let α be a unit speed timelike curve in R_1^3. The Frenet frame $\{T, N, B\}$ of α is given by

$$T(s) = \alpha'(s),\ \ N(s) = \frac{\alpha''(s)}{\|\alpha''(s)\|},\ \ B(s) = T(s)\Lambda N(s)$$

where Λ is the Lorentzian cross product.satisfying $T\Lambda N = B$, $N\Lambda B = -T$, $B\Lambda T = N$. Then we will use the Frenet equations

$$T'(s) = \kappa(s).N(s)$$

$$N'(s) = \kappa(s).T(s) + \tau(s).B(s)$$

$$B'(s) = -\tau(s).N(s)$$

where κ and τ stand for the curvature and torsion of the curve, respectively. We first assume that α is a slant helix. Let d be the vector field such that the function $\langle N, d\rangle = \mathrm{c}$ is constant. There exists a_1 and a_3 such that

$$d = a_1 T + a_3 B + cN \qquad (3.1)$$

Then, if we take the derivative of the equation (3.1) and by using Frenet equation, we have:

$$d' = (a_1' + c.\kappa)T + (a_1\kappa - \tau a_3)N + (a_3' + \mathrm{c}.\tau)B.$$

Since the system $\{T, N, B\}$ is linear independent, we get:

$$a_1 + c\kappa = 0$$

$$a_1\kappa - \tau a_3 = 0 \qquad (3.2)$$

$$a_3' + c\tau = 0 \qquad (3.3)$$

and from (3.2) and (3.1), respectively

$$a_1 = \left(\frac{\tau}{\kappa}\right).a_3 \qquad (3.4)$$

$$\langle d, d\rangle = -a_1^2 + a_3^2 + \mathrm{c}^2 = \text{constant} \qquad (3.5)$$

By using the equalities (3.4) and (3.5), we obtain:

$$-\left(\frac{\tau}{\kappa}\right)^2 a_3^2 + a_3^2 = \text{constant - c}^2 \qquad (3.6)$$

and from the equation (3.6) we have

$$\left(\left(\frac{\tau}{\kappa}\right)^2 - 1\right) a_3^2 = m^2$$

where m^2 is constant. So,

$$a_3 = \frac{m}{\sqrt{\left(\frac{\tau}{\kappa}\right)^2 - 1}} \qquad (3.7)$$

Taking the derivative in each part of the equation (3.7) and by using (3.5), we get:

$$\frac{\kappa^2}{\left(\tau^2 - \kappa^2\right)^{\frac{3}{2}}}\left(\frac{\tau}{\kappa}\right)' = \text{constant} \qquad (3.8)$$

We deduce from that the curve α is slant helice when we have d . Conversely, assume that the condition (3.8) is satisfied. In order to simplify the computations, we assume that the function (19) is constant. Define

$$d = \frac{\tau}{\sqrt{\tau^2 - \kappa^2}}T + \frac{\kappa}{\sqrt{\tau^2 - \kappa^2}}B + \mathrm{c}.N \qquad (3.9)$$

A differentiation of (3.9) together the frenet equations gives $d' = 0$, that is, d is a constant vector. It can easily be seen that $d' = 0,$ that is d is a constant. On the other hand, $\langle N, d\rangle =$ c and this means that α is a slant helix.

The constant direction d is the axis of both the slant helice α and the darboux helice α. These axises coincide.

Similarly, when α is spacelike , the following results can be obtained easily for axes.

Conclusion 1. i) If the normal vector of α is timelike, the axis of α is

$$d = \frac{\tau}{\sqrt{\tau^2 + \kappa^2}}T + \frac{\kappa}{\sqrt{\tau^2 + \kappa^2}}B + \mathrm{c}.N$$

ii) If the normal vector of α is spacelike:, the axis of α is

$$d = \frac{-\tau}{\sqrt{\tau^2 - \kappa^2}}T + \frac{\kappa}{\sqrt{\tau^2 - \kappa^2}}B + \mathrm{c}.N$$

4. Curves of constant precession

Letr α be a spacelike curve (The normal vector of α is timelike). Then we use the following frenet equations

$$T'(s) = \kappa(s).N(s)$$

$$N'(s) = \kappa(s).T(s) + \tau(s).B(s)$$

$$B'(s) = \tau(s).N(s)$$

where κ and τ stand for the curvature and torsion of the curve, respectively. Since $W = \tau T - \kappa B$ and $\langle W, W\rangle = \tau^2 + \kappa^2$, then W is a spacelike vector and $\|W\| = \sqrt{\tau^2 + \kappa^2}$. Recall that the centrode axis of the Frenet frame is given by

$$d = \frac{\tau}{\sqrt{\tau^2 + \kappa^2}}T + \frac{\kappa}{\sqrt{\tau^2 + \kappa^2}}B + \mathrm{c}.N$$

and

$$d = \frac{W}{\|W\|} + \mathrm{c}.N \qquad (4.1)$$

where $W = \tau T + \kappa B$. From (4.1),

$$\|W\|.d = W + \|W\|.\mathrm{c}.N$$

By taking $\varpi = \|W\| = \sqrt{\tau^2 + \kappa^2}$, $\varpi.d = A$ and $\varpi.\ \mathrm{c} = \mu$, we get $A = W + \mu.N$

If we take $\|W\|$ =constant, the darboux helice α are constant precession. We deduce from that [4] is true.

A unit speed curve of constant precession is defined by the property that its (Frenet) Darboux vector revolves about a fixed line in space with angle and constant speed. A curve of constant precession is characterized by having

$$\kappa(s) = \varpi \sin(\mu(s)),$$

$$\tau(s) = \varpi \cos(\mu(s)),$$

where $\varpi \rangle 0$, μ and are constant [10].

Similarly, the following results can be obtained easily.

Conclusion 2. i) Let α be a unit speed spacelike curve (the normal vector of α is spacelike) in R_1^3 . A curve of constant precession is characterized by having

$$\kappa(s) = -\varpi \mathrm{sh}(\mu(s)),$$

$$\tau(s) = \varpi \mathrm{ch}(\mu(s)),$$

where $\varpi \rangle 0$, μ and are constant.

ii) Let α be a unit speed timelike curve. A curve of constant precession is characterized by having

$$\kappa(s) = \varpi \mathrm{ch}(\mu(s)),$$

$$\tau(s) = -\varpi \mathrm{sh}(\mu(s)),$$

where $\varpi \rangle 0$, μ and are constant.

Example 1. Let $\alpha(s)$ be a spacelike curve (the

normal vector of α is timelike) parametrized by the vector function:

$$\alpha(s)=\left(\frac{9}{400}\sin(25s)+\frac{25}{144}\sin(9s),\frac{-9}{400}\cos(25s)+\frac{25}{144}\cos(9s),\frac{15}{136}\sin(17s)\right)$$

where $s\in[0,2\pi]$.

The spacelike curve α is rendered in the following figure 1.

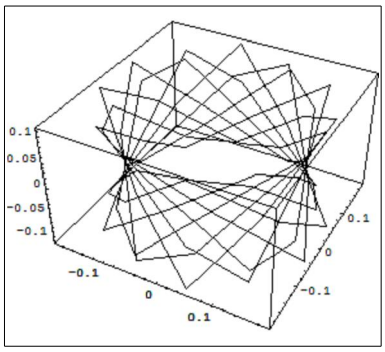

Fig 1. The spacelike curve α(s)

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Studying the Effects of Artificial Pollination and Cycocel Hormone on Germination Traits of Hamedani Alfalfa Seed

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Abstract: In order to investigate the effects of various concentrations of ccc and artificial pollination on the components and behavior of Alfalfa seeds, an experiment of splitting plots with completely randomized blocks and three replications was performed in two-purpose fields (seed-forage) of Boroujerd' s research agricultural station. Basic treatment includes artificial pollination through stretching the rope in two stages at 70% levels of pollination which was replicated in 100% pollination stage as compared to control treatment and the second treatment involves different concentrations of Cycocel Hormone (0, 1.6, 3.2, 6.4 liter/ha). The results obtained by analysis of variance indicated that the effects of artificial pollination on the bush length are significant at 5% level in the hormone treatment and considering the number of seeds at artificial pollination and hormone levels, they were significant at the levels of 5 and 1 percents, respectively. In this study, the minimum rate of length and maximum number of seeds were demonstrated by the levels of 6.4 liter and 70%+100%.

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Key words: Ccc (cycocel), artificial pollination, alfalfa seed.

1. Introduction

Alfalfa (Medicago sativa l.) is one of the most important forage plants playing a crucial role in providing the required forage of the country. As the cultivation of this product is increased, providing sufficient seed is required [1]. Alfalfa is considered as grass legume.

More than 616000 ha area has been cultivated by alfalfa in Iran [2]. Since alfalfa is a cross plant and its pollination is done by the help of wind, bees, pollinator insects and other external elements, the improvement of artificial pollination increases the number of bunches in each bush. In case, this plant cannot pollinate under some different circumstances, the seed production is decreased in the plant [3]. Through studying the onion plants, it has been determined that the pollination done by bees was 25.758 and 44.385% more than artificial pollination (using brush) and control one [4]. Cycocel (ccc) is an onion compound and regarded as most consumed moderator of plant growth especially in Europe and nowadays, is frequently applied to decrease the dormancy and control the germination growth of cultivating plants [5]. Ccc prevents the activities of synthesized anti-covering enzyme and decreases the plant height [6]. Seed performance of plants treated with ccc leads to the increases in root growth and water potential in the leaves [5]. Based on some research results, Cycocel reduces the stem length and enhances the number of seeds in the ears [6].

This paper aims to determine the best concentration of ccc and highest level of artificial pollination in order to enhance the yield of seeds and examine the alfalfa's components and behaviors' reactions in two-purpose (seed and forage) fields.

2. Materials and Methods

This research has been performed in the experimental field of alfalfa's seed production placed in Agriculture Research center of Boroujerd along with wet and cold winter and relatively moderate and dry summer. The desired cultivar was Hamedani alfalfa cultivar. This research has been performed as a plot splitting experiment of completely randomized blocks with three replications and each treatment was implemented in the furrows of 6m long and 2m wide. Control treatments include artificial pollination done by pulling a rope at two stages along with pollination levels of 70 and 100%. 100% non-artificial pollination was done. Solution was sprayed from the height of 25 cm using a crop sprayer at 1 atmosphere pressure. Secondary treatment involves various concentrations of Cycocel hormone (0, 1.6, 3.2 & 6.4 liter/ha). Ccc treatment has been performed by solution-spraying. The targeted features are the bush height and the number of seeds. Then, data were normalized for analysis of variance using $spss_{18}$and sas_9 software. Also, the calculated means have been compared by the means of Tukey test.

3. Discussion

3.1. Height of bush:

Results obtained by analysis of variance indicate that considering the height of bush, no significant variation exists between the levels of artificial pollination.

Hormone treatment has been significant at 5% level but the effects of artificial pollination on hormone are not significant (Table1). Comparing the means demonstrated that the lowest and highest heights were related to the 100% flowering stage and control treatment for the levels of artificial pollination, respectively. Through comparing the hormone level, the lowest height of bushes has been specified for 6.4 liter/ha concentration.

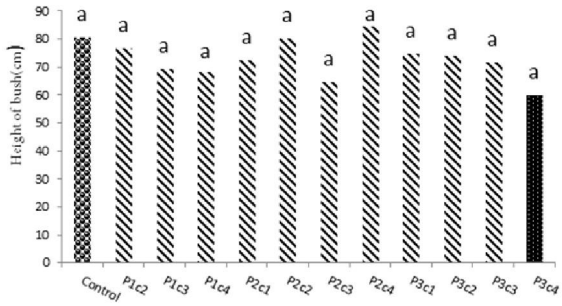
While comparing the means of these two variables' effects using Tukey test at 5% level, the lowest and highest bush heights have been found for 100% flowering stage and 6.4 (liter/ha) hormone level and control treatments of artificial pollination and hormone, respectively (graph1).

Results indicate that the lowest and highest heights have been related to flowing and hormone stages and control treatments of artificial pollination and hormone. Cycocel prevents the lengthwise growth of cells in nodes which is stimulated by Gibberellin hormone, stops the synthesis of ant-enzyme at early stages of Gibberellin biosynthesis and reduces the Apical dominance. Due to preventing the synthesis of Geranyl Pyrophosphate in the cycle of Gibberellin acid biosynthesis, the height of bush is reduced because the longitudinal growths of stem and nodes decrease. However, with regard to these conditions, Cycocel's effects do not always reduce the plant height and are varied in different plants because of various concentrations.

For example, the lack of effects on the length of wheat stem and oat has been reported [7].

Table1: Studied features' analysis of variance

Variation coefficients	Degree of freedom (df)	Height of bush (cm)	Seed number in pod	Seed behavior
Block	2	1013.26	275.85	1.53
Artificial pollination	2	279.95	667.86	45.15
Error of a	4	335.25	103.72	0.81
Hormone	3	543.11	278.43	8.52
Artificial pollination*hormone	6	649.07	4086.92	28.09
Error of b	18	4504.98	73.24	0.272
Cv%	-	12.02	4.49	3.88



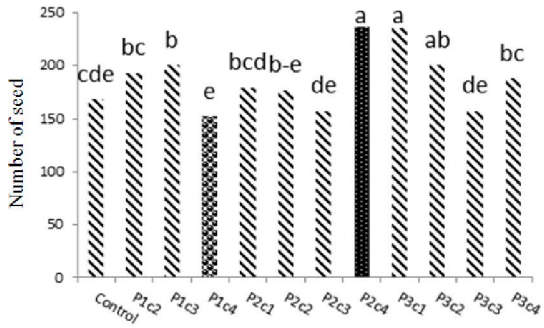
3.2. Graph1: Effects of artificial hormone pollination on the bush height

3.2.Number of seeds: The results of seeds' number given by analysis of variance show that there are significant relationships between artificial pollination and hormone at 5 and 1% levels (Table1). Comparing the means for the levels of artificial pollination presented that the highest and lowest numbers of seeds have been determined for 70+100% artificial pollination and control treatment.

Also, 1.6 and 6.4 (liter/ha) hormone levels had the highest and lowest number of seeds. Regarding the effects of these two factors using Tukey test at 5% level, 70+100% artificial pollination and 1.6 (liter/ha) hormone levels had the highest number and control treatment and 6.4 (liter/ha) hormone level were associated with the lowest number of seeds (graph2).

The research results show that the plants treated with artificial pollination have higher number of seeds as compared to control treatment and as the hormone rate is increased, the number of seeds decreases, especially at 6.4 (liter/ha) hormone level which has increased the establishment of pollen on the flowers at 70+100% level of artificial pollination because alfalfa is a cross plant whose pollination is done by the factors such as wind, bees and insects. In case, it cannot pollinate, it is regarded as a self-incompatible plant.

Consequently, artificial pollination leads to the increase in the number of seeds; on the other hand, Cycocel hormone affects the number of seeds in the ears by increasing them but decrease the number of those in the pods due to the increase in the number of pods in each bush. Because there is a reverse relationship between the number of pods in the ears and number of seeds in the pods and the increase in the number of pods in the ears reduces the number of seeds in each ear while decreasing the level of carbohydrates in the ear. These results are in conformity with those reported in [8-9].



Graph2: Effects of artificial pollination with hormone on the number of seeds in pods

3.3.Grain Yield

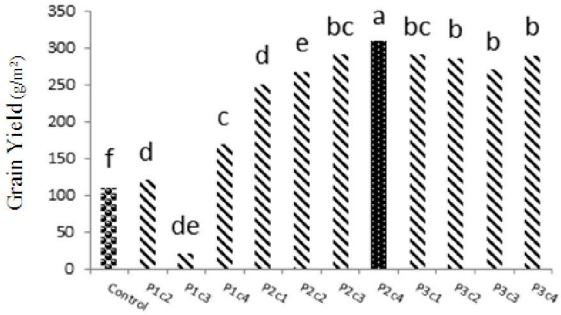
The results related to seed yield and obtained by analysis of variance indicated that artificial pollination and hormone treatments and their interactions at 1% level have a significant variation (Table1).

Through comparing the means using Tukey test for the effects of artificial pollination levels on seed yield, it has been found that the highest and lowest rates were associated with 70+100% level of artificial pollination and control treatment.

Regarding hormone levels, the highest and lowest rates were observed for 6.4 (liter/ha) level and control treatment, respectively. With regard to the effects of these two factors using Tukey test at 5% level, 70+100% pollination and 6.4 (liter/ha) hormone levels had the highest rate of seed yield and the lowest rate was related to control treatments of artificial pollination and hormone levels (graph3).

Results report that the increase of pollination treatment causes the increase of seed yield so that the highest rate of seed yield is seen at 70+100% artificial pollination levels indicating that since alfalfa is a cross plant, artificial pollination treatment enhances the period of pollination, the establishment of pollen on the pollen tube, the formation of seeds and the seed yield. On the other hand, the increase in hormone rate enhances the seed yield because Cycocel reduces the number of seeds in the ears. Though, it increases the number of stems, branches, fertile ears, the height and number of flowering branches and the weight of seeds. Therefore, the seed yield is enhanced and the growth moderator increases the yield through changing Photoassimilates and directing them toward the targeted destination. Cycocel derivations such as Micovat chloride and Mepycowat chloride have a group of Ammonium in their structures which may release nitrogen existing in an Ammonium group after separating them in the metabolic processes and give them to the plant as a nitrogen source.

It stimulates the growth and its dependent indices leading to the increase in the number of pods which can be resulted because of physiological method' s creativity (seeds) before pollination; on the other hand, the increase of seed yield is related to the increase of biological nitrogen performance which is resulted from consuming higher levels of ccc. Therefore, the increase of N contributes to the increase of seed yield. Also, Cycocel decreases the height of plant and increases the vertical growth of branches so that the plant receives much light to do photosynthesis which improves the yield of seeds.



Graph3: Effects of artificial pollination with hormone on the number of seeds in pods

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Effects of Synchronous Generator Supplementary Controllers on System Stability

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Abstract: One of the most important supplementary controllers on synchronous generator is turbines and governing systems. In a power system, the generators are generally driven by turbines and each turbine is equipped with a governing system to control of frequency. In this paper effect of turbines and governing system on dynamic stability of power system is investigated.

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Keywords: Dynamic Stability of Power System, Turbines and Governing Systems.

1. Introduction

Turbines and Governing Systems are important component in power system to control of frequency and also stability [1-20]. In a power system, the synchronous generators are normally driven by steam turbines, gas turbines or hydro turbines and each turbine is equipped with a governing system to provide a means by which the turbine can be started, run up to the operating speed and operate on load with the required power output. The proposed turbines work based on different theories.

In coal-burn, oil-burn and nuclear power plants the energy contained in the fuel is used to produce high-pressure, high-temperature steam in the boiler. The energy in the steam is then converted to mechanical energy in axial flow steam turbines. Each turbine consists of a number of stationary and rotating blades concentrated into groups, or stages. As the high-pressure steam enters the fixed set of stationary blades it is accelerated and acquires increased kinetic energy as it expands to a lower pressure. The stream of fluid is then guided onto the rotating blades where it experiences a change in momentum and direction thereby exerting a tangential force on the turbine blade and output torque on the turbine shaft. As the steam passes axially along the turbine shaft its pressure reduces, so its volume increases and the length of the blades must increase from the steam entrance to the exhaust to accommodate this change. Typically a complete steam turbine will be divided into three or more stages, with each turbine stage being connected in tandem on a common shaft. Dividing the turbine into stages in this way allows the steam to be reheated between stages to increase its enthalpy and consequently increase the overall efficiency of the steam cycle. Modern coal-fired steam turbines have thermal efficiency reaching 45%. Steam turbines can be classified as non-reheat, single-reheat or double-reheat systems. Non-reheat turbines have one turbine stage and are usually built for use in units of below 100 MW.

Unlike steam turbines, gas turbines do not require an intermediate working fluid and instead the fuel thermal energy is converted into mechanical energy using the hot turbine exhaust gases. Air is normally used as the working fluid with the fuel being natural gas or heavy/medium fuel oil. The most popular system for gas turbines is the open regenerative cycle and consists of a compressor, combustion chamber and turbine. The fuel is supplied through the governor valve to the combustion chamber to be burnt in the presence of air supplied by the compressor. The hot, compressed air, mixed with the combustion products, is then directed into the turbine where it expands and transfers its energy to the moving blades in much the same way as in the steam turbine. The exhaust gases are then used to heat the air delivered by the compressor. There are also other, more complicated cycles that use either compressor inter cooling and reheating, or inter cooling with regeneration and reheating. The typical efficiency of a gas turbine plant is about 35%.

A significant technological step forward in the use of gas turbines came with the introduction of the combined cycle gas turbine (CCGT). In this system the exhaust heat from the gas turbine is directed into a heat-recovery boiler (HRB) to raise steam, which is then used to generate more electricity in a steam-driven generating unit. Generally the temperature of the gas turbine exhaust gases is quite high, typically around 535 ◦C, so by adding a steam turbine cycle at the bottom end of the gas cycle the otherwise wasted heat can be utilized and the overall cycle efficiency significantly increased. Modern CCGT plant can have an efficiency approaching, or even exceeding,

60%. Usually CCGT power stations utilize the exhaust gases from two or three gas turbines to raise steam for one steam turbine with both types of turbines driving separate generators. More recently single-shaft modes have become popular where both the gas and the steam turbines are mounted on the same shaft and drive the same generator. In some CCGT designs the HRB may be equipped with supplementary firing to increase the temperature of the HP steam. In addition, some combined cycle plants are designed to produce steam for district heating or for use in the process industry. CCGT plants, apart from higher thermal efficiency, also have other important advantages over more traditional coal-fired plants. They have a short construction time and low capital construction cost, both about half that of the equivalent coal-fired plant, they are relatively clean with almost no SO2 emission, they require little staffing, and the materials handling problem of gas versus coal and ash is much simpler.

The oldest form of power generation is by the use of water power. Hydraulic turbines derive power from the force exerted by water as it falls from an upper to a lower reservoir. The vertical distance between the upper reservoir and the level of the turbine is called the head. The size of the head is used to classify hydroelectric power plants as high-head, medium-head and low-head (run-of-river) plants, although there is no strict demarcation line [21].

2. Turbine Governing Systems

For many years turbine governing systems were of a mechanical–hydraulic type and used the Watt centrifugal mechanism as the speed governor. The original Watt mechanism used two fly-balls as the speed-responsive device, but on new machines the Watt governor has been replaced by an electro-hydraulic governor. The main disadvantages of the Watt centrifugal governor are the presence of dead-bands and a relatively low accuracy. The size of the dead-bands also tends to increase with time due to wear in the moving mechanical elements. Newer solutions replace the Watt centrifugal mechanism with an electronic regulator. In these systems the turbine rotor speed is measured electronically, with high accuracy, using a toothed wheel and a probe. The resulting electrical signal is amplified and acts on the pilot valve via an electro-hydraulic converter [21].

3. Turbine Characteristics

For stable operation the turbine must have a power–speed characteristic such that as the speed increases the mechanical input power reduces. Similarly, a decrease in speed should result in an increase in the mechanical power. This will restore the balance between the electrical output power and mechanical input power [21].

To examine how such a characteristic can be achieved, Figure 1 shows the idealized power–speed characteristics for an unregulated and a regulated turbine. Point A is the rated point which corresponds to the optimal steam flow through the turbine, as determined by the turbine designers. Consider first the unregulated characteristic and assume that the turbine is initially operating at point A with the turbine control valve fully open. The generator is assumed to be synchronized with the system and its speed can only change if the system frequency changes. If the system frequency rises, then the speed of the rotor is raised. As the main valve is fully open the speed increase causes additional losses in the turbine and the efficiency of the steam flow drops (with respect to the optimal point A) with a corresponding reduction in power as shown by the dashed curve 1. Similarly, a decrease in the system frequency causes the rotor speed to drop with a corresponding drop in power as shown by curve 2. The rapid reduction in turbine power with reduction in system frequency can be explained as follows. The steam flow through the turbine depends on the performance of the boiler and the boiler feed pumps. As the performance of these pumps is strongly dependent on frequency, a reduction in system frequency (and rotor speed) reduces their performance. This causes a decrease in the amount of steam flowing through the turbine and a further drop in the turbine torque. The task of the turbine governor is to set a characteristic corresponding to line 3 which has a small droop. As explained below, such a characteristic is necessary to achieve stable operation of the turbine.

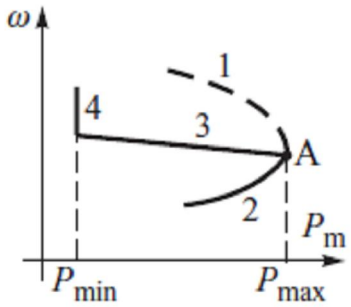

Figure 1: Turbine power–speed characteristic for the unregulated turbine (lines 1, 2) and the regulated turbine (lines 3-2-4) [21]

A simplified block diagram of elector hydraulic governors is shown in Figure 2-a. The coefficient KA corresponds to the amplification gain of the servomotor, while coefficient R corresponds to

the gain of the feedback loop. Transformation of the block diagram allows R to be eliminated from the feedback loop by moving it into the main loop to obtain the block diagram shown in Figure 2-b where TG = 1/(KAR) and is the effective governor time constant. The block diagram of Figure 2-b allows an approximate analysis of the static and dynamic properties of the turbine–governor system. In the steady state $t\to\infty$, $s \to 0$ and the turbine block diagram can be simplified to that shown in Figure 2-c where P_{ref} is the load reference set point expressed as a fraction of the nominal or rated power, P_n. If the valve position c is assumed to vary between 0 (fully closed) and 1 (fully open) then a small change in turbine speed $\Delta\omega=\omega-\omega_{ref}$ will produce a corresponding change in valve position $\Delta c = -\Delta\omega/R$. normally $\Delta\omega$ is expressed as a fraction of rated speed ω_n so that:

$$\Delta c = -\frac{1}{\rho}\frac{\Delta\omega}{\omega_n} \quad \text{or} \quad \frac{\Delta\omega}{\omega_n} = -\rho\Delta c$$

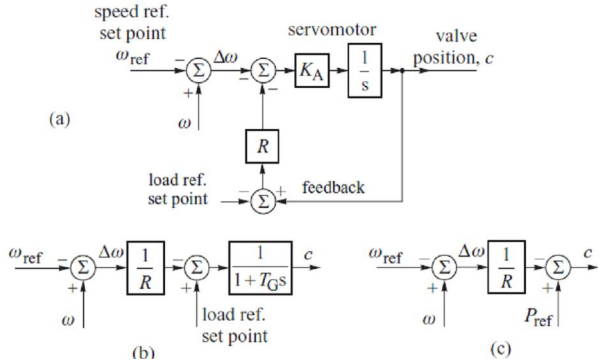

Figure 2: Simplified model of the steam turbine governing system: (a) block diagram with negative feedback; (b) equivalent block diagram; (c) equivalent block diagram for the steady state [21].

3. System under Study

In order to show effect of turbine governing systems on stability, a typical power system is considered as test case. The turbine governing systems parameters are changed to show effect of them on stability. Figure 3 shows the test system and its data are given in [22].

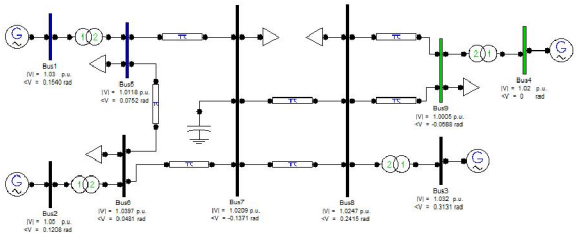

Figure 3: IEEE 9-bus System Dynamic Benchmark[22]

4. Simulation results

The following cases are considered for simulation, where the case 1 is the nominal condition.

Table 1: turbine governing systems parameters

	Droop R	Pole time constant	Zero time constant
Case 1	0.04	20	0.2
Case 2	0.02	20	0.2
Case 3	0.04	30	0.25

The simulation results for the proposed system are depicted in Figures 4-11. The simulation results show the effect of turbine governing systems parameters on stability of power system. It is clearly seen that the system stability is a function of turbine governing systems parameters. The system oscillation depends to turbine governing systems tuning and with changing turbine governing systems parameters the oscillations are changed. The effect of turbine governing systems parameters on stability denotes the importance of turbine governing systems sitting in power systems. An optimal and good tuned turbine governing systems can improve power system stability, while a non-tuned turbine governing systems can greatly affect on stability and would lead to instability.

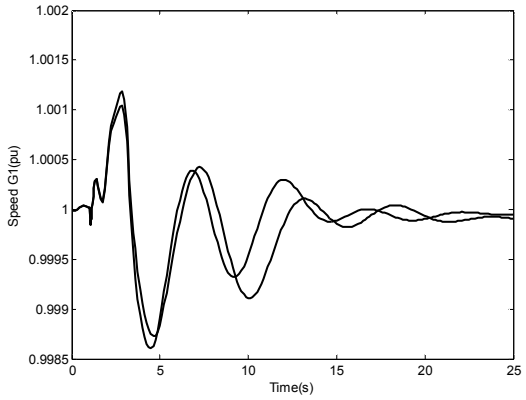

Figure 4: Speed G_1 (solid: case 1; dashed: case 2)

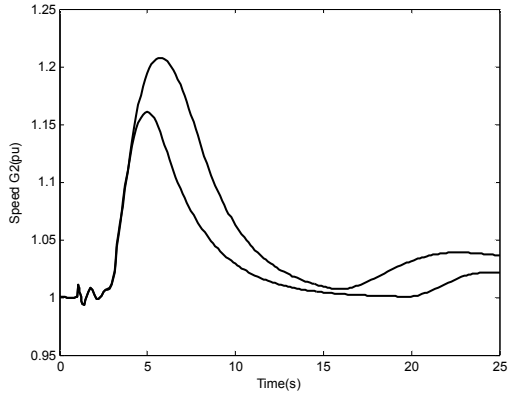

Figure 5: Speed G_2 (solid: case 1; dashed: case 2)

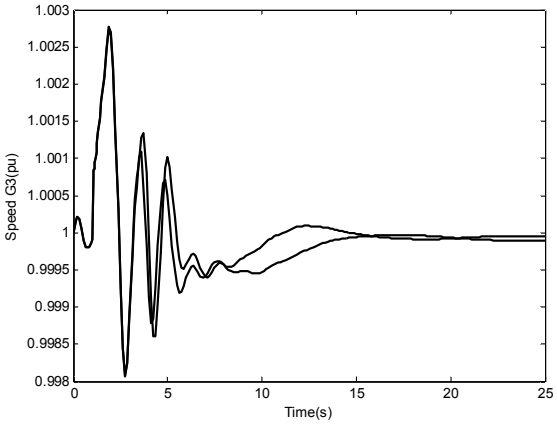

Figure 6: Speed G_3 (solid: case 1; dashed: case 2)

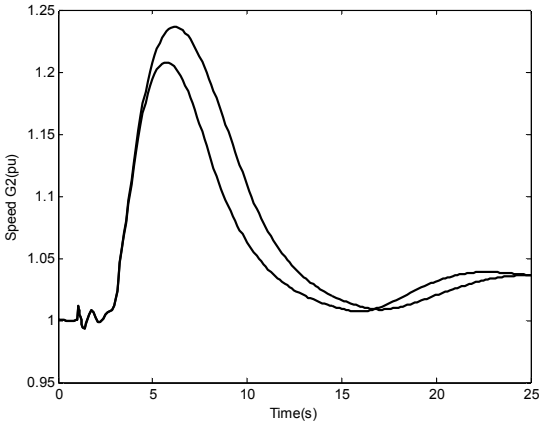

Figure 9: Speed G_2 (solid: case 1; dashed: case 3)

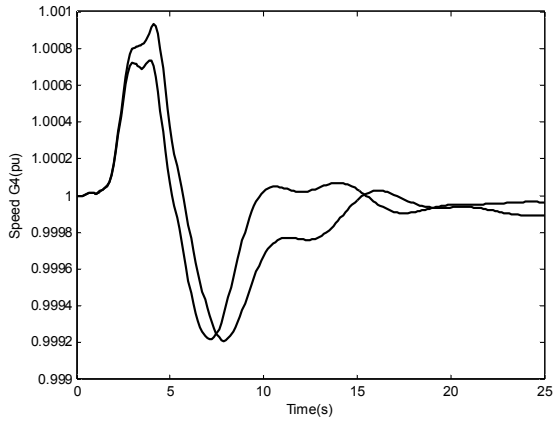

Figure 7: Speed G_4 (solid: case 1; dashed: case 2)

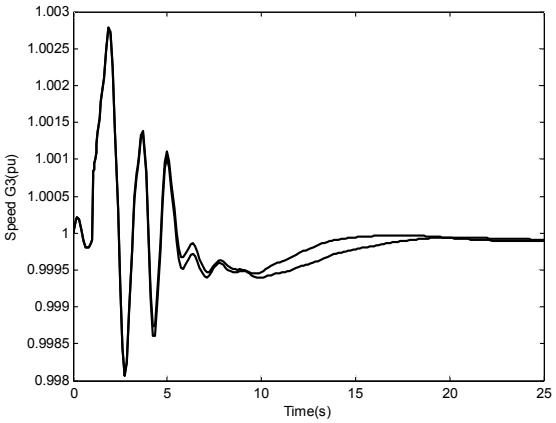

Figure 10: Speed G_3 (solid: case 1; dashed: case 3)

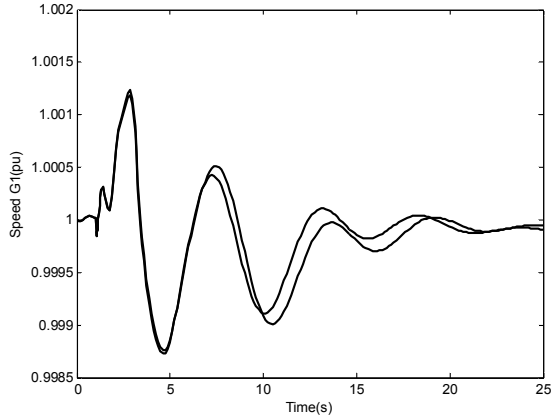

Figure 8: Speed G_1 (solid: case 1; dashed: case 3)

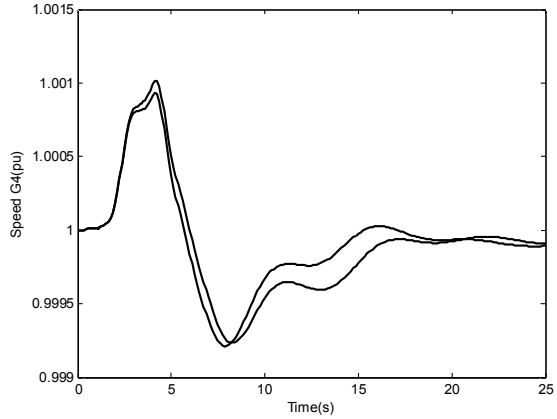

Figure 11: Speed G_4 (solid: case 1; dashed: case 3)

5. Conclusion

Effect of turbine governing systems on stability and oscillations was investigated in this paper. A typical power system equipped with turbine governing systems on all generators was chosen as case study and effect of turbine governing systems parameters was investigated on test system. The simulation results showed the great effect of turbine governing systems parameters on power system stability. The power system stability is associated with turbine governing systems good sitting and non-tuned turbine governing systems may lead to instability.

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Effect of Load Model on Damping of Oscillations in Power Systems

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Abstract: Power system dynamic stability is closely associated with load model and damping of oscillations is affected by load model. In this regard, investigation of load model on system dynamic stability is useful. Application of a practical load model can lead to more suitable results in power system simulations. In this paper, different load models are investigated and some of them are simulated and compared. The results show the great effect of load model on power system stability and performance.

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Keywords: Low Frequency Oscillations, Load Model, Power System Stability.

1. Introduction

Load models have always been an important issue in power system analysis and performance and many different researches have been presented to show effect of load models in power systems [1-9]. The aggregate characteristic of the load depends on the characteristics of its individual components. A rough estimate of the aggregate characteristic, viewed from the medium-voltage side (the secondary of the feeder transformer), can be obtained by summing the individual load characteristics. Figure 1 shows two examples of load characteristics obtained by this technique. Figure 1(a) shows an industrial load characteristic with a predominance of heavily loaded induction motors and discharge lighting. Near the nominal operating point (voltage Vn), the P(V) curve is flat while the Q(V) curve is steeper with a positive slope. As the voltage decreases, the Q(V) curve becomes flatter and even rises due to the increased reactive power demand of the stalled motors. When the voltage drops below about 0.7 per unit, the P(V) and Q(V) curves rapidly decrease due to tripping of the induction motors and extinguishing of the discharge lighting. Figure 1(b) shows an example of a residential/commercial load that is dominated by traditional bulb lighting and heating. Near the nominal voltage both the P(V) and Q(V) curves are quite steep. Again the real and reactive power demand drops rapidly at about 0.7 per unit. As the induction motor's stall voltage is now below the dropout voltage, dropout is not preceded by an increase in the reactive power demand. The curves shown in Figure 1 can only give an indication of the kind of shape a load voltage characteristic may have. They cannot be treated in a general manner because the characteristic of a particular load may be quite different. For example, reactive power compensation can cause the Q(V) curve to be flatter near the nominal voltage. Also relatively small, non-utility generation embedded in the load area will significantly affect the load characteristic. There is also a difference in the characteristic as seen from the primary and secondary sides of the feeder transformer. Firstly, the real and reactive power loss in the transformer must be added to the load demand. Secondly, the feeder transformer is usually equipped with an on-load tap changer to help control the voltage in the distribution network and this also affects the characteristic as illustrated in Figure 1. In Figure 1 the middle dashed bold line represents the load voltage characteristic at the nominal transformation ratio. Tap changing is controlled in discrete steps so that if the transformers tap setting is changed, the voltage characteristic moves to the left or right in discrete steps as shown by the dotted lines. The extreme left and right characteristics represent the tap-changer limits. A dead zone is also present in the regulator in order to prevent any tap changes if the voltage variations are within limits. The resulting voltage characteristic is shown by the bold line and is quite flat within the regulation range, as can be seen by sketching an average line through the resulting characteristic.

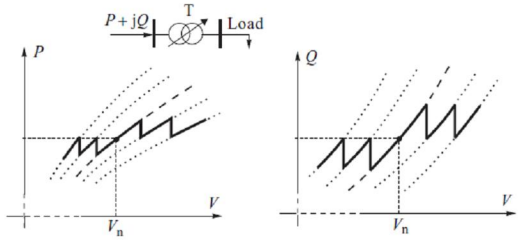

Figure 1: Influence of a tap-changing transformer on the voltage characteristic of a composite load [10]

2. Load Models

The last subsection described how the real and reactive power of particular types of load depends on the load voltage but did not explain how these could be represented by a mathematical model. Since all power system analysis programs, for example load flow or dynamic simulation, require such a load model, this subsection describes some of the most popular models currently in use.

2.1. Constant Power/Current/Impedance

The simplest load models assume one of the following features [10]:

- a constant power demand (P)
- a constant current demand (I)
- a constant impedance (Z).

A constant power model is voltage invariant and allows loads with a stiff voltage characteristics $k_{PV} \approx k_{QV} \approx 0$ to be represented. This model is often used in load flow calculations, but is generally unsatisfactory for other types of analysis, like transient stability analysis, in the presence of large voltage variations. The constant current model gives a load demand that hangs linearly with voltage $k_{PV} \approx 1$ and is a reasonable representation of the real power demand of a mix of resistive and motor devices. When modeling the load by a constant impedance the load power changes proportionally to the voltage squared $k_{PV} \approx k_{QV} \approx 2$ and represents some lighting loads well but does not model stiff loads at all well. To obtain a more general voltage characteristic the benefits of each of these characteristics can be combined by using the so-called polynomial or ZIP model consisting of the sum of the constant impedance (Z), constant current (I) and constant power (P) terms [10]:

$$P = P_0\left[a_1\left(\frac{V}{V_0}\right)^2 + a_2\left(\frac{V}{V_0}\right) + a_3\right]$$

$$Q = Q_0\left[a_4\left(\frac{V}{V_0}\right)^2 + a_5\left(\frac{V}{V_0}\right) + a_6\right]$$

where, V_0, P_0 and Q_0 are normally taken as the values at the initial operating conditions. The parameters of this polynomial model are the coefficients (a_1 to a_6) and the power factor of the load. In the absence of any detailed information on the load composition, the real power is usually represented by the constant current model while the reactive power is represented by constant impedance.

2.2. Exponential Load Model

In this model the power is related to the voltage by [10]:

$$P = P_0\left(\frac{V}{V_0}\right)^{n_p} \quad \text{and} \quad Q = Q_0\left(\frac{V}{V_0}\right)^{n_q}$$

where, n_p and n_q are the parameters of the model. Note that by setting the parameters to 0, 1, 2, the load can be represented by constant power, constant current or constant impedance, respectively. The slope of the characteristics given by equation depends on the parameters n_p and n_q. By linearizing these characteristics it can be shown that n_p and n_q are equal to the voltage sensitivities.

2.3. Piecewise Approximation

None of the models described so far will correctly model the rapid drop in load that occurs when the voltage drops below about 0.7 per unit. This can be remedied by using a two-tier representation with the exponential, or polynomial, model being used for voltages close to rated and the constant impedance model being used at voltages below 0.3–0.7 per unit. Figure 2 shows an example of such an approximation [10].

2.4. Frequency-Dependent Load Model

Frequency dependence is usually represented by multiplying either a polynomial or an exponential load model by a factor $(1 + a_f(f - f_0))$ where f is the actual frequency, f_0 is the rated frequency and a_f is the model frequency sensitivity parameter. Using the exponential model this gives [10]:

$$P = P(V)\left[1 + k_{Pf}\frac{\Delta f}{f_0}\right]$$

$$Q = Q(V)\left[1 + k_{Qf}\frac{\Delta f}{f_0})\right]$$

where, P(V) and Q(V) represent any type of the voltage characteristic and k_{Pf}, k_{Qf} are the frequency sensitivity parameters, $f = f - f_0$.

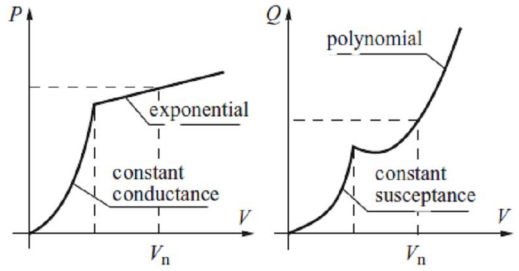

Figure 2: Example of a two-tier approximation of the voltage characteristics [10]

3. Load Model and Stability

Figure 3 shows a simple model of power system. Following relation can be driven form the figure [10]:

$$\left(\frac{EV}{X}\right)^2 = [P_L(V)]^2 + \left[Q_L(V) + \frac{V^2}{X}\right]^2$$

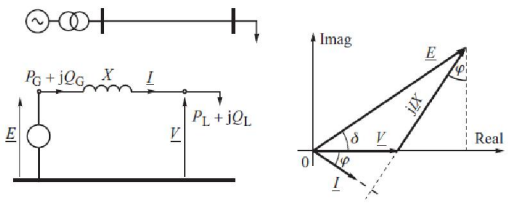

Figure 3: simple power system model [10]

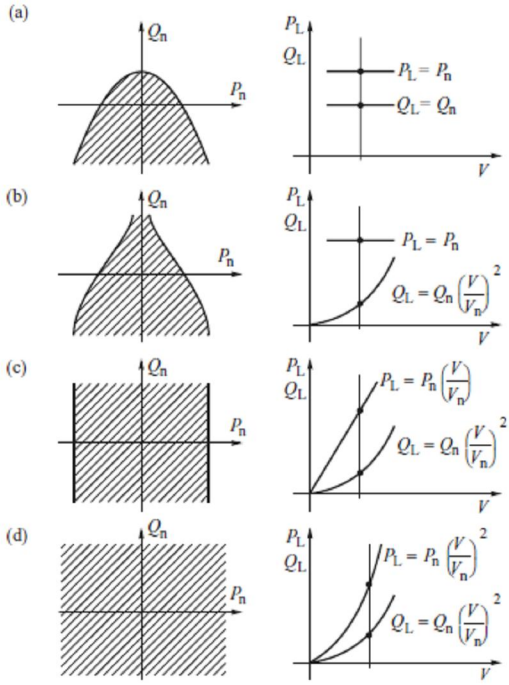

Figure 4: Dependence of the network solution area on the shape of the load characteristics [10]

For the more general case the power demand will depend on the voltage as described by the voltage characteristics $P_L(V)$ and $Q_L(V)$. The possible solutions to above equation will not now be bounded by a simple parabola, as for $P_L(V) = Pn$, $Q_L(V) = Qn$, but the shape of the solution area will vary depending on the actual voltage characteristics as shown in Figure 4. In general the less stiff the load, the more open the solution area. For the constant load discussed above, the solution area corresponds to a parabola, Figure 4(a). If the reactive power characteristic is a square function of the voltage, $Q_L(V)=(V/Vn)^2Qn$, then the solution area opens up from the top, Figure 4(b), so that for $Pn = 0$ there is no limit on Qn. If the real power characteristic is linear $PL(V) = (V/Vn)^2Pn$ as in Figure 4(c), then the solution area is bounded by two parallel, vertical lines. If both real and reactive power characteristics are square functions of the voltage, $PL(V)=(V/Vn)^2Pn$ and $QL(V)=(V/Vn)^2Qn$, then there are no limits on the values of Pn and Qn as shown in Figure 4(d). Consider again the characteristics of Figure 4(d) where there are no limits on the real and reactive power. This can be proved by expressing [10]:

$$P_L(V) = P_n\left(\frac{V}{V_n}\right)^2 = \frac{P_n}{V_n^2}V^2 = G_n V^2$$

$$Q_L(V) = Q_n\left(\frac{V}{V_n}\right)^2 = \frac{Q_n}{V_n^2}V^2 = B_n V^2$$

4. Simulation results

In order to show effect of turbine governing systems on stability, a typical power system is considered as test case. The turbine governing systems parameters are changed to show effect of them on stability. Figure 3 shows the test system and its data are given in [11]. Two load models are considered as follows:

Case 1: ZIP load model
Case 2: Constant P-Q load model

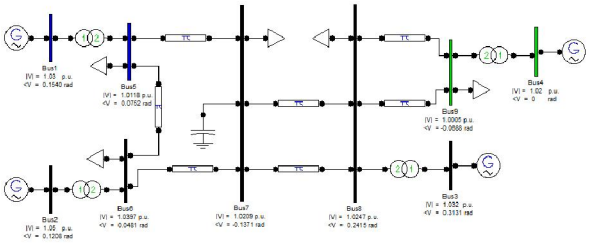

Figure 5: IEEE 9-bus System Dynamic Benchmark[11]

The simulation results are carried out by applying three disturbances as follows:

Disturbance 1: 6-cycles three phase short circuit in bus 6
Disturbance 2: 8 cycles three phase short circuit in bus 6

The simulation results are depicted in Figures 6-13. It is clearly seen that the load model has a great effect on responses and constant PQ model is the worst case model in power systems. The results show that PQ model is instable in some conditions such as Figures 10-13, where the ZIP model is stable. Therefore the results show effectiveness of load model in power system analysis.

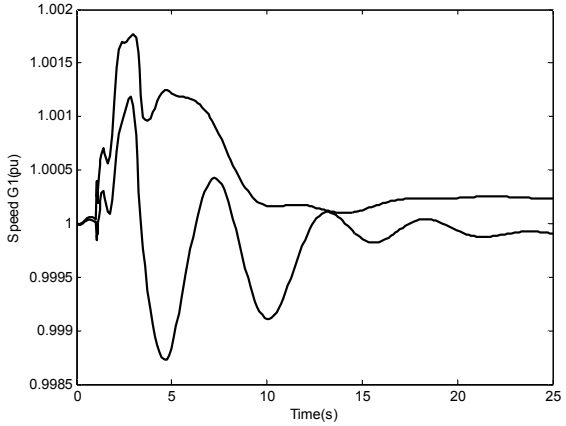

Figure 6: Speed G_1 following disturbance 1 (solid: case 1, dashed: case 2)

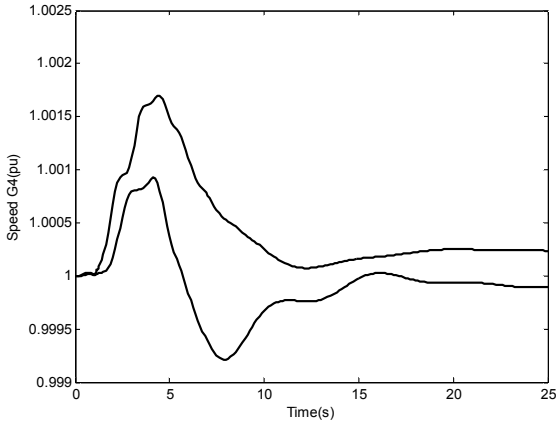

Figure 9: Speed G_4 following disturbance 1 (solid: case 1, dashed: case 2)

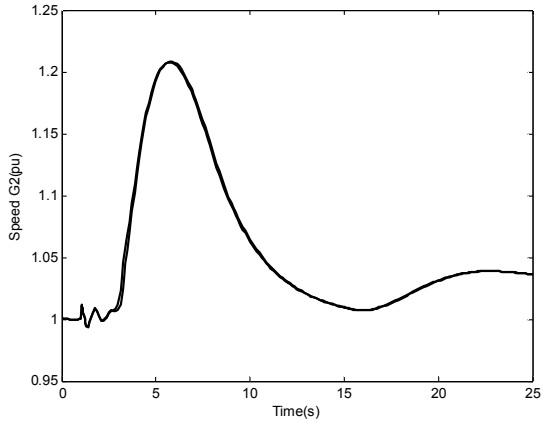

Figure 7: Speed G_2 following disturbance 1 (solid: case 1, dashed: case 2)

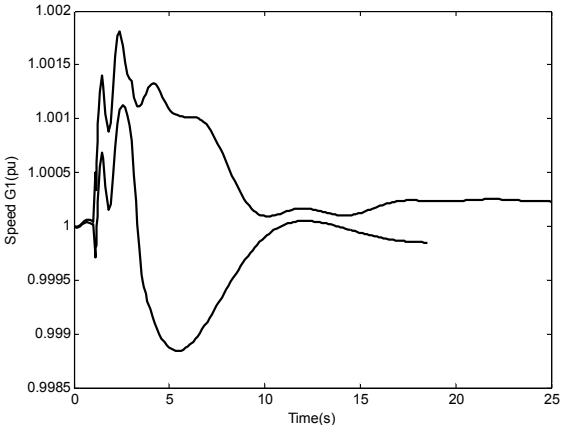

Figure 10: Speed G_1 following disturbance 2 (solid: case 1, dashed: case 2)

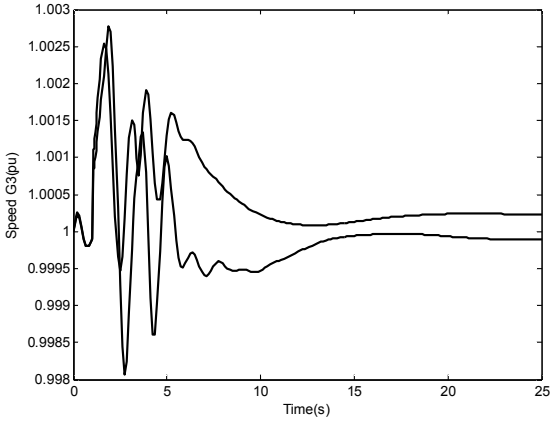

Figure 8: Speed G_3 following disturbance 1 (solid: case 1, dashed: case 2)

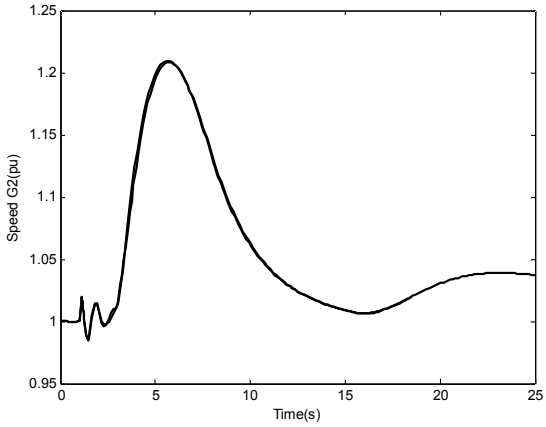

Figure 11: Speed G_2 following disturbance 2 (solid: case 1, dashed: case 2)

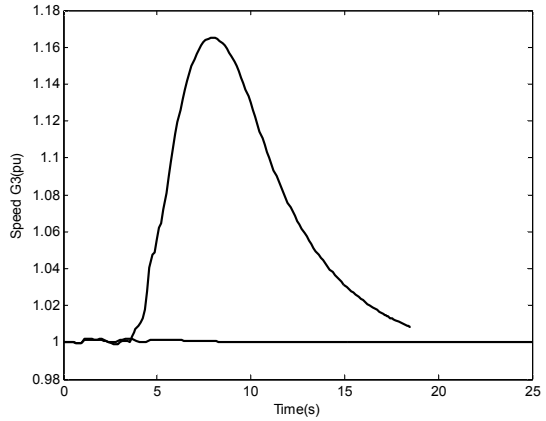

Figure 12: Speed G_3 following disturbance 2 (solid: case 1, dashed: case 2)

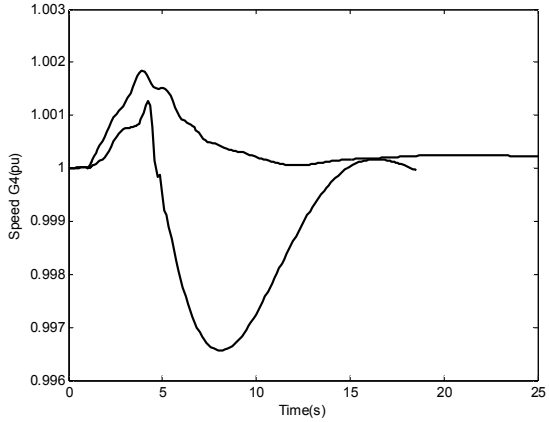

Figure 13: Speed G_4 following disturbance 2 (solid: case 1, dashed: case 2)

5. Conclusion

In this paper, different loading models were defined and analyzed. The difference between two load models was investigated and results showed that the PQ load model is the worst case model in power system. A typical power system with different loading models was considered as test case.

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12/19/2012

Fuzzy Scaled Power System Stabilizer in Multi Machine Power System

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Abstract: Power System Stabilizers (PSS) are used to generate supplementary damping control signals for the excitation system in order to damp the Low Frequency Oscillations (LFO) of the electric power system. The PSS is usually designed based on classical control approaches but this Conventional PSS (CPSS) has some problems. In order to overcome the drawbacks of CPSS, numerous techniques have been proposed in literatures. In this paper a new Fuzzy type PSS is considered for damping electric power system oscillations. In this Fuzzy approach, the upper and lower bounds of the Fuzzy membership functions are obtained using Genetic Algorithms (GA) optimization method. The proposed Fuzzy-Genetics PSS (FGPSS) is evaluated on a multi machine power system. The simulation results clearly indicate the effectiveness and validity of the proposed method.
[Behrang Yousefpour, Mohammad Bigdeli Tabar, Mehdi Nikzad, Shoorangiz Shams Shamsabad Farahani, Hossein Tourang. **Fuzzy Scaled Power System Stabilizer in Multi Machine Power System.** *Life Sci J* 2012;9(4):5924-5928] (ISSN:1097-8135). http://www.lifesciencesite.com. 888

Keywords: Electric Power System Stabilizer, Low Frequency Oscillations, Genetic Algorithms Optimization, Fuzzy Logic

1. Introduction

Large electric power systems are complex nonlinear systems and often exhibit low frequency electromechanical oscillations due to insufficient damping caused by adverse operating. These oscillations with small magnitude and low frequency often persist for long periods of time and in some cases they even present limitations on power transfer capability. In analyzing and controlling the power system's stability, two distinct types of system oscillations are recognized. One is associated with generators at a generating station swinging with respect to the rest of the power system. Such oscillations are referred to as "intra-area mode" oscillations. The second type is associated with swinging of many machines in an area of the system against machines in other areas. This is referred to as "inter-area mode" oscillations. Power System Stabilizers (PSS) are used to generate supplementary control signals for the excitation system in order to damp both types of oscillations. The widely used Conventional Power System Stabilizers (CPSS) are designed using the theory of phase compensation in the frequency domain and are introduced as a lead-lag compensator. The parameters of CPSS are determined based on the linearized model of the electric power system. Providing good damping over a wide operating range, the CPSS parameters should be fine tuned in response to both types of oscillations. Since power systems are highly nonlinear systems, with configurations and parameters which alter through time, the CPSS design based on the linearized model of the power system cannot guarantee its performance in a practical operating environment. Therefore, an adaptive PSS which considers the nonlinear nature of the plant and adapts to the changes in the environment is required for the power system. In order to improve the performance of CPSSs, numerous techniques have been proposed for designing them, such as intelligent optimization methods [1-4] and Fuzzy logic method [5-9]. Also many other different techniques such as robust control methods have been reported in [10-14].

This paper deals with a design method for the stability enhancement of a multi machine power system using a new Fuzzy type PSS whose membership functions boundaries are tuned by genetic algorithms.

2. System under study

In this paper IEEE 14 bus test system is considered to evaluate the proposed method. The system data can be found in [15]. Figure 1 shows the proposed test system.

2.1. Dynamic model of the system

The nonlinear dynamic model of the system is given as follows:

$$\begin{cases} \dot{\omega}_i = \dfrac{(P_m - P_e - D\omega)}{M} \\ \dot{\delta}_i = \omega_0(\omega - 1) \\ \dot{E}'_{qi} = \dfrac{(-E_q + E_{fd})}{T'_{do}} \\ \dot{E}_{fdi} = \dfrac{-E_{fd} + K_a(V_{ref} - V_t)}{T_a} \end{cases} \quad (1)$$

where i=1, 2, 3, 4,5 (the generators: 1 to 4); δ, rotor angle; ω, rotor speed; P_m, mechanical input power; P_e, electrical output power; E'_q, internal voltage behind x'_d; E_{fd}, equivalent excitation voltage; Te, electric torque; T'_{do}, time constant of excitation circuit; K_a, regulator gain; T_a, regulator time constant; V_{ref}, reference voltage; V_t, terminal voltage.

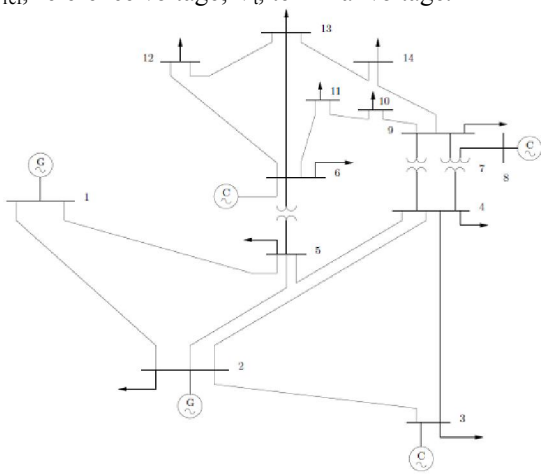

Figure 1: IEEE 14 bus test system

3. Power System Stabilizer

As mentioned before, in large interconnected power systems, the damping torque of system is reduced and system need to PSS for stability. The basic function of PSS is to add damping torque to the generator rotor oscillations by controlling its excitation using auxiliary stabilizing signal. To provide damping, the stabilizer must produce a component of electrical torque in phase with the rotor speed deviations. The PSS configuration is given in as (2). where, Δω is the speed deviation in p.u. This type of PSS consists of a washout filter, a dynamic compensator. The output signal is fed as a supplementary input signal to the excitation of generator. The washout filter, which is a high pass filter, is used to reset the steady state offset in the PSS output. In this paper the value of the time constant (Tw) is fixed to 10 s. The dynamic compensator is made up to two lead–lag stages with time constants, T1–T4 and an additional gain K_{DC} [16].

$$U = K_{DC}\frac{ST_W}{1+ST_W}\frac{1+ST_1}{1+ST_2}\frac{1+ST_3}{1+ST_4}\Delta\omega \qquad (2)$$

4. Design methodology

As mentioned before, in this paper a new Fuzzy type PSS in considered for damping power system oscillations. Fuzzy method has three major sections as membership functions, rule bases and defuzzification. In classical Fuzzy methods, the boundaries of membership functions are adjusted based on expert person experiences that may be with trial and error and does not guarantee performance of the system. For solve this problem, in this paper the boundaries of the membership functions are tuned by an optimal search for achieving the best boundaries. Therefore the boundaries of input and output membership functions are considered as uncertain and then the optimal boundaries are obtained by genetic algorithms [17]. Here the proposed Fuzzy controller block diagram is given in Figure 2. In fact, it is a nonlinear PI-type Fuzzy logic controller with two inputs and one output. In this paper ΔV_{ref} is modulated in order to output of PSS and the speed deviation Δω and its rate d(Δω)/dt are considered as the inputs to the PSS. The inputs are filtered by washout block to eliminate the DC components. Also there are three parameters denoted by K_{in1}, K_{in2} and K_{out} which are defined over an uncertain range and then obtained by genetic algorithms optimization method. Therefore the boundaries of inputs and output signals are tuned on an optimal value.

Though the Fuzzy controller accepts these inputs, it has to convert them into fuzzified inputs before the rules can be evaluated. To accomplish this, one of the most important and critical blocks in the whole Fuzzy controllers should be built and it is The Knowledge Base. It consists of two more blocks namely the Data Base and the Rule Base [17].

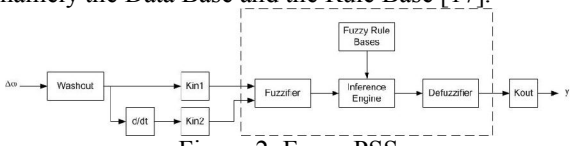

Figure 2: Fuzzy PSS

4.1. Data base

Data base consists of the membership function for input variables Δω and d(Δω)/dt and output variable described by linguistic variables shown in Tables 1-3 [17].

Table 1: The linguistic variables for Δω

Big Positive (BP)	Medium Positive (MP)	Small Positive (SP)
Big Negative (BN)	Medium Negative (MN)	Small Negative (SN)
Zero (ZE)		

Table 2: The linguistic variables for d(Δω)/dt

Positive (P)	Negative	Zero (ZE)

Table 3: The linguistic variables for output

Big Positive (BP)	Medium Positive (MP)	Small Positive (SP)
Big Negative (BN)	Medium Negative (MN)	Small Negative (SN)
Zero (ZE)	Very Big Positive (VBP)	Very Big Negative (VBN)

The "triangular membership functions" are used as membership functions for the input and output variables. The Figures 3-5 illustrate these in detail indicating the range of all the variables. These ranges are defined as default and then tuned via cascade K parameters (K_{in1}, K_{in2} and K_{out}) and adjusted on the optimal values.

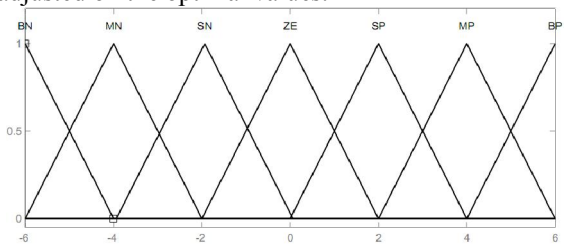

Figure 3: Membership function of input 1 (Δω)

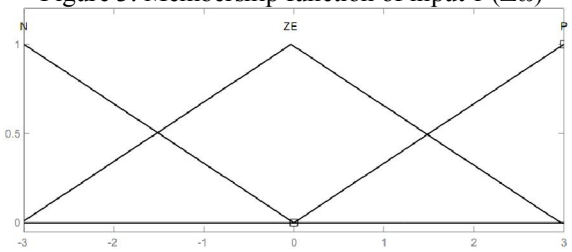

Figure 4: Membership function of input 2 (d(Δω)/dt)

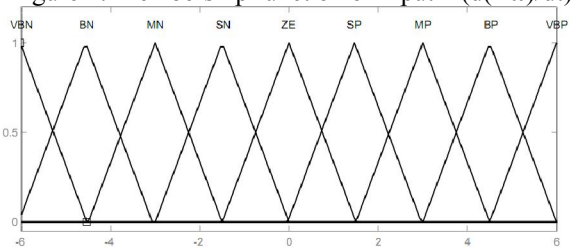

Figure 5: Membership function of output

4.2. Rule base

The other half of the knowledge base is the Rule Base which consists of all the rules formulated by the experts. It also consists of weights which indicate the relative importance of the rules among themselves and indicates the influence of a particular rule over the net fuzzified output. The Fuzzy rules which are used in this scheme are shown in Table 4.

Table 4: Fuzzy Rule Bases

Δω / d(Δω)/dt	BN	MN	SN	ZE	SP	MP	BP
N	VBN	BN	MN	SN	ZE	MP	BP
ZE	BN	MN	SN	ZE	SP	MP	BP
P	BN	MN	ZE	SP	MP	BP	VBP

The next section specifies the method adopted by the Inference Engine especially the way it uses the Knowledge Base consisting of the described Data Base and Rules Base.

4. 3. Methodologies adopted in fuzzy inference engine

Though many methodologies have been mentioned in evaluating the various expressions like Fuzzy union (OR operation), Fuzzy intersection (AND operation) and etc with varying degree of complexity. Here in Fuzzy scheme the most widely used methods for evaluating such expressions are used. The function used for evaluating OR is "MAX", which is the maximum of the two operands and similarly the AND is evaluated using "MIN" function which is defined as the minimum of the two operands. It should be note that in the present research paper, the equal importance is assigned to all the rules in the Rules Base and all the weights are equal [17].

4.4. Defuzzification method

The Defuzzification method followed in this study is the "Center of Area Method" or "Gravity method". This method is discussed in [17]. As mentioned before, in this paper the boundaries of the membership functions are adjusted by genetic algorithms. In the next section a brief introduction about genetic algorithms is presented.

4.5. Genetic Algorithms

Genetic Algorithms (GA) are global search techniques, based on the operations observed in natural selection and genetics. They operate on a population of current approximations-the individuals-initially drawn at random, from which improvement is sought. Individuals are encoded as strings (Chromosomes) constructed over some particular alphabet, e.g., the binary alphabet {0.1}, so that chromosomes values are uniquely mapped onto the decision variable domain. Once the decision variable domain representation of the current population is calculated, individual performance is assumed according to the objective function which characterizes the problem to be solved. It is also possible to use the variable parameters directly to represent the chromosomes in the GA solution. At the reproduction stage, a fitness value is derived from the raw individual performance measure given by the objective function and used to bias the selection process. Highly fit individuals will have increasing opportunities to pass on genetically important material to successive generations. In this way, the genetic algorithms search from many points in the search space at once and yet continually narrow the focus of the search to the areas of the observed best performance. The selected individuals are then modified through the application of genetic operators. In order to obtain the next generation Genetic operators manipulate the characters (genes) that

constitute the chromosomes directly, following the assumption that certain genes code, on average, for fitter individuals than other genes. Genetic operators can be divided into three main categories: Reproduction, crossover and mutation [18].

- Reproduction: selects the fittest individuals in the current population to be used in generating the next population.
- Cross-over: Causes pairs, or larger groups of individuals to exchange genetic information with one another
- Mutation: causes individual genetic representations to be changed according to some probabilistic rule.

5. Fuzzy controller tuning using Genetic Algorithms

In this section the membership functions of the proposed FGPSS are tuned by K parameters (K_{in1}, K_{in2} and K_{out}). Only one PSS is installed on generator 1. These K parameters are obtained based on genetic algorithms optimization method. The parameter ΔE_{ref} is modulated to output of FGPSS and speed deviation $\Delta\omega$ and its rate are considered as input to FGPSS. The optimum values of K_{in1}, K_{in2} and K_{out} which minimize an array of different performance indexes are accurately computed using genetic algorithms. In this study the performance index is considered as (3). In fact, the performance index is the Integral of the Time multiplied Absolute value of the Error (*ITAE*).

$$\mathrm{ITAE} = \int_0^t t|\Delta\omega|dt \qquad (3)$$

To compute the optimum parameter values, a three phase short circuit in bus 3 is assumed and the performance index is minimized using genetic algorithms. The optimum values of the parameters K_{in1}, K_{in2} and K_{out} are obtained using genetic algorithms and summarized in the Table 5.

Table 5: Obtained parameters using GA

Parameters	K_{in1}	K_{in2}	K_{out}
Obtained Value	55.3	24.7	0.39

6. Simulation results

Simulations are carried out on the test system. To evaluate the system performance under disturbances, a 6-cycle three-phase short circuit in bus 4 is considered as fault.

The simulation results are presented in Figures 6-10. The simulation results show that applying PSS signal greatly enhances the damping of the generator angle oscillations. The results clearly show that in large electric power systems, PSS can successfully increase damping of power system oscillations. Also the responses without PSS clearly show that the system without PSS does not have enough damping torque and the responses go to fluctuate.

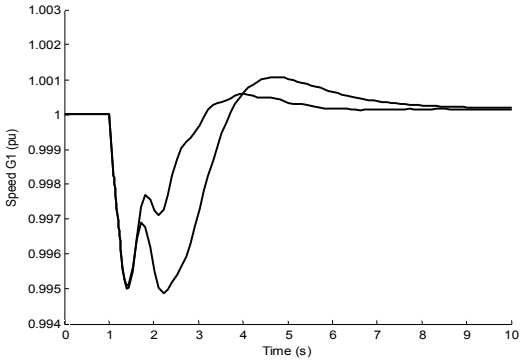

Figure 6: Speed G_1 (Solid (GA-PSS), Dashed (without PSS))

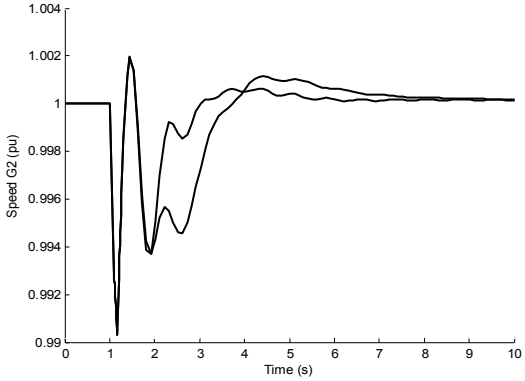

Figure 7: Speed G_2 (Solid (GA-PSS), Dashed (without PSS))

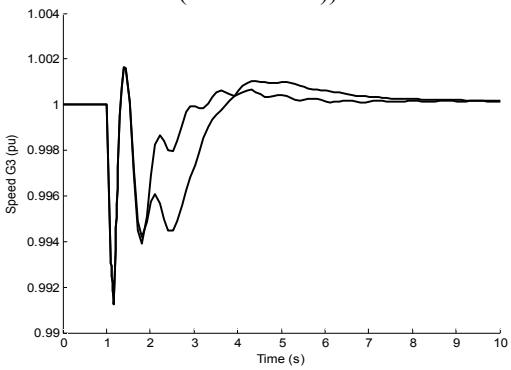

Figure 8: Speed G_3 (Solid (GA-PSS), Dashed (without PSS))

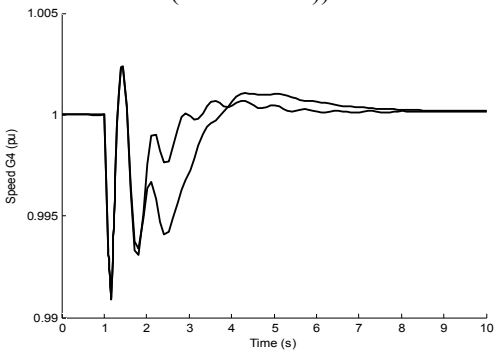

Figure 9: Speed G_4 (Solid (GA-PSS), Dashed (without PSS))

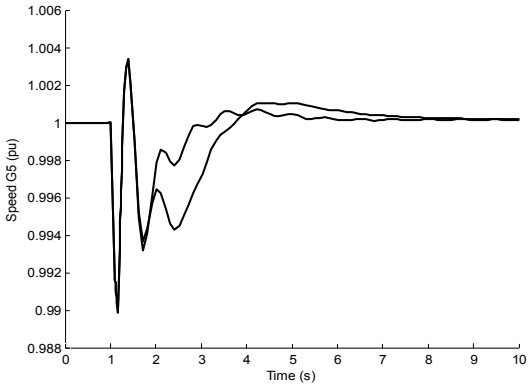

Figure 10: Speed G_5 (Solid (GA-PSS), Dashed (without PSS))

9. Conclusions

In this paper a new Fuzzy PSS based on genetic algorithms optimization method has been successfully proposed. The final designed FGPSS has characteristics of the both optimal and nonlinear controllers. The proposed method was applied to a typical power system. The simulation results demonstrated that the designed optimal FGPSS is capable of guaranteeing the robust stability and robust performance of the power system under a wide range of system uncertainties. These results and the suitability of Fuzzy logic to nonlinear problems, open the door to study the effect of nonlinear constraints on the power system damping oscillations problems.

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The Architectural & Typological Properties of Plans in Design of Historical Monuments in Arak from Qajar Period

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Abstract: According to the historical documents, the old fabric of Arak is the first pre-thought city in the history of Iran that was constructed based on a pre-planned design. In an era when most towns in Iran were gradually built as organic and based on need of the people, all stages of the construction of the city, from beginning to end, including orientation, spatial organization, composition of land application and building construction were first designed and then executed. Goal of the research is to identify the architectural and typological properties of plans in design of historical monuments in Arak from Qajar period including typology, architectural concept, axes, hierarchy, compositional center, scale, proportion & module. Methodology of the study concentrates on the documentation, descriptive and architecture analysis of the historical monuments and their classification. The combination of qualitative factors with quantitative factors for analysis of monuments has been used. Conclusion of the study is presentation of typology about each of the architectural characteristics, separately for different groups including religious, public, residential, communal, memorial buildings & minor architectural forms.
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Keywords: Architectural features, Typology, Plan, Historical monuments, Arak, Qajar.

1. Introduction

Arak city as the capital of central province is located in Iran central plateau and near the Zagros Mountains. Arak as a symbol of pre-determined designed historical cities in Iran was constructed in 1812 A.D & in the rule of Fathali shah of Qajar. In Qajar period, a style in typological features of architectural monuments begins that on the one hand has been influenced by Esfahan style in Safavid period and on the other hand it is an adoption of the western method. Since the style was formed in Tehran city for the first time thus it has been named after Tehran style. Arak old fabric as index sample of Qajar style has valuable monuments which each of them has unique architectural and historical values. Based on existing documents, monuments belonging to the Qajar period in Arak are divided into 6 groups including religious, public, residential, memorial, communal buildings and minor architectural forms. In each group, the buildings are divided into several types and an index building from each type has been analyzed as a representative of the type. In the group of religious buildings, Sepahdari mosque and Sheikh Abolhassan Mosque, in the group of public buildings, Naghshineh, Taghvai, Akbarian, Kashani, Nozari and Ketabforushha Sara , in the group of residential buildings, Khakbaz, Hassanpur and Hajagha Mohsen Araki house , in the group of communal buildings, Chaharfasl and Safai baths , in the group of memorial buildings, Hazrat Abolfazl ,Mohammad Ebrahim, Molla Ghasem Saqakhaneh and in the group of minor architectural forms , Charsuq, Garmkhaneh, Sarbineh, Hassanpur and Nozari pool have been selected as index buildings and representative of types. In the case of the architectural properties including the typology, architectural concept, axes, hierarchy, compositional center, scale, proportion and module, the classifications are presented separately for each group.

A. Religious buildings

In the group of religious buildings, mosques of Sepahdari and Sheikh Abolhassan have been selected as index buildings and representative of types. These two old mosques have remained with the original structure.

a. Mosque of Sepahdari

The building has been built with style of schools borrowed from the Safavid period and the typology of mosque is as two-porch mosques. The collection is as central courtyard and has a ground with regular geometry. Ratio of site and the courtyard dimensions are 1 to 1.5. Architectural concept of building is combination of an open space as central courtyard and a roofed space around of the yard.

The building has two floors that the second floor consists of two rooms in the southern and northern sides. The ratio of closed spaces area to open spaces is 1.5 to 1 and 10% of roofed area is allocated to the semi-open spaces (Ivan). The mosque has two longitudinal and transverse symmetry axes and the geometric center of the courtyard overlaps on intersection of the axes. The entrance axes are symmetrical compared to the longitudinal axis. There are two porches (Ivan) at the two ends of the longitudinal axes. Porches have different form and function of the other spaces and are more elevated

than the adjacent spaces (Hierarchy). System of repeat in rooms is based on a modular network with width of 4 meters and communication porches located on front of every room, has been caused communication between rooms and courtyard . The compositional center of the building is on intersection of axes and overlaps on the compositional center of the yard.

b. Mosque of Sheikh Abolhassan

The typology of the building is Shabestani mosques type. In this type, the Shabestan is a roofed space includes of the collection of columns and is without porch (Ivan). In the collection, the building is located on a side of the yard and ratio of the building dimensions is 1 to 1. Architectural concept of the building is combination of an open space and a roofed space and the building has two yard in levels with different height. The building has two floors and the ceiling of the first floor is yard for the second floor. The ratio of closed spaces area to open spaces is 1 to 1 and the building is without the semi-open spaces (Ivan). The mosque has two symmetry axes and the geometric center of the building overlaps on intersection of the axes. The entrance axes are symmetrical compared to the longitudinal axis. The sanctuary is located at the end of longitudinal axis, form and decoration of space in the sanctuary is different from other spaces (Hierarchy). System of repeat in rooms is based on a modular network with dimensions of 4*4 meters and in number of 5 modules along the axes. The compositional center of the building is on intersection of axes and overlaps on the compositional center of the building.

B. Public buildings

In Arak old fabric, the most important buildings belonging to this group are Timcheh and Sara. These buildings have commercial and chamber use. In the past, merchants who often travelled in from distant towns spent the night on Sara and Timcheh. This group of buildings is along the bazaar and their entrances are connected with the main axis of bazaar. All axes of the Sara and Timcheh are parallel to bazaar path. This group of buildings in Arak historical fabric is classified into six types based on the combination of Sara (central courtyard structure) and Timcheh (roofed space with central hall) compared to each other and their location in comparison with bazaar axis.

Type 1: This type consists of Timcheh as roofed space and is without Sara. This group of buildings has an overall plan in the form of rectangular and entrance is along the longitudinal axis. The names of some buildings located in this type are: Timcheh of Hezaveiha, No, Mesgarha, Naghshineh, Karimi and Flestin.

Type 2: This type consists of Sara with structure of central courtyard and is without Timcheh. This group of buildings contains a row of porch as a semi-open space and entrance is along the symmetry axis. The names of some buildings located in this type are: Sara of Fadai, Ghomiha and Kermanshahiha.

Type 3: This type consists of Sara with structure of central courtyard and the Timcheh as roofed space. Combination of Sara and Timcheh is in a way that Sara does not have direct access to Bazaar and to enter Sara, should be passed from Timcheh. The names of some buildings located in this type are: Timcheh and Sara of Ketabforushha and Hajibashi

Type 4: This type consists of Sara with structure of central courtyard and The Timcheh as roofed space. Combination of Sara and Timcheh is in a way that Timcheh does not have direct access to Bazaar and to enter Timcheh, should be passed from Sara. The names of some buildings located in this type are: Timcheh and Sara of Taghvai and Akbarian.

Type 5: This type consists of Sara with structure of central courtyard and The Timcheh as roofed space. Combination of Sara and Timcheh is in a way that while Timcheh and Sara communicates with each other, they have independent entrance from Bazaar. The names of some buildings located in this type are: Timcheh and Sara of Aghai, Nabizadeh, Kashani and Golshan.

Type 6: This type consists of Sara with structure of central courtyard and several Timcheh as roofed space. Combination of Sara and Timcheh is in a way that three Timcheh have surrounded The Sara from three sides. While Timcheh and Sara communicate with each other, they have independent entrance from Bazaar. The name of only building located in this type is: Timcheh and Sara of Nozari

Since for conducting of the analysis process, the sample of any type should be comprehensive and contain all the properties related to the type, so from any type, the building have been chosen that their Structure and details have changed less over the time and have greater diversity. Based on these criteria, the samples have been selected for the type 1, 3,4,5,6 are Timcheh and Sara of Naghshineh, Ketabforushha, Akbarian, Kashani and Nozari respectively. Because all the buildings belonging to type 2 have been demolished and rebuilt with new style, so this type cannot be analyzed.

a.Timcheh of Naghshineh

The building belongs to the type 1 of Timcheh and Sara. The type 1 consists of The Timcheh as roofed space and is without Sara. The collection has a ground with regular geometry and dimension of the building is based on the golden ratio. Architectural concept of building is a central roofed lobby and rooms which are located on around. Ratio of roofed spaces area to lobby is 4 to 1. Timcheh has a symmetrical axis that the building is symmetrical

compared to the axis. The compositional center overlaps on geometric center of the building and Entrance axis is located on longitudinal symmetry axis. The Timcheh has three floors consist of basement, first floor and second floor which have similar architectural design. At the two ends of longitudinal axis, form and function of space are different so that the beginning of axis has been devoted to entrance and the end of axis to the main space and has been decorated differently compared to other rooms. This matter reflects that design of the architectural spaces is based on hierarchy. The central hall of Timcheh is in form of octagonal and has an elongated shape so that the ratio of width to the length of space is 1 to 2.5. System of repeat in chambers is based on a modular network with width of 4 meters and communication joints located on middle of every two module, has been caused communication between rooms and lobby.

b. Sara of Ketabforushha

The building belongs to the type 3 of Timcheh and Sara. The type 3 consists of Sara with structure of central courtyard and The Timcheh as roofed space. Combination of Sara and Timcheh is in a way that Sara does not have direct access to Bazaar and to enter Sara, should be passed from Timcheh. The collection has a ground with regular geometry and is a combination of open and closed spaces. The placement of the components of the building compared to Bazaar is such that Timcheh and adjacent hallways are next to bazaar and the Sara is located after Timcheh and farther from bazaar. Timcheh and Sara have a common symmetry and longitudinal axis. Entrance axis is located on the longitudinal and symmetry axis of Timcheh and Sara and pass through the compositional center of the building.The Sara has two floors with a similar architectural design. Architectural design of Sara is in the form of a central courtyard so that the compositional center of the building overlaps the geometric center of the courtyard. The courtyard is limited to the chamber from three sides, and from one side to Timcheh and adjacent hallways. The ratio of closed spaces area to open spaces is 2 to 1 and 10% of roofed area is allocated to the semi-open spaces (Ivan). The Sara has two longitudinal and transverse axis of symmetry so that its longitudinal axis overlaps the symmetry axis of Timcheh. At the two ends of axes, form and function of space are different so that the end of longitudinal axis is allocated to main space and has a circular cross-section and is different from the other rooms. It reflects the fact that design architectural spaces is based on the principle of hierarchy. System of repeat in chambers is such a way that a communication joint is located between two rooms and has been caused communication between rooms and courtyard. Ordering of rooms in northern and eastern sides is single-layer, but in the southern side of the yard, since it is overlooking the passageway, it is dual layer, so that one layer connected to the passageway and another to the yard.

Timcheh and adjacent hallways have an elongated shape and so that in central hall, the ratio of width to the length of space is 1 to 2.5. Form of The central hall is like an octagonal and to convert the rectangular to octagonal a triangle terrace is constructed which is repeated in both floors. The compositional center of Timcheh is located on the longitudinal symmetry axis and along the geometric center of Sara. The rooms located along the body of Timcheh have two entrances, one from Timcheh and another from the adjacent hallways.

c. Sara of Akbarian

The building belongs to the type 4 of Timcheh and Sara. The type 4 consists of Sara with structure of central courtyard and The Timcheh as roofed space. Combination of Sara and Timcheh is in a way that Timcheh does not have direct access to Bazaar and to enter Timcheh, should be passed from Sara. The collection has a ground with regular geometry and is a combination of open and closed spaces. Ratio of Sara dimensions is 1 to 1 and the same ratio in Timcheh is 1 to 2. Architectural concept of building is combination of an open space as central courtyard and a roofed space .Timcheh and Sara have a common symmetry axis so that this axis is located on entrance axis and is perpendicular to Bazaar axis and pass through the compositional centers of Sara and Timcheh. The Sara has two floors with a similar architectural design. Architectural design of Sara is in the form of a central courtyard and all components are symmetrical to geometrical center of the yard. Sara is in form of rectangular. There is a colonnade around the yard that it has given the courtyard a octagonal space. The ratio of closed spaces area to open spaces is 2 to 1 and 10% of roofed area is allocated to the semi-open spaces (Ivan). The Sara has two symmetry axes which are perpendicular to each other so that geometrical center overlaps compositional center. At the two ends of western and eastern axes, form and function of space are different (hierarchy). System of repeat in chambers is based on a modular network with dimension of 4*4 meters and colonnade has been caused communication between rooms and courtyard. Ordering of rooms in all sides of the yard is single-layer so that rooms located on eastern side of the yard have two entrances, one from yard and another from Bazaar. Timcheh has an elongated shape so that the ratio of width to the length of space is 1 to 3. Form of Timcheh is like an octagonal and to convert the rectangular to octagonal a triangle terrace has been constructed. The Timcheh has two symmetrical axes.

Entrance from Sara is located on transverse axis and entrance from bazaar path is on longitudinal axis. The compositional center of Timcheh is located on intersection of the longitudinal and transverse axes and is along the compositional center of Sara.

d. Sara of Kashani

The building belongs to the type 5 of Timcheh and Sara. The type 5 consists of Sara with structure of central courtyard and The Timcheh as roofed space. Combination of Sara and Timcheh is in a way that while Timcheh and Sara communicates with each other, they have independent entrance from Bazaar. The collection has a ground with regular geometry and is a combination of open and closed spaces. Ratio of Sara dimensions is 1 to 1 and the same ratio in Timcheh is 1 to 2. Architectural concept of building is combination of an open space as central courtyard and a roofed space .The communication axis of Timcheh and Sara overlaps on transverse symmetry axis of Timcheh and doesn't pass through the compositional center of Sara yard. The Sara has two floors with a similar architectural design. Architectural design of Sara is in the form of a central courtyard and all components are symmetrical to geometrical center of the yard. Sara is in form of rectangular. There is a colonnade around the yard that it has given the courtyard an octagonal space. The ratio of closed spaces area to open spaces is 2 to 1 and 15% of roofed area is allocated to the semi-open spaces (Ivan). The Sara has a symmetry axis which overlaps on entrance axis. At the two ends of this axis, form and function of space are different (hierarchy). System of repeat in chambers is based on a modular network with width of 4 meters and communication joints located on middle of every two module, has been caused communication between rooms and courtyard . Ordering of rooms in northern, southern and eastern sides is single-layer, but in the western side of the yard, since it is overlooking the Bazaar, it is dual layer. Timcheh has an elongated shape so that the ratio of width to the length of space is 1 to 4. Form of Timcheh is like an octagonal and to convert the rectangular to octagonal a triangle terrace has been constructed. The Timcheh has two symmetrical axes. Entrance from Bazaar is located on longitudinal axis and entrance from Sara is on transverse axis. The compositional center of Timcheh is located on intersection of the longitudinal and transverse axes and is not along the compositional center of Sara.

e. Sara of Nozari

The building belongs to the type 6 of Timcheh and Sara. The type 6 consists of Sara with structure of central courtyard and several Timcheh as roofed space. Combination of Sara and Timcheh is in a way that three Timcheh have surrounded The Sara from three sides. while Timcheh and Sara communicates with each other, they have independent entrance from Bazaar. The collection has a ground with regular geometry and is a combination of open and closed spaces. Ratio of the building dimensions is 1 to 1. Architectural concept of building is combination of an open space as central courtyard and roofed spaces in the form of U around it. The western-eastern symmetry axis of Sara is perpendicular to the longitudinal axis of western Timcheh and is parallel to the longitudinal axes of southern and northern Timcheh. The southern-northern symmetry axis of Sara is perpendicular to the longitudinal axes of southern and northern Timcheh and is parallel to the longitudinal axis of western Timcheh. The main entrance is not located on symmetry axes. The Sara has two floors with a similar architectural design. Architectural design of Sara is in the form of a central courtyard and all components are symmetrical to geometrical center of the yard. Sara is in form of rectangular. There is a colonnade around the yard that it has given the courtyard an octagonal space. The ratio of closed spaces area to open spaces in Sara is 3 to 1 and 10% of roofed area is allocated to the semi-open spaces (Ivan). The Sara has two symmetry axes so the compositional center overlaps on geometrical center. At the two ends of the axes, form and function of space are different (hierarchy). System of repeat in chambers is based on a modular network with width of 4 meters and communication joints located on symmetrical axes and corners of the yard have been caused communication between rooms and courtyard. Ordering of rooms in northern, southern and western sides is single-layer, but in the eastern side of the yard, since it is overlooking the Bazaar, it is dual layer.

Timcheh has an elongated shape so that the ratio of width to the length of space in the western Timcheh is 1 to 3 and the same ratio in southern and northern Timcheh is 1 to 10. Form of the western Timcheh is like an octagonal and to convert the rectangular to octagonal a triangle terrace has been constructed. The compositional center of Timcheh is located on the southern-northern axes and is along the compositional center of Sara. In southern and northern Timcheh, Entrance axes from Bazaar are located on longitudinal symmetrical axes.

C. Residential buildings

This group of buildings is located in the depth of quarters and their entrances are connected with semi public and semi private passages. All axes of the house are parallel to the around passages. The residential buildings in Arak old fabric is classified into three types based on the combination of open and closed spaces compared to each other.

Type1: In this type, roofed space is in the center of the yard as closed space is associated with open space from four directions. This type consists of 30 percent

of old house in Arak. The names of some houses located in this type are: houses of Hajvakil, Yasrebi, Hajibashi, Roshanzamir and Khakbaz

Type 2: In this type, open space is surrounded by closed space so the courtyard located in the center of the building and is surrounded by roofed space. This type consists of 60 percent of old house in Arak. The names of some houses located in this type are: houses of Hassanpur, Maleki, Sotudeh, Sohrabi and Rastin.

Type3: In this type, the building includes of several central courtyards as independent from each other so that the courtyards has been surrounded by roofed space. This type consists of 10 percent of old house in Arak. The names of some houses located in this type are: houses of Hajagha Mohsen Araki and Arg.

Since for conducting of the analysis process, the sample of any type should be comprehensive and contain all the properties related to the type, so from any type, the building have been chosen that their Structure and details have changed less over the time and have greater diversity. Based on these criteria, the samples have been selected for the type 1, 2, 3 are houses of Khakbaz, Hassanpur and Hajagha Mohsen Araki respectively.

a. House of Khakbaz

The building belongs to the type 1 of residential houses. In this type, roofed space is in the center of the yard as closed space is associated with open space from four directions. The collection has a ground with regular geometry and is a combination of open and closed spaces. Ratio of site dimensions is 1 to 1 and the same ratio in the building is 1 to 1.5. Architectural concept of building is placement of an extrovert cubic in the geometric center of an open space as the building is the turning point of the space.

The building has basement and two floors as the first and second floor have a similar architectural design. The ratio of closed spaces area to open spaces is 1 to 10 and 20% of roofed area is allocated to the semi-open spaces (Ivan). The house has two symmetry axes which overlap on entrances axes. At the two ends of the axes, form and function of space are different (hierarchy). System of repeat in rooms is based on a modular network with width of 3 meters. Rooms linked together by a central hall as the Central hall located at the geometric center of the building and with stair is directly related. The compositional center of the building is located on intersection of the longitudinal and transverse axes and overlaps on the geometric center of the building.

b. House of Hassanpur

The building belongs to the type 2 of residential houses. In this type, open space is surrounded by closed space so the courtyard located in the center of the building and is surrounded by roofed space. The collection has a ground with regular geometry and is a combination of open and closed spaces. Ratio of site dimensions is 1 to 1.5 and the same ratio in the courtyard is 1 to 2. Architectural concept of building is combination of an open space as central courtyard and a roofed space around of the yard. The building has two floors with a similar architectural design. The ratio of closed spaces area to open spaces is 2 to 1 and 10% of roofed area is allocated to the semi-open spaces (Ivan). The house has a longitudinal symmetry axis which overlaps on entrance axis. At the two ends of this axis, form and function of space are different (hierarchy). System of repeat in rooms is based on a modular network with width of 4 meters and communication joints located on middle of every two module, has been caused communication between rooms and courtyard . The compositional center of the building is located at the end of the longitudinal axis and is along the compositional center of the yard.

c. House of Hajagha Mohsen Araki

The building belongs to the type 3 of residential houses. In this type, the building includes of several central courtyards as independent from each other so that the courtyards has been surrounded by roofed space. [8, p.131]The collection has a ground with regular geometry and is a combination of open and closed spaces. Ratio of site and main courtyard dimensions are 1 to 1.5. Architectural concept of building is combination of several independent complexes which have common geometry. The building contains basement and two floors that basement and the first floor have similar architectural design. The building include of a main courtyard with a large dimensions and two side courtyards with small dimensions. The ratio of closed spaces area to open spaces is 1 to 1 and 5% of roofed area is allocated to the semi-open spaces (Ivan). The house has a longitudinal axis as main axis and three minor axes. At the two ends of the axes, form and function of spaces are different. So there is a three door room (main room) at the end of the longitudinal axis (hierarchy). System of repeat in rooms is based on a small modular network with width of 3 meters and a large modular network with width of 5 meters. Communication joints located on middle of every two module has been caused communication between rooms and courtyard. The compositional centers of the building are located at the end of the axes and are along the compositional centers of the yard.

D. Communal buildings

The communal buildings in Arak old fabric are of two types including single & multi complex that baths of Safai & Chaharfasl have been selected as representatives of types.

a. Bath of Safai

The building is classified in the Qajar style and its architectural concept is a complex with organic

geometry. Ratio of site dimensions is 2 to 1. All parts of the building are below ground level and the roof is same level with the floor of passages and surrounding streets. All spaces of the bath are closed and there are no open and semi-open spaces. The building has entrance, dressing space, communication joint, hothouse, and water storage. There is a symmetry axis in the bath. Entering the building is done through the corridor which is not along the axis. At the end of the axis, form of space is different (hierarchy).System of spaces repetition is based on a modular network in width of 1.5 m. The composition center of each space is along the symmetry axis.

b. Bath of Chaharfasl

The building is classified in the Qajar style and is Continuous collection with organic geometry. Ratio of site dimensions is 3 to 1. Architectural concept of building is combination of several complexes so that they are completely independent and don't have any form and functional connections with each other. All parts of the building are below ground level and the roof is same level with the floor of passages and surrounding streets. All spaces of the bath are closed and there are no open and semi-open spaces. The building has four complexes including of baths of Muslim men, Muslim women, religious minorities and the properties. Each complex has entrance, dressing space, communication joint, hothouse, and water storage. Shape of more space is Octagonal and each space has two symmetry axis are perpendicular to each other. But the whole building and each complex don't have axis independently. Spaces are connected with each other through a communication joints which are in form of octagonal and changing the angle of 45-180 ° is accompanied. In each space, intersection of the axes overlaps on geometric center of the space. Entering the building is done through the vestibules and entrance to spaces is not along the axes and is located on the corner of the space. At the end of the axes, form of space is different and area is more compared to adjacent spaces (hierarchy). System of spaces repetition is based on a modular network in width of 1.5 m. in each space; the composition center is on intersection of the axes and overlaps on the geometric center of the space.

E. Memorial buildings

The most memorial buildings have been destroyed due to lack of sponsorship. The only buildings which have remained are Hazrat Abolfazl Alabas, Mohammad Ebrahim & Molla Ghasem Saqakhaneh. These buildings are holy to people and are a symbol of Karbala battle.

a. Saqakhaneh of Hazrat Abolfazl Alabas

Architectural concept of the form is a rigid cubic so that it is connected with the outside only from one side. Ratio of the plan dimensions is 1 to 1. The form has a symmetry axis. The compositional center of the form is along the axis and overlaps on its geometric center.

b. Saqakhaneh of Mohammad Ebrahim

Architectural concept of the form is a rigid cubic so that it is connected with the outside only from one side. Ratio of the plan dimensions is 1 to 1. The form has a symmetry axis. The compositional center of the form is along the axis and overlaps on its geometric center.

c. Saqakhaneh of Molla Ghasem

Architectural concept of the form is a rigid cubic so that it is connected with the outside only from one side. Ratio of the plan dimensions is 1 to 1. The form has a symmetry axis. The compositional center of the form is along the axis and overlaps on its geometric center.

F. Minor Architectural forms

In Arak old fabric, Minor Architectural forms include symbolic pools which are often located on the middle of urban & architectural spaces and give Intimate quality to the space.

a. Pool of Charsuq

Architectural concept of the form is an octagonal prism which is located in the center of an urban area as completely symbolic. Ratio of the plan dimensions is 1 to 1. The form has a symmetry center and components of form are radially symmetrical compared to the basis point. The compositional center of the form is on its geometric center.

b. Pool of Garmkhaneh

Architectural concept of the form is an octagonal prism which is located in the center of an architectural space as completely symbolic. Ratio of the plan dimensions is 1 to 1. The form has a symmetry center and components of form are radially symmetrical compared to the basis point. The compositional center of the form is on its geometric center.

c. Pool of Sarbineh

Architectural concept of the form is an octagonal prism which has been combined with four cubes from four sides. The form is located in the center of an architectural space as completely symbolic. Ratio of the plan dimensions is 1 to 1. The form has a symmetry center and components of form are radially symmetrical compared to the basis point. The compositional center of the form is on its geometric center.

d. Pool of Nozari

Architectural concept of the form is an octagonal prism which is located in the center of an architectural space as completely symbolic. Ratio of the plan dimensions is 1 to 1. The form has a symmetry center and components of form are radially symmetrical compared to the basis point. The compositional center of the form is on its geometric center.

e. Pool of Hassanpur

Architectural concept of the form is a cube prism which is located in the center of an architectural space as completely symbolic. Ratio of the plan dimensions is 1 to 1. The form has two symmetry axes and components of form are symmetrical compared to axes. The compositional center of the form is on its geometric center.

Conclusion

The typological features of plans in design of historical monuments in Arak from Qajar period are as follows: Plans are mainly of two types including blocked & courtyard composition. In the case of religious buildings, the great mosques are of courtyard composition and have two verandas and a dome (Sepahdari mosque).Small and medium-sized mosques are of blocked composition with the structure of column collection (Sheikh Abolhassan mosque). In the case of public buildings, the buildings are classified into six types based on the combination of Sara with courtyard structure and Timcheh with blocked composition and their location in comparison with bazaar axis. Small residential buildings are of blocked composition (Khakbaz house). Typology of medium-sized houses is courtyard composition (Hassanpur house) and the great houses are of multi courtyard composition (Hajagha Mohsen Araki house).In the case of communal buildings, baths are of single and multi complex composition. The complexes are completely independent and have no functional and formal communication with each other. In the case of memorial buildings, all Saqakhaneh are of blocked composition and are symmetrical compared to central axis of plan. In the case of minor architectural forms, pools are of two types in form of octagonal prism and cube that all of them have a symmetry center.

The architectural properties of plans in design of historical monuments in Arak from Qajar period are as follows:

1. In terms of hierarchy, in most buildings, main halls are in behalf of the courtyard and are along the symmetrical axes. The index spaces usually have notable dimension, form and decoration. In few buildings, the hierarchy of the complex corresponds to the unity of the volume.

2. Without any exception all buildings have at least one symmetry axis which is perpendicular to passageway and usually starts at the entrance point and ends of the main space. In most buildings except mosques & baths, the entrance axis overlaps on one of the symmetry axes. Approximately 60% of the buildings have two symmetry axes which are perpendicular to each other.

3. In most buildings, the composition center is located on the intersection of symmetry axes & overlaps on geometric center of the space. In few buildings, the composition center is in behalf of the central hall and at the end of longitudinal symmetry axis.

4. Ratio of the dimensions of all buildings is horizontal in vertical direction. Excluding baths, the plans differ from square to golden section relation of the depth and width. Aspect ratio is linear in the baths. The Index elements are in sculptural arrangement in the great mosques.

5. Scale of all buildings except the great mosques is in natural size. The great mosques are of heroic scale.

6. In all buildings, structural elements are located on a modular network and spaces are repeated as monotonous & alternating.

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Bone marrow stromal cells transplantation impact spatial learning and memory and the expression of BDNF and P75NTR in rats with chronic cerebral ischemia

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Abstract: Chronic cerebral ischemia gradually generates cognitive impairment associated with modifications in the hippocampus, a brain structure that is largely involved in learning and memory processes. Such alterations have been attributed to the damage of neuronal plasticity of hippocampus. Numerous of studies demonstrated that bone marrow stromal cells (BMSCs) transplantation improved neural function of animal models with neurological diseases, including chronic cerebral ischemia. The effects of BMSCs transplantation attributed to modulation the express of Brain-derived neurotrophic factor（BDNF）and P75 neurotrophin receptor (P75NTR) are uncertain. To investigate the potential mechanisms of BMSCs transplantation for treating chronic cerebral ischemia, we established animal model by permanent occlusion of bilateral common carotid arteries and administrated BMSCs with green fluorescent protein (GFP) via tail vein at 48 hours after surgery. We found that the deficiency of spatial learning and memory caused by chronic cerebral ischemia were improved compared with vehicle-injected group. Meanwhile, results of immunohistochemistry in the CA1 region of hippocampus showed that the expression of BDNF was up-regulated and P75NTR was down-regulated. Our research suggested that BDNF and P75NTR could be influenced by BMSCs transplantation which is associated with the spatial learning and memory improvement.
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1. Introduction

Chronic cerebral ischemia is the common pathological process of the development of various diseases, such as Vascular Dementia, Alzheimer's disease and Binswanger disease, and eventually cause cognitive impairment(Jian et al., 2012). The deficiency of spatial learning and memory ability is one manifestation of cognitive dysfunction. Researches demonstrated that chronic cerebral ischemia can induce pathological changes of dendrite, axon and myelin(Sozmen et al., 2012) which are the foundation of the function of spatial learning and memory.

Brain-derived neurotrophic factor（BDNF）is one of the neurotrophins which play an important role in many aspects of CNS function. BDNF has pleiotropic effects on modulating activity-dependent forms of synaptic plasticity, neuronal survival, neuronal development, dendritic arborization and axon growth (Cowansage et al., 2010, Tanaka et al., 2008), which underlie circuit formation and cognitive function.P75 neurotrophin receptor (P75NTR) is a transmembrane receptor that is identified as a low-affinity receptor for mature neurotrophins which includes nerve growth factor (NGF), BDNF, neurotrophin-3(NT-3) and neurotrophin- 4(NT-4). P75NTR plays as a negative regulator that involves in activity- dependent forms of synaptic plasticity (Teng et al., 2005) when it bands with BDNF. Studies also showed that P75NTR was required for the signaling pathway of myelin-associated inhibitors (Nogo-A, MAG, OMgp) that inhibited neurite outgrowth (Domeniconi et al., 2005).

Numbers of studies demonstrated that bone marrow stromal cells (BMSCs) may provide an adequate source for individualized cell transplantation and can circumvent problems which come from ethics and immunogenicity. BMSCs were demonstrated to improve from the function of spatial learning and memory of rats with chronic cerebral ischemia(Yanlin Wang 2012). The study of Zhang J et al(Zhang et al., 2008) have found that BMSCs could protect oligodendrocytes from injury of oxygen -glucose deprivation though reducing the expression of P75NTR.Whether the pan-neurotrophin receptor, p75NTR, might play critical roles in the pathogenesis of chronic cerebral ischemia or its express could be influenced by BMSCs transplantation was unclear.

In the present study, first we induced a rat chronic cerebral ischemia model by permanent occlusion of bilateral common carotid arteries. Then we transplanted BMSCs into the rat model and estimated the protective effects of BMSCs against the deficiency of spatial learning and memory ability caused by chronic cerebral ischemia. We also observe the changes of the expression of BDNF and P75NTR in the CA1 region of hippocampus of rats in different groups. The mechanism of recovery of spatial learning and memory may be relevant to BMSCs transplantation by mediating the expression of BDNF and P75NTR.

2. Materials and Methods

2.1. Isolation and culture of BMSCs

Bone marrow was obtained under sterile conditions from an 8-week-old rat according to the improved method that our laboratory described previously(Yanlin Wang 2012). This procedure was approved by the Ethics Committee of Zhengzhou University, Zhengzhou, China.

The femurs were separated and both ends were cut. Then, the marrow was flushed with 5 ml medium (Dulbecco's Modified Eagle Medium:Nutrient Mixture F-12 (DMEM / F-12) supplemented with 10% fetal bovine serum (FBS), 1% non-essential amino acids (NEAAs), and 100IU/ml penicillin/streptomycin) (all from Invitrogen). Cells were collected by centrifugation, resuspended in 5 ml medium, plated in a 25 cm^2 tissue culture flask and incubated at 37°C and 5% CO2. The non-adherent cells were removed by changing the medium after 48 h. The medium was changed every 2 days. When the cells achieved 80% confluence, the cells were passed with 0.25% trypsin / EDTA at a ratio of 1:3. In this study, the cells were passed four times and were used for subsequent experiments. The levels of expression of BMSCs surface antigen CD34, CD44, CD45 and CD105 (Biolegend) were evaluated by flow cytometry.

2.2. Establishment of animal model

All experimental procedures were carried out under the Institutional Animal Care and Use which approved by the Ethics Committee of Zhengzhou University, Zhengzhou, China. Adult male Sprague-Dawley (SD) rats weighing between 270 and 300 g were used in this study. After 1 w of adaptive feeding, Morris water maze were used to select qualified experimental rats via excluding rats which found the platform within 2s or which did not find the platform within 120s.

The qualified experimental rats were randomly divided into sham group, vehicle-injected group and BMSCs-transplanted group. Each group had 10 rats. To establish chronic cerebral ischemic model, a surgery of bilateral common carotid arteries occlusion (BCCAO) was taken according to previous report(de la Torre and Aliev 2005). Rats were anesthetized with 10% chloral hydrate by intraperitoneal injection. Through a midline incision, the bilateral common carotid arteries were carefully separated and ligated permanently. Rats in the sham group were given a sham operation, in which their carotid arteries were merely separated carefully. The rats were kept under conditions of controlled temperature and humidity with free access to food and water.

2.3. Morris water maze

The spatial learning and memory ability of rats of each group was evaluated using Morris water maze experiments 1 month after surgery. Water maze experiments were performed in a large quiet room with a number of extra-maze visual cues including geometric images of squares, triangles, circles hung on the wall. The Morris water maze consisted of a black circular pool (diameter: 160 cm, height: 70 cm) filled to a depth of 30 cm of water which maintained at 22.0±1.0 °C and was virtually divided into four equal quadrants. An invisible platform of 10 cm in diameter was submerged approximately 1.0 cm below the surface of the water and placed in the center of a quadrant.

In hidden platform task, rats were given 4 trials per day for 5 consecutive days to locate and climb on to the hidden platform. A trial was initiated by placing the rat in the water directly facing the pool wall in one of the 4 quadrants. The time which they took to climb on to the platform was recorded as the escape latency. Each rat was allowed to rest for 20 s on the platform when they found it. The trial finished when the rat found the platform or when 60 s had elapsed. If the rat did not found the platform within 60 s, it was guided to the platform and allowed to rest for 20 s on it, meanwhile the escape latency was recorded as 60 s. The mean number of seconds (±SEM) spent in four trials was recorded as the mean escape latency of the day.

The day following the last hidden plat form trial, the platform was removed from the pool and probe trials (120 s in length) were performed. The number of crossings over the previous platform location and the time spent in each quadrant were measured.

2.4. Transplantation of GFP-labeled BMSCs

The BMSCs were transfected with lentiviruses which carried the cDNAs of GFP 48 hours before transplantation. GFP-labeled BMSCs cells were collected and resuspended with 0.01 mM PBS. Cells (2×10^7/mL) with 90–95% viability which was assessed by trypan blue exclusion were used for transplantation. At 48 h post-BCCAO, rats of the BMSCs- transplanted group were injected with 0.5ml cell suspension via tail vein. Rats in the vehicle- injected group were injected with an equal volume of PBS via the same vein.

2.5. Histological analysis

At the end of behavioral testing, each animal was

anesthetized and perfused through the heart with ice-cold saline, followed by 4% paraformaldehyde in 0.1 M phosphate buffer. Brains were rapidly extracted, post-fixed overnight in the same fixative at 4 °C. The brain tissues of hippocampal region were then embedded in paraffin, sectioned at a thickness of 3μm in the coronal plane and mounted on slides coated with poly-lysine. The sections were processed for fluorescence observation, HE staining and immunohistochemistry.

After incubation in 3% H_2O_2 followed by 4% normal goat serum (Boster), sections were incubated with a primary antibody against BDNF (1:100, Santa) or P75NTR (1:100, Santa) at 4 °C overnight for immunohistochemistry. Sections were then incubated with biotinylated goat anti-rabbit IgG(1:200, ZSGB-Bio) for 2 h. Detection of the bound antibodies was performed using a standard peroxidase-based method (ABC-kit, ZSGB-Bio), followed by DAB staining. Quantification of BDNF and P75NTR positive cells of CA1 region of the hippocampus was carried out in 2 sections bilaterally per rat. The sections were visualized under a 40× objective in a microscope (Leica) and five sample areas were obtained for each section. Image J software was used for gray scale analysis of each sample area, and the mean value (±SEM) was recorded as the gray scale value of the rat.

2.6. Statistical analysis

Data are presented as mean ± SEM. One-way analysis of variance (ANOVA) followed Fisher's LSD post hoc test by was used for multiple comparisons. A P-value < 0.05 was considered statistically significant.

3. Results

3.1. Results of flow cytometry

Flow cytometry was used to identify whether the cells isolated and cultured were BMSCs. MSCs are identified by the expression of many molecules including CD105 and CD44 and are negative for the hematopoietic markers CD34and CD45.In our research, the BMSCs had a high purity, CD105 and CD44 double-positive rate was 99.8%, while the negative rate of CD34 and CD45 was 100% (Figure.1).

3.2. Green fluorescence observed after virus transfection

BMSCs exhibited typical morphology of fusiform. When the cells achieved 80% confluence, they present morphology like swirling or fish stock. 48 h after viral transduction, there was not any significant changes in cell morphology and green fluorescence could be observed when the BMSCs were visualized under a fluorescence microscope.

3.3. Assessment of spatial memory in the Morris Water Maze experiment

After the surgery, the vehicle-injected group showed significant disorder of spatial leaning and memory function in the hidden platform task and probe trials. In the hidden platform task, the vehicle-injected group showed a longer escape latency than the sham group (P<0.01). Interestingly, the escape latency of the BMSCs- transplanted group decreased gradually during the testing period compared with the vehicle- injected group (P<0.01) (Figure.2).In the probe trials, the mean number of seconds (±SEM) spent in target quadrant and the total number of crossings over the previous platform area were both compared. Statistic results showed that the time spent in target quadrant and number of crossings of the vehicle-injected group decreased significantly than the sham group (P <0.05). Compared with the vehicle-injected group, the BMSCs- transplanted group obtained an increase in the time spent in target quadrant and number of crossings (P <0.05)(Table 1). These data indicate that the spatial learning and memory ability of rats of the BMSCs-transplanted group has improved.

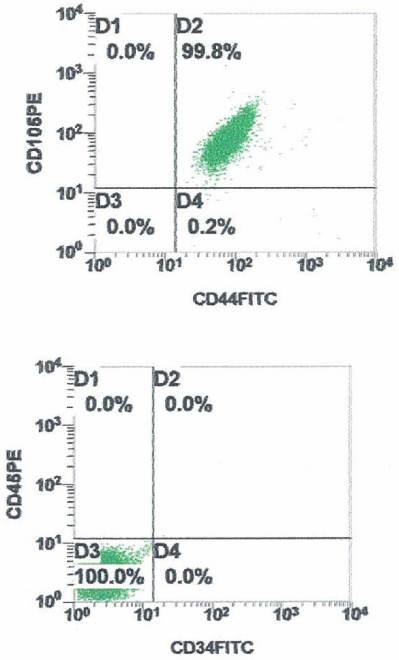

Figure 1. Results of flow cytometry

3.4. Migration of BMSCs

Under fluorescence microscopy, the GFP- positive cells could be seen in bilateral hippocampus of the rat of BMSCs-transplanted group. However, few GFP-positive cells could not be found in other brain regions. This result demonstrated that BMSCs could survival and migration in the chronic ischemic regions of rat brains 1 month after tansplantation.

3.5. Morphological changes of hippocampal neurons

The sections of hippocampal region were stained with HE in all three groups to observe the morphological changes of hippocampal neurons. The

neurons of hippocampal region of the sham group which had original morphology arranged normally. Any pyknosis, vacuolization, degeneration, edema or necrosis was found. In vehicle-injected group, hippocampal neurons arranged disorderly , and showed obvious swelling, vacuolization, degeneration and loss. These pathological characteristic demonstrated a successful model. Compared with the vehicle- injected group, the neurons of hippocampal region of the BMSCs-transplanted group arranged more orderly, and the number of pathological cells was reduced.

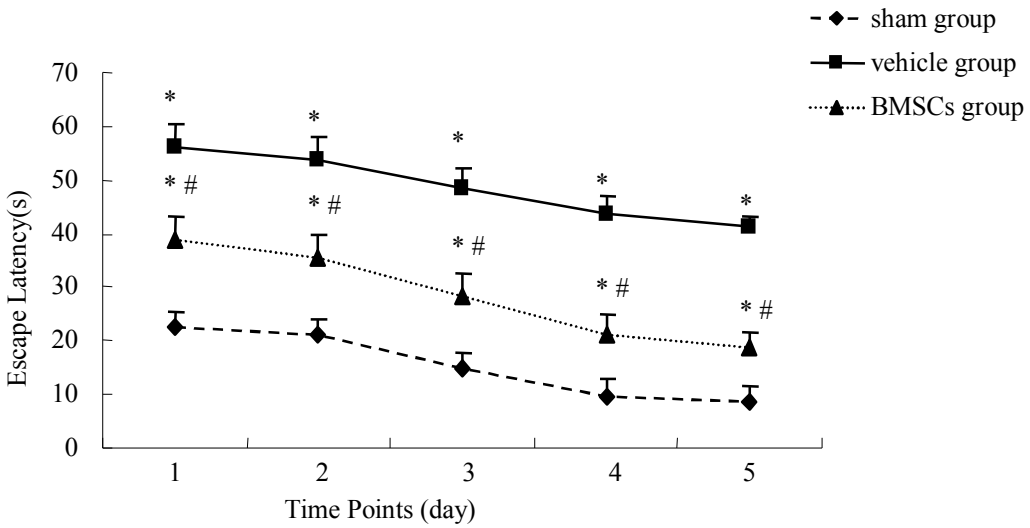

Figure 2. Average escape latency of all three groups at each time point (n=10). * P < 0.05 vs sham group, # P < 0.05 vs vehicle-injected group.

Table 1. Results of the probe trials ($\overline{X} \pm S$, n=10)

Groups	Mean time spent in target quadrant (s)	Mean number of crossings over the previous platform area
sham group	57.86±2.33	3.50±1.65
vehicle-injected group	21.74±3.46*	1.00±1.05*
BMSCs- transplanted group	37.97±2.72#*	2.20±1.61#*

* P < 0.05 vs sham group;# P < 0.05 vs vehicle-injected group.

3.6. Expression of BDNF and P75NTR in CA1 region of hippocampus

BDNF and P75NTR immunoreactivity was detected in all three groups. BDNF immunostaining was less observed in the vehicle-injected group throughout the hippocampal area. In contrast, BDNF immunoreactivity was more prominent in the BMSCs-transplanted group and the sham group. Furthermore, the intensity of immunoreactivity in BDNF-positive cells was obviously higher in another two groups than the vehicle-injected group (P <0.05).P75NTR immunoreactivity was most evident in the vehicle-injected group, while was rarely detected in the sham group. In the BMSCs-transplanted group, P75NTR immunostaining was less prominent compared with the vehicle-injected group (P <0.05) (Figure 3).

4. Discussion

In this research, we investigated the effects of BMSCs transplantation and the expression of BDNF and P75NTR of rats suffering the chronic cerebral ischemic injury or sham operation. A rat chronic cerebral ischemia model was established by occluding bilateral common carotid arteries permanently. Morris water maze, the most favorite and significant tool for detecting the level of learning and memory of laboratory animals, was used to estimate differences of the spatial learning and memory among the three groups.30 days post chronic cerebral ischemic injury,

the rats in the vehicle-injected group showed a longer escape latency in the hidden platform task, a shorter time spent in the target quadrant and number of crossings over the previous platform area compared with rats in the sham group. This demonstrated that chronic cerebral ischemia could cause dysfunction of spatial learning and memory. While the results of morris water maze of rats in the BMSCs- transplanted group were significantly superior to that of rats in vehicle-injected group. These behavior results indicated that BMSCs transplantation in some ways improved the cognitive function of rats suffering ischemic injury, which was similar to the results of study of Perasso L et al (Perasso et al., 2010).

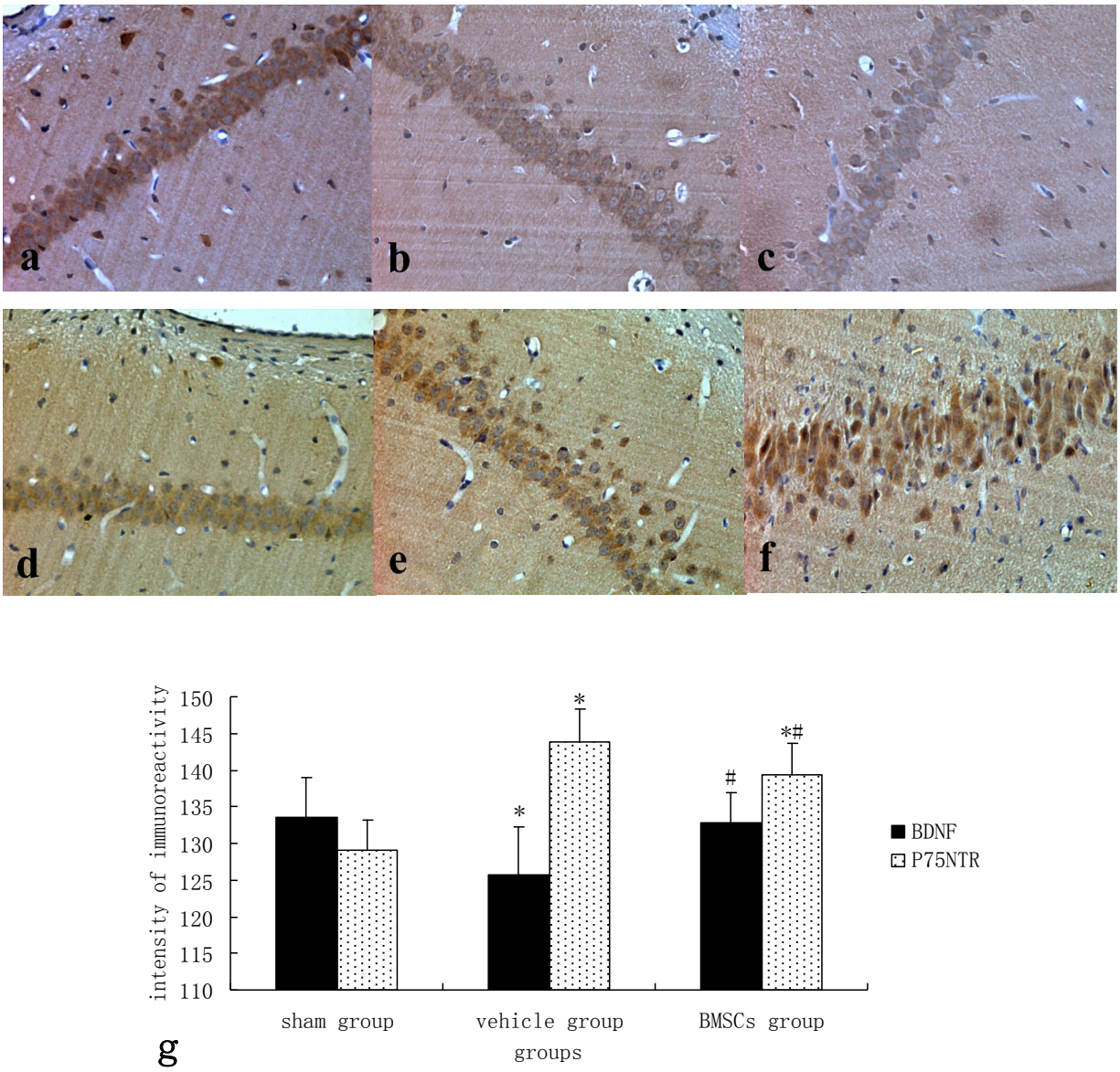

Figure 3. Expression of BDNF and P75NTR in CA1 region of hippocampus. a-f are figures of immunohistochemistry,400×. a, b and c were the results of BDNF immunostaining. d, e and f were the results of P75NTR immunostaining. a and d: sham group. b and e: BMSCs-transplanted group. c and f: vehicle-injected group. g is the intensity of immunoreactivity, * $P < 0.05$ vs sham group;# $P < 0.05$ vs vehicle-injected group.

Hippocampus is largely involved in learning and memory processes and its alterations were associated with the decline of cognitive functions. BDNF belongs to the neurotrophins family and the highest level of BDNF in the CNS is found in the hippocampus. BDNF is involved in the survival of neurons, modulating synaptic structure and quantity, promoting the maturation of new synapses and the growth of dendritic spines and axons (Cowansage et al., 2010, Tanaka et al., 2008). In such ways BDNF impacts the learning and memory ability. Most neuronal effects of BDNF are mediated through high-affinity receptors, tyrosine kinase B receptors (TrkB) (Nagahara and Tuszynski 2011). Nevertheless, BDNF also binds to the low-affinity receptor P75NTR, which activates ceramide turnover, c-Jun kinase(JNK) cascade and caspases(Ibanez and Simi 2012), mediating functions opposite of TrkB like inducing neuronal apoptosis and negatively regulating the complexity of dendrite of mature hippocampal neurons. P75NTR can also activate the small GTPase RhoA which leads to growth-cone collapse and inhibition of axonal growth.

In our research, the express of BDNF declined in the brains of rats in the vehicle-injected group, which is consistent with the study of Sun H et al(Sun et al., 2010). A decrease in BDNF expression can cause neuronal death or axonal damage. Researches demonstrated that applying exogenous BDNF was effective in treating some neurological disorders (Nagahara et al., 2009). However, BDNF is a medium molecular protein with charge that poorly penetrates the blood–brain barrier and the brain parenchyma. Such characteristic make it a poor drug candidate for neurological diseases therapy. MSCs, an effective cell therapy which can improve the neural function, have been found to increase the level of BDNF of different animal models such as ischemic stroke, spinal cord injury, traumatic brain injury and so on(Honmou et al., 2012, Wright et al., 2011, Walker et al., 2012). P75NTR is rarely expressed in adult tissues, but in pathological conditions it is highly expressed. P75NTR was found upregulated in the hippocampus of rats with transient global cerebral ischemia (Soltys et al., 2003) and our study also found a similar result. In vitro study, BMSCs could reduce p75NTR expression in the oligodendrocyte subjected to oxygen-glucose deprivation (Zhang et al., 2008). In our study, the expression of P75NTR was decreased in hippocampus of the BMSCs-transplanted group than that of the vehicle-injected group. This indicated that BMSCs could down-regulate P75NTR expression of the CA1 region of hippocampus of rats subjected chronic cerebral ischemia.

P75NTR knockout mice showed that the dendritic complexity and dendritic spine density of hippocampal neurons were increased(Barrett et al., 2010). Meanwhile, spatial learning and hippocampal LTP deficits could be reversed by applying BMSCs. After BMSCs transplantation in our research, the GFP-positive cells could be observed survival and migration in bilateral hippocampus of rats. The neurons of hippocampal region of the BMSCs-transplanted group arranged more orderly compared with the vehicle-injected group and the extent of cellular edema and necrosis was significantly lightened. The spatial leaning and memory function was improved in the BMSCs-transplanted group to a certain extent. Our results suggested that the mechanisms of spatial learning and memory improvement caused by BMSCs transplantation may be correlated with down-regulation of P75NTR and up-regulation of BDNF which thereby mediated synaptic activity, promoted dendritic and axonal growth, improved self-repair of the nervous system.

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Nomadic Learning Culture: Narratives of a Teacher

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Abstract: In this study using the narratives of the teacher of a nomadic tribe during his first year of teaching, we tried to understand the learning culture of itinerant nomadic schools. This study is a narrative inquiry-based research, the one that is belonging to qualitative and interpretative paradigm. The teacher's diaries revolved around a series of interrelated subjects dealing with his educational setting. The focal point is the students' learning experiences, with other concepts being the conceptual peripheries. The data analysis shows that students' learning and corporal punishment are the main concerns of the nomadic teacher. This study shows that several features of nomads' lifestyle cause disruption in the teacher instruction, which leads to corporal punishment.
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Keywords: Nomadic education; nomads' lifestyle; corporal punishment; students learning

1. Introduction

For more than two decades, education scholars have been warning about the improbability of transformational reform in educational systems and curricula without taking the element of culture into consideration. Bruner for the first time addressed the correlation between culture and education in a systematic fashion in his "Culture and Education" (1997). Besides Bruner, other scholars such as Joseph, Bravmann, Windschitl, Mikel, and Green (2011) believe that development, implementation and assessment of curriculum is productive if the cultural settings are taken into consideration. Thus, the present article aims to present a deeper understanding of the learning culture in a unique type of school in Iran, namely the nomadic school, relying on the assumption that transformation in education entails consideration of the learning culture.

During the past six millennia, Iran has witnessed the three basic forms of living, which are nomadic, rural and urban (Amanelahi Baharvand, 2004). As time has passed, economic, social and cultural transformations have influenced both the rural and urban modes of living in Iran. Nonetheless, the nomadic lifestyle has undergone less powerful changes according to some scholars, in a manner that has even deprived them of full usage of the recent achievements of the modern age (Akbari & Mizban, 2004).

From the 1920s, there emerged volunteers to establish modern schools for the nomads and teachers from urban areas were recruited in these modern schools. Since 1923, nomadic education has passed through several stages of evolution, increasing its enrolment and diversifying its activities. Such efforts earned an award from UNESCO in 1976 for fighting illiteracy (Bahman-Beigi, 2005).The General Office of Nomadic Education is now in charge of training more than 168,000 students across the country (Abbasi, 2008).

In this paper, using the narratives of the teacher of a nomadic tribe during his first year of teaching, we try to understand the learning culture of itinerant nomadic schools. According to Iran's Center of Statistics, moving nomads are defined as those communities which hold at least the following three characteristics: tribal structure, reliance on animal farming and shepherding as the key element of lifestyle (Goudarzi, 1994). In other words, moving nomads are those communities that due to their specific way of living should have an itinerary in the summer and winter twice in a year and blood relations form their social relations.

The school in which the teacher carries out his duty is a multi-grade class with 11 students, which come from eight households. The school is located in the nomadic region of Poshtkouh in province of Lorestan in Iran.

2. Research Method

This study is utilizing a narrative inquiry-based approach, the one that is belonging to qualitative and interpretative researches paradigm. In narrative inquiry-based approach, story is the focal subject under investigation. As a research methodology, this approach requires a phenomenological viewpoint where an experience is studied as a phenomenon (Clandinin, Pushor, & Orr, 2007; Webster & Mertova, 2007). Narrative is "meaning-making through the shaping or ordering of experience" (Chase, 2011, p. 430). Polkinghorne (2007, in Chase, 2011) points out that narrative research makes claims about how people understand situations, others, and themselves. According to Rushton (2004), narrative in the form of stories is a strong tool for research in educational settings. Sá (2002) holds that written language in the

form of diaries has two functions including the development of skills to think about facts and provision of strong potentialities for analysing and understanding of what is going on in the classroom.

The narrative inquiry-based approach shares four characteristics with other qualitative research approaches: 1) emphasis on natural setting, 2) interest in conception and understanding, 3) inductive analysis; and 4) development of theory (Bartlett, Burton, & Peim, 2002). But unlike the common qualitative researchers who usually present short excerpts from interviews or fieldwork in their published work, narrative researches often publish longer stories from individuals' narratives (Chase, 2011).

As its main source of information, the present paper draws upon the diaries of a nomadic teacher, written during a single school year. Like other qualitative approaches, this approach does not employ data analysis in a linear fashion, namely, after data collection. The researcher analyzes the data while collecting them and encodes the data. More data is obtained and encoded during the research process and old data is reviewed through data analysis and comparison. Finally, the researcher classifies the codes according to their perceived significance and discards some codes.

3. Results

3.1. Learning and corporal punishment as the main themes

The teacher's diaries revolved around a series of interrelated subjects dealing with his educational setting. The focal point is the students' learning experiences, with other concepts being the conceptual peripheries. Since the beginning, the teacher tries to teach in a manner which facilitates optimum learning among students. The students, however, show reluctance in learning and interrupt his teaching in the classroom. He applies several teaching methods to control the class but to no avail. Advice, punishment, talking to the parents, giving extra assignments, cutting the recess time, and so forth, also failed to prove effective. Some other factors reinforce using corporal punishment as an educational method, including parents' expectations, children's convictions about corporal punishment and educational inspector's recommendations. Parents expect the teacher to use corporal punishment as a tool to educate the students. As the teacher says: "All this time the families have told me that if I don't beat the students they would not pay attention to me". While the teacher tells the families that corporal punishment is not a correct behavior, they respond: "these kids won't bow with peaceful behavior."

Even the children believe that only corporal punishment can force them to study. As Maryam, a female student, tells the teacher: "kids in here are corrected only with beating." This is such dominant a belief among the nomads that during the composition class, when the teacher asks the students to write about their future career, one writes: "when I grow up I want to be a teacher and beat the students if they have unwashed hands or faces;" or "I want to be a teacher and teach the students well but eat their [food] rations [allocated by the Ministry of Education to rural and nomadic schools] myself, and if they become noisy beat them as much as I can."

Better education, studying and keeping calm are the advantages of corporal punishment according to the parents and the students. On the other hand, the teacher believes that escaping from schools, cutting classes for several days, and evading the teacher in face-to-face confrontations are some consequences of corporal punishment, an observation that research justifies. Boldaji's research titled "sociocultural and educational factors contributing to school leave among the middle school students of Lordegan and Ardal nomadic schools" cites corporal punishment in school among the factors which encourage school leave (cited in Elham, 2008).

Finally, several factors convince the teacher to embrace corporal punishment as an educational instrument. These include increasing pressure from the parents who believe in corporal punishment as an effective instrument to educate children and think of a punishment-avoiding teacher as inefficient, children's perception of an authoritative teacher, the educational inspectors' pressure to improve the students' learning records and the need for better control of the students. The teacher writes:

"Students should not be excessively respected and smiled at … I'm coming to the conclusion that except for Maryam and Ahmadreza and the first grade students, the others are hard to control with mild verbal methods and need to be physically punished, of course periodically."

In the following section of this article, we will attempt to analyze the situation of the nomadic teacher by the main themes of his narrated memories.

3.2. Nomadic Lifestyle and the Teacher's Situation

We can understand the roots of the teacher's situation, which convinces him to use punishment against his own beliefs, with regard to nomadic lifestyle and its consequences in their life. In his "Dehkouh Children", Eric Friedel (1997, cited in Fazeli, 2011) states that nomadic parents consider their children as 'property' and have to follow strict, authoritative structure of the family with God placed at the top, followed by father and then nature. Unyielding educational norms are enforced in a top-down manner and the father can use force whenever deemed necessary. The obedience structure is bottom-up and

the children should obey the father's orders. In Dehkouh, the authority hierarchy is based on age and gender. Women hold a lower status than ten-year old boys and children and younger girls stand at the bottom of the hierarchy. At the peak of the structure, men are the all-powerful authority. The authoritative social relations in Dehkouh, and in Iranian nomadic families in general with their specific moral norms and rationality, place excessive burden on the children.

In summary, nomadic culture gives little space to dialogue and persuasion, a trend that is reflected in their learning culture. The teacher writes: "One thing I discovered throughout this time about discussions among the nomads is that they are neither the type of ready-to-explain people nor have enough patience to follow a lengthy subject."

3.3. Teacher's Stature among the Nomads

During the winter period, the teacher is unable to prepare food since he teaches in two subsequent shifts. In the meantime, tradition holds that the teacher's food be prepared by the students' families. In fact, families may find teacher's rejection of their offer of food as offensive. That is why most unlike their urban colleagues, nomadic teachers are satisfied with their career. As the teacher of Poshtkouh nomads says: "My everyday confrontation with such behavior engendered the belief in me that the stature teachers used to hold in the past has remained untouched here and the teachers still enjoy their true value here."

The teacher is treated as a member of the family. "They told me feel at home and regard them as my own family." Drivers even do not take fare from a teacher and place them at the front seat as a sign of respect. The teacher writes:

"While returning home on foot from the educational facility in a car-unfriendly route, an automobile pulled off to give me a ride. Interestingly, they immediately ask who we are and where we go. As soon as I tell them that I am a teacher, they prepare the front seat for me, even if that means moving the front seat occupant to the backseat; unless a senile occupant is there which I myself do not feel comfortable about. Anyway, the driver brought me to the front seat. Whenever I pay a visit to a student's house, or while returning, as soon as the residents of the area find out about my job, they turn friendlier. Most drivers who pick me up on the way will not even take my fare. They ask for my exact destination and sometimes insist that I be their guest".

The teacher's stature among the nomads increased his sense of responsibility and even encouraged emotional responses:

"Sometimes I feel I will shoulder a great debt if there is shortcoming in my teaching. Maybe it's because I bother them for meals every day. Every time I visit the home of a student who has problems with their lessons, I feel ashamed for failing to improve their performance. Now I understand why the last year soldier-cum-teacher had told one of the students that he gives top grades to students because of [the kindness of] their families".

Occasionally, the nomads have further expectations from the teachers, and assign them other duties. The teacher in this case says:

Today was the [Muslim holiday of] Eidul Adha and Arash's grandmother wanted to sacrifice a lamb. With the Mafateeh al-Janaan book [which contains religious prayers] that a guide had brought for me an hour earlier, I left for their house and recited the special prayer for sacrifice; and of course I was invited to dinner."

Apparently, the nomadic teacher enjoys significant authority and influence and accordingly, it is expected him to use his authority to educate his students by corporal punishment.

3.4. Working Nomadic Lifestyle

Manderscheid (2001) distinguishes working nomadic lifestyle from other forms of tribal life. According to Manderscheid (2001), family members in nomadic life divide the husbandry tasks among family members (family enterprise). The teacher says:

Nomadic life is difficult. From wake-up to sleep they are working. The poor men have to be alert even at night to protect the cattle from thieves or wolves. Of course, here, women work along men, and even more than the men. Besides the daily household chores, they have to look after the children and bring water from the spring, which is perhaps two kilometers away from their houses. Feeding the sheep, putting them inside the barn, and milking the cattle are their duty and when the men leave the abode, it is the women who have to graze the cattle."

Children also help their families in pasture, which stops them from adequate study of their lessons. Studies by Torimiro, Dionco-Adetayo, and Okorie (2003), shows that among Nigerian nomads the children start helping the family in pasturage from the age of 4 to 14 and the older they become, the more they become interested. Torimiro et al. (2003), consider this as a basic reason for nomadic children's neglect of education. The teacher in our study recalls:

"Just like the early spring, I first trod the asphalt road and then the dirt road to get to their village, but found out that like Amin's village, they have not erected the black tents here. As I entered the village, I saw Maryam and Ahmad who were standing beside the grazing cows. Maryam had a "Let's Write" book in his hand while Ahmad was playfully hopping around. I waved my hand but they did not notice me, so I thought I might have misidentified them. However, as I went closer, I saw that they are those I guessed. I called them and they came so that I could

take the exam. Maryam said that somebody had to take care of the cows but no one was free so she had to stay there. I said that it was ok and I would take the exam right there, so I told Ahmad to call Saman for the exam and to bring books and pencils for himself and Maryam."

Golzadeh and Safarnejad (2008) state that animal farming and moving are major obstacles against the education of nomadic children. They maintain that even if they pass the basic educational stages, the students ultimately have to choose between continuing their academic studies and living among their nomads. The irrelevance of educational subject and the nomads' needs usually create a dilemma, the authors claim. Consequently, this lifestyle generates some disadvantages. Parents have no time to support their children and participate in their academic tasks, so they have a high expectation of the teacher. In addition, the children have a limited time to do their homework. During the daytime, they are expected help their parents in animal rearing and after nightfall, because of lack of facilities such as electricity, they could not meet the teacher's expectations.

Torimiro et al. (2003), hold that animal rearing by nomads' children has developed in them some characteristic such as boldness, aggressiveness, and resistance to foreign culture. As the teacher tells:

"They [parents] tell me the story of the teacher who came here two years ago and was disrespected by the students and since he refused to beat them, they started to mock him (and even Maryam once called him a 'giraffe' in his face). They also recall another teacher who frequently beat the students at the first month, such that they were frightened even when hearing his name. The interesting point is that the parents give great credit to the second teacher."

Another feature of nomadic lifestyle, addressed by Manderscheid (2001), is the changeability of their residence according to the availability of pastures and needs of animals. As the teacher writes, due to migration, nomadic schools' academic year is quite short. All the time, the teacher has to keep pace in order to hold final exams in simultaneity with national final exams across the country. The pace of teaching troubles some students in keeping along with the class procedures. On the other hand, for different reasons mentioned earlier such as family members' working all together, the students' families could not really help the students and sometimes even ask the teacher to press their children to achieve a desirable score. The teacher may resort to corporal punishment and that ultimately fosters negative attitude towards school among the students.

The main characteristic of nomadic lifestyle is that animal husbandry is an important means of subsistence (Manderscheid, 2001). Children are involved in animal husbandry and follow the animals in their migration for pasturage; this created among the children an emotional connection to the cattle. Besides that, most of their time is spent on taking care of the animals. Goudarzi (1994) asserts that in this lifestyle, the people are forced to make at least two yeylagh and gheshlagh migrations during summer and winter when they may fall victim to bandits or other tribes. In such circumstances, unity and solidarity, and helping each other to facilitate their migration, provides an opportunity to defend the tribal members against foreigners. Of course, this attitude fosters a sense of excessive pride that permeates interpersonal relations among nomads and occasionally causes problems. Goudarzi (1994) explains that in nomadic culture, similarities and differences, even family roots, can cause feud. The nomads have taken shape throughout tens of generations and genealogy is a definitive characteristic of identity for them. The father teaches the names of ancestors to the children since early childhood and instructs them to memorize the names. Bragging about ancestors and bearing grudge over their enemies, rivals and perhaps murderers is transferred from one generation to another.

Accordingly, relations between classmates from different tribes are usually laden with self-centeredness and counterproductive competition along with strong tribal affiliations. In these relations, all try to prove that they are the best. This is of course a common trend in smaller societies having limited contact with the outside world (Fazeli, 2011). This nomadic personality, which stems from nomads' lifestyle, is one of the main causes of indiscipline that occasionally arouse teacher complaints. The teacher writes that the children manifest their hostility in different modes including:

- In recess time, when the students play in teams, they want victory at any price to prove their superiority.
- Every individual confrontation, whether verbal of physical, quickly turns into a group fight.
- Ridiculing and humiliating each other
- Posing a riddle to the others and refusing to give the answer.
- Ostentation with family wealth to prove superiority.
- Blind educational competition inside the class.

As mentioned earlier, animal husbandry is the main source of nomadic subsistence and all members of the family work for survival. This kind of living limits the time for true parenthood. The result is increasing expectation among the parents that the teacher holds responsibility for their children's upbringing. Nomadic parents have little time to attend

to their children and spend most of the day making ends meet. On the contrary, in urban schools, the increasingly educated parents are paying more and more attention to their children's education, sometimes interfering with the teacher's responsibilities and asserting their opinion. Nomadic parents on the other hand are too occupied to monitor their children's education and prefer to shift all duties to the teacher. Besides, nomadic mothers lack the required level of literacy to complement the teacher's role at home, so they put all responsibilities on the teacher. The teacher is not merely the conveyor of education. The nomadic teacher recalls what one of the parents said once: "as I was talking to Farid's father today, he told me that they expect the teacher to teach the correct behavior to students, more than they want them to educate the students".

So far, we mentioned several factors, which influence the behavior of nomadic children in school; it is necessary to mention that those who have achieved success through education rarely come from nomadic communities. This creates a sense of reluctance, especially among the young girls, to attend school. It becomes worse when the families say that all they want is that their children become literate otherwise there is no benefit in their schooling. Of course, their argument may not be that irrelevant. As Sohrabi (1994) reports on the value of literacy among the nomadic tribes in his "Education among the Iranian Nomads", literacy has made no difference in their social and economic structure, has brought no progress in removing injustice and poverty dominating the community and could not improve the status quo. In fact, literacy has had no impact on employment and social status, and that has lessened motivation to achieve literacy. Sohrabi's account of the nomadic tribes in older times still sounds more or less true.

4. Conclusion

In this article, we tried to describe and analyze the difficult situation which a nomadic teacher has confronted during an academic year. Class control and corporal punishment were his main challenges. We explained his position with regard to the broader context of nomadic culture and analyzed his situation regarding nomads' lifestyle. Such conditions have been observed in other nomadic regions in countries such as Nigeria. Tahir, Muhammad, and Mohammed (2005) noted that some major constraints in nomadic education include constant migration, children's involvement in animal rearing, incompatibility of nomadic lifestyle and school curriculum, schedule and nomads' physical isolation from the rest of society. Some states have tried to solve educational problems of nomads and their other problems by sedentarisation. In India until the mid-1980s, the state encouraged nomads to choose a sedentary lifestyle (Dyer, 2001). Nonetheless, in Iran the policy of sedentarisation has been unsuccessful and in some cases has destroyed the grasslands (Tavakoli & Zia Tavana, 2009).

As Umar and Tahir (2000) have stated, what we need is an effective educational system for nomads, which recognizes their educational needs and culture and truly intends to solve problems that create many challenges for teaching in and management of nomadic classes.

It is quite necessary to adjust the nomadic children's curriculum to their lifestyle. Some countries have taken steps in this path including Tibetan nomadic schools that have been allowed to localize as much as 20% of the curriculum of their regional schools (Bangsbo, 2008). Such initiatives provide an opportunity to develop a curriculum related to nomadic communities' lifestyle with which the children are familiar. The curriculum development system in Iran should dispense with the centralized educational system and supply some contents specially tailored to the nomadic lifestyle, and take into consideration the differences between urban, rural and nomadic settings.

In addition, adopting a flexible timetable for nomadic schools is necessary. In winter and summer, nomads usually migrate to areas which provide grass and water resources for their herd. Regarding this unique lifestyle feature, it seems that the existing curriculum is hardly compatible with the nomadic lifestyle and slows down the learning pace of nomadic students.

The time spent by students inside the class should be also shortened. Nomadic parents need their children to assist them in animal rearing, so some of them do not send their children to school, even though they value the children's education. By decreasing this time, parents could be convinced to send their children to schools, particularly if we consider that there is no correlation between students' time of attendance in school and their academic achievements.

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Identification of molecular markers for flower characteristics in *Catharanthus roseus* producing anticancer compounds

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Abstract: *Catharanthus roseus* or vinca produces over 130 TIAs with pharmaceutical value. Two of them, namely vinblastine (VB) and vincristine (VC), are species-specific and extensively used in anticancer chemotherapeutics. To detect *C. roseus* genotypes abundant in desired TIAs, contrasting genotypes should be analyzed via marker-assisted selection (MAS) to avoid analytical quantitation. A trustable morphological marker, like a flower characteristic, will lessen the selection efforts in improving such a quantitative trait. The present work aims at detecting PCR-based molecular markers, i.e., RAPD, ISSR and AFLP, for eight *C. roseus* cultivars for flower characteristics as possible markers for high levels of VC and VB. The study indicated high levels of polymorphism generated across different type of marker; AFLP was the most powerful, while ISSR was the least. The polymorphism information content (PIC), average of heterozygosity (H_e), the effective multiplex ratio (E), and the marker index (MI) revealed that data of ISSR is the least trustable. The overall results separated the cultivars with white versus those with pink colors, on one hand, and versus colored flowers, on the other hand. A number of 79 cultivar-specific markers were detected across type of marker. Other 100 markers for important flower characteristics were also detected. They are white petal, colored petal, pink petal, petal white center and yellow flower eye center. The highest number of flower trait markers was scored during AFLP analysis (65), while the lowest was scored during RAPD analysis (14). Recent efforts indicated that some of these markers can be linked to the levels of the anticancer compounds VC and VB in *C. roseus*.

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Keywords: RAPD, ISSR, AFLP, anticancer compounds, TIAs.

1. Introduction

Plant species are known to synthesize over 2000 different types of terpenoid indole alkaloids (TIAs) (Barleben *et al.*, 2007, Ziegler & Facchini, 2008, Guirimand *et al.*, 2010). TIAs are naturally synthesized as a defense against pests and diseases (Roepke *et al*., 2010). More than 130 TIAs are produced in the periwinkle, *Catharanthus roseus* or vinca (van der Heijden *et al.*, 2004, Wang *et al*., 2011) mostly act as valuable pharmaceuticals. Two of them, namely vinblastine (VB) and vincristine (VC), are species-specific and extensively used in anticancer chemotherapeutics (van der Heijden *et al*., 2004, Pasquier & Kavallaris, 2008).

Among the various plant breeding procedures available, the selection breeding involves isolation of individual plants bearing superior phenotype from the segregating population (Sharma *et al*., 2012). Hybrids between parents possessing desirable features are used to generate segregating populations. The selection breeding brings together genes/alleles favorable for the improved expression of the traits of interest, from diverse parents, into the selected genotype(s). To detect *C. roseus* genotypes abundant in desired TIAs, contrasting genotypes should be analysed (Guirimand *et al.*, 2011a&b). In marker-assisted selection (MAS) (Dekkers & Hospital, 2002), the DNA markers linked to the desired trait should be identified. A trustable morphological maker, like flower or fruit characteristics, will lessen the selection efforts in improving such a trait. Application of this technology in *C. roseus* will allow tracking of trait of high TIAs, specifically VC and VB, in segregating populations

without having actually to quantitate them analytically.

DNA-based genetic markers are recently integrated into several plant systems and expected to play a very important role in the future of plant breeding and molecular genetics. Polymerase chain reaction (PCR) was invented as a genetic assay based on selective DNA amplification (Saiki *et al*., 1988, Innis *et al.*, 1990). Random amplified polymorphic DNAs (RAPDs) (Williams *et al.*, 1990) are useful PCR-based molecular markers for the assessment of genetic diversity among species (Artyukova *et al.*, 2004, Sureja *et al*., 2006, Guerra *et al*., 2010) including vinca (Gupta *et al.*, 2007, Shaw *et al.*, 2009) because of their simplicity, speed and relatively low cost as compared to other types of molecular markers. Inter simple sequence repeats (ISSRs) were developed to access variation in the numerous microsatellite regions dispersed throughout the genome (Zietkiewicz *et al*., 1994). They are simple and reproducible approach based on the amplification of DNA regions between inversely oriented SSRs or microsatellites (Bussell *et al*., 2005). ISSR primers are designed from SSR motifs and can be undertaken for any plant species containing a sufficient number and distribution of SSR motifs in the genome ((Morgante & Olivieri, 1993, Buhulikar *et al*., 2004). Therefore, ISSRs are widely used in many respects such as the study of genetic diversity in barley (Brantestem *et al.*, 2004) and cultivar identification in tobacco (Denduangboripant *et al.*, 2010) and vinca (Shaw *et al.*, 2009). Amplified fragment length polymorphism (AFLP) utilizes fragments of DNA amplified using primers from restriction digested genomic DNA (Vos *et al.*, 1995). It provides the highest levels of resolution to allow delineation of complex genetic structures, to differentiate individuals in a population and in gene flow experiments, and also to register plant varieties (Powell *et al.*, 1996, Law *et al.*, 1998, Barker *et al.*, 1999, Aparajita & Rout, 2010, Misra *et al.*, 2010).

The present work aims at detecting PCR-based molecular markers, i.e., RAPD, ISSR and AFLP, for eight *C. roseus* for color characteristics as possible molecular markers for high levels of TIA, especially VC and VB.

2. Materials and Methods

Plant material

The study involved eight cultivars of *C. roseus*, differing in petal color, flower eye and center colors, and petal shape grown naturally in the Mecca region (Table 1 & Figure 1). Detection of different cultivars was based on the petal color and flower eye and center colors as described by Show *et al.* (2009). Flower petal was separated as colorless (white) (a-c) and colored (d-h). Petals of some cultivars overlap (b, c, d, f and g), while the rest non-overlap (a, e and h). Leaf samples of each genotype were collected from plants in three locations (populations). Ten plants of different genotypes were selected in each location based on morphological homogeneity.

Genomic DNA extraction and purification

Extraction of total DNA was performed using the modified procedure of Gawel and Jarret (1991). The minimum number of plants to be bulked for each genotype to saturate polymorphisms within each cultivar subjected to experimentation (data shown upon request). To remove RNA contamination, RNase A (10 mg/ml, Sigma, USA) was added to the DNA samples and incubated at 37^{o}C for 30 min. Estimation of the DNA concentration in different samples was done by measuring optical density at 260 nm according to the equation: DNA concentration (ug/ml) = OD_{260} X 50x dilution factor.

Table 1: Names, flower petal colors and flower eye and center colors of the eight cultivars of *Catharanthus roseus* (L.) G. Don. Single red line represents cultivars with white flowers, while double blue line represents cultivars with pink flowers.

Code	Name of cultivar	Petal color	Eye color
I. Colorless			
a.	Patricia White	White	White eye with yellow center
b.	First Kiss Polka Dot	Milky white	Red radiating eye with small red center
c.	First Kiss Peach	Whitish pink	Pink radiating eye with yellow center
II. Colored			
d.	Experimental Rose Pink	Pale pink	Red radiating eye with red center
e.	Experimental Deep Pink	Pink	Dark pink radiating eye with pink center
f.	Cooler Orchid	Pinkish red	White radiating eye with yellow center
g.	Victory Red	Deep red centre	Dark red eye with small red center
h.	Blue Pearl	Purple blue	White large radiating base with yellow center

Random amplified polymorphic DNA (RAPD)

A set of 20 random 10*mer* primers (Operon Technology, USA) from groups A, B, C, O and Z (Table 2) was used in detecting polymorphism among different genotypes, but 14 only were successful in generating reproducible, polymorphic and reliable amplicons. The amplification reaction was carried out in 25-µl reaction volume containing 1x PCR buffer, 4 mM $MgCl_2$, 0.2 mM dNTPs, 21 pmole primer(s), 2 units Taq DNA polymerase and 25 ng template DNA.

Table 2: List of random 10*mer* primers (groups A, B, C, O and Z) and their nucleotide sequences used in the present study. Primers succeeded to recover reproducible, polymorphic and reliable amplicons are written in bold, while the rest was written in italics.

Primer	Sequence (5'–3')	Primer	Sequence (5'–3')
OP-A04	**AATCGGGCTG**	**OP-C07**	**GTCCCGACGA**
OP-A09	**GGGTAACGCC**	*OP-C11*	*AAAGCTGCGG*
OP-A13	*CAGCACCCAC*	**OP-C14**	**TGCGTGCTTG**
OP-A17	**GACCGCTTGT**	**OP-C16**	**CACACTCCAG**
OP-B01	**GTTTCGCTCC**	*OP-C18*	*TGAGTGGGTG*
OP-B02	**TGATCCCTGG**	**OP-O01**	**GGCACGTAAG**
OP-B03	**CATCCCCCTG**	*OP-O02*	*ACACACGCTG*
OP-B04	**GGACTGGAGT**	**OP-O07**	**CAGCACTGAC**
OP-B05	**TGCGCCCTTC**	**OP-O09**	**TCCCACGCAA**
OP-B07	*GGTGACGCAG*	*OP-Z04*	*AGGCTGTGCT*

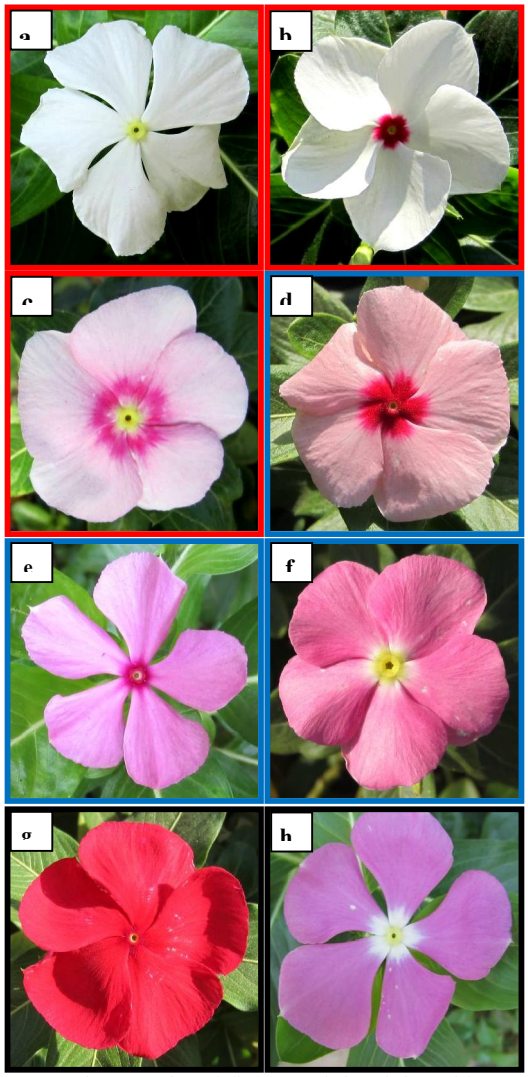

Figure 1: Photographs of flowers of the eight cultivars of *Catharanthus roseus* (L.) G. Don. Flower color ranged from colorless or white (a-c, red framed) to pink (d-f, blue framed) and/or colored (d-h). Color of petal eye can be white (a, f and h), pink (c and e) or red (b, d and g). Eye c enter can be yellow (a, c, f and h) or red (b, d and g) or pink (e).

RAPD-PCR amplification was performed in a Perkin Elmer 2400 thermocycler (Germany), programmed to fulfill 40 cycles after an initial denaturation cycle for 4 min at 94°C. Each cycle consisted of a denaturation step at 94°C for 1 min, an annealing step at 37°C for 2 min, and an extension step at 72°C for 2 min, followed by extension cycle for 7 min at 72°C in the final cycle.

Inter simple sequence repeat (ISSR)

Seventeen primers for ISSR were successfully used in the present study in generating reproducible and reliable amplicons for different genotypes. Names and sequences of these primers are shown in Table 3. PCR analysis was performed in 25-µl reaction and amplification was programmed to fulfill 40 cycles after an initial denaturation cycle for 4 min at 94°C. Each cycle consisted of a denaturation step at 94°C for 1 min, an annealing step at 40°C for 2 min, and an extension step at 72°C for 2 min, followed by extension cycle for 7 min at 72°C in the final cycle.

Amplified fragment length polymorphism (AFLP)

AFLP analysis was performed using the AFLP Analysis System I according to the manufacturer's protocol (Invitrogen, cat. no. 10544-013). Genomic DNA samples were digested with *Eco*RI and *Mse*I restriction enzymes in which *Eco*RI and *Mse*I adapters were ligated to the digested DNA fragments. Pre-amplification was carried out using *Eco*RI primer plus one extension base at the 3' position (A) and *Mse*I primer plus one extension base at the 3' position (C) to amplify fragments that contain complementary sequences. Five combinations of *Eco*RI primers plus three extension bases and *Mse*I primers plus three extension bases were used to selectively amplify the DNA fragments matching the primer-extension sequence, four of them succeeded to recover good quality polymorphic patterns. These four combinations are: M-CCA/E-ACT, M-CAC/E-ACA, M-CAG/E-AAC and M-CTC/E-AAG.

Table 3: List of ISSR primers and their nucleotide sequences used in the present study.

No.	Name	Sequence	No.	Name	Sequence
1	814	$(CT)_8TG$	10	HB10	$(GA)_6CC$
2	844A	$(CT)_8AC$	11	HB11	$(GT)_6CC$
3	844B	$(CT)_8GC$	12	HB12	$(CAC)_3GC$
4	17898A	$(CA)_6AC$	13	HB13	$(GAG)_3GC$
5	17898B	$(CA)_6GT$	14	HB14	$(CTC)_3GC$
6	17899A	$(CA)_6AG$	15	HB15	$(GTG)_3GC$
7	17899B	$(CA)_6GG$	16	UCB-820	$(GT)_8C$
8	HB8	$(GA)_6GG$	17	UCB-827	$(AC)_8G$
9	HB9	$(GT)_6GG$			

Detection of PCR products

The products of both RAPD and ISSR were detected using electrophoresis on agarose gel (1.2% in 1x TBE buffer), stained with ethidium bromide (0.3 ug/ml), then visually examined with UV transilluminator and photographed using a CCD camera (UVP, UK). AFLP products were detected by capillary electrophoresis and virtual gels were prepared and analyzed. Fragments were separated and sized on an ABI 3500 DNA sequencer (Applied Biosystems, Foster city, California). Using the program Genemapper 4.1 (Applied Biosystems, Foster city, California), a genetic fingerprint was produced for each individual sample by scoring for the presence or absence of a standardized set of markers between 50 and 600 base pairs in size (Rogers, 2008).

Computer and statistical analysis

The bands recovered by different techniques were considered reproducible and scorable only after observing and comparing them in three separate amplifications for each primer (data provided upon request). Clear, unambiguous and reproducible bands recovered through different techniques were considered for scoring. Each band was considered a single locus. Data were scored as (1) for the presence and (0) for the absence of a given DNA band. Band size was estimated by comparing with 100-bp ladder (Bioron, Germany) using Gel Works 1D advanced gel documentation system (UVP, UK). The binary data matrices were entered into the TFPGA (Ver. 1.3) and analyzed using qualitative routine to generate similarity coefficient. Dissimilarity coefficients were used to construct a dendrogram using un-weighted pair group method with arithmetic average (UPGMA) and sequential hierarchical and nested clustering (SHAN) routine.

Similarity matrix produced by RAPD, ISSR and AFLP were compared based on the genetic distance of the TFPGA, the normalized Mantel statistic (Mantel, 1967). The PIC (polymorphism information content) was calculated by applying the following formula given by Powell *et al*. (1996) and Smith *et al*. (1997): $PIC = 1 - \sum fi^2$ in which $i = 1 - n$, and fi is the frequency of the i^{th} amplicon. The number of amplicons refers to the number of scored bands. The frequency of an amplicon was obtained by dividing the number of cultivars, where it was found, by the total number of cultivars. The PIC value provides an estimate of the discriminating power of a marker. Marker index (MI) was calculated for each primer or primer combination as the product of PIC and the number of polymorphic bands.

Analysis of molecular variance (AMOVA) is a method of estimating population differentiation directly from molecular data and testing hypotheses about such a differentiation. A variety of molecular marker data (for example, RAPD or AFLP), direct sequence data, or phylogenetic trees may be analyzed using this method (Excoffier *et al*., 1992). AMOVA was performed using GENALEX 6 (genetic analysis in excel, Peakall & Smouse, 2006) in RAPD, ISSR and AFLP to partition the total molecular variance between and within populations.

3. Results and Discussion

In this work, the three marker types, namely RAPD, ISSR and AFLP were utilized to analyze eight cultivars of *C. roseus* (see Table 1 & Figure 1). We estimated the optimal number of primers for PAPD and ISSR or primer combinations for AFLP required to discriminate among genomic DNAs of different plant genotypes based on the reproducibility of data and level of polymorphism obtained by each type of molecular analysis (e.g., RAPD, ISSR, AFLP, RFLP, etc.). The argument of the required value of genetic distance to classify correlated plants accessions as distinct cultivars have been raised (Cabrita *et al*., 2001, Papadopoulou *et al*., 2002). In the present study, primers (14 for RAPD, 17 for ISSR and four combinations for AFLP) with informative patterns were selected (samples are shown in Figure 2). Selection of primers was based on the number of amplicons recovered through PCR and the stability (or reproducibility) of the patterns. These primers were used in the characterization of eight genotypes belonging to the *C. roseus* species. Less than 7% intra-plant polymorphism (within) was found across the three types of analyses for the plants of the same genotype (data provided upon request).

Table 4: List of cultivar-specific markers of C. *roseus* for different marker types. The table indicates the type and number of markers along with their molecular weights (MW) in bp for different cultivars (a-h). Single red line represents cultivars with white flowers, while double blue line represents cultivars with pink flowers.

Marker type	Primer	Number (and MW in bp) of cultivar-specific markers						
		a[1] b	c	d	e	f	g	h
RAPD	A04	1 (470)	-	-	-	--	-	-
	A09	- 1 (240)	-	-	1 (1440)	-	-	-
	A17	- -	-	-	-	-	-	-
	B01	- 1 (980)	-	-	-	1 (720)	-	-
	B02	- -	-	1 (1150)	-	-	1 (520)	-
	B03	- -	1 (2080)	-	-	-	-	-
	B04	2 (880, 1450)	-	--		1 (2220)	--	
	B05	- -	-	-	-	-	-2 (260, 420)	
	C07	- -	1 (1480)	-	-	-	-	-
	C14	- 1 (750)	-	-	-	-	-	-
	C16	1 (780)	-	-	-	-	--	-
	O01	- -	-	-	-	-	-	-
	O07	- 1 (1720)	-	1 (660)	-	-	--	
	O09	- -	-	-	-	-	-	-
	Total	**4 4**	**2**	**2**	**1**	**2**	**1**	**2 = 18**
ISSR	814	1 (180)	-	-	-	-	--	-
	844A	- -	2 (620, 1780)	-	-	-	-	-
	844B	- 1 (680)	-	-	-	-	-	-
	17898A	- -	-	-	-	-	-	-
	17898B	- -	-	-	-	3 (440, 480, 980)	-	-
	17899A	- -	-	-	-	1 (2100)	-	-
	17899B	1 (420)	-	-	-	-	--	-
	HB8	- -	1 (550)	-	-	-	1 (960)-	
	HB9	1 (800)	-	-	-	1 (2050)	--	-
	HB10	- -	-	1 (620)	-	-	1 (440)	-
	HB11	- 1 (250)	-	-	1 (480)	-	-	-
	HB12	- -	-	-	-	-	-2 (220, 500)	
	HB13	1 (580)	-	-	-	-	--	-
	HB14	1 (1950)	-	-	2 (450, 1650)		---	-
	Total	**5 2**	**3**	**3**	**2**	**4**	**2**	**2 = 23**
AFLP	CCA/ACT	1 (320)	1 (250)	1 (370) 400, 440, 520)	6 (160, 220, 300),--		3 (200, 460, 550)	1 (280)
	CAC/ACA	- 3 (170, 420, 510)	-	3 (210, 290, 330)	1 (280)	-	2 (260, 400)	1 (360)
	CAG/AAC	2 (240, 380)	-1 (450)	1 (510)	-	-1 (300)	3 (170, 190, 290)	
	CTC/AAG	1 (430)	-	-2 (260, 350)	1 (520)-2 (190, 220)		1 (580)	
	Total	**4 4**	**2**	**12**	**2**	**-**	**8**	**6 = 38**
Total	**13**	**10**	**7**	**17**	**5**	**6**	**11**	**10= 79**

[1]See Table 1

Table 5: Numbers of cultivar-specific and flower characteristics markers of C. *roseus* across different marker types.

Marker type	Marker name	marker[a]						
		1	2	3	4	5	6	**Total**
RAPD	A04	1	-	1	-	-	-	2
	A09	2	-	-	-	-	1	3
	A17	-	1	-	-	-	-	1
	B01	2	-	-	-	1	-	3
	B02	2	1	-	-	-	-	3
	B03	1	-	-	-	-	-	1
	B04	3	-	-	1	-	-	4
	B05	2	-	-	-	-	-	2
	C07	1	-	-	1	-	-	2
	C14	1	-	-	-	-	1	2
	C16	1	-	-	-	-	-	1
	O01	-	2	-	1	-	-	3
	O07	2	-	-	1	-	1	4
	O09	-	-	-	1	-	-	1
	Total	**18**	**4**	**1**	**5**	**1**	**3**	**32**
ISSR	814	1	1	-	-	-	-	2
	844A	2	-	1	-	-	-	3
	844B	1	1	-	1	-	1	4
	17898A	-	1	-	-	-	1	2
	17898B	3	-	-	-	-	-	3
	17899A	1	-	1	2	-	-	4
	17899B	1	-	-	-	1	-	2

	HB8	2	1	-	-	-	-	3
	HB9	2	-	-	-	1	-	3
	HB10	2	-	-	2	-	-	4
	HB11	2	1	-	-	1	-	4
	HB12	2	-	-	-	-	1	3
	HB13	1	-	-	-	-	1	2
	HB14	3	1	-	-	-	-	4
	Total	**23**	**6**	**2**	**5**	**3**	**4**	**43**
AFLP	CCA/ACT	13	6	2	4	2	4	31
	CAC/ACA	10	3	3	1	5	2	24
	CAG/AAC	8	5	2	1	4	6	26
	CTC/AAG	7	4	4	5	3	-	23
	Total	**38**	**18**	**11**	**11**	**14**	**12**	**103**
Total		**79**	**28**	**14**	**21**	**18**	**19**	**179**

[a]1: cultivar-specific, 2: white petal, 3: colored petal, 4: pink petal, 5: petal white eye, 6: yellow eye center.

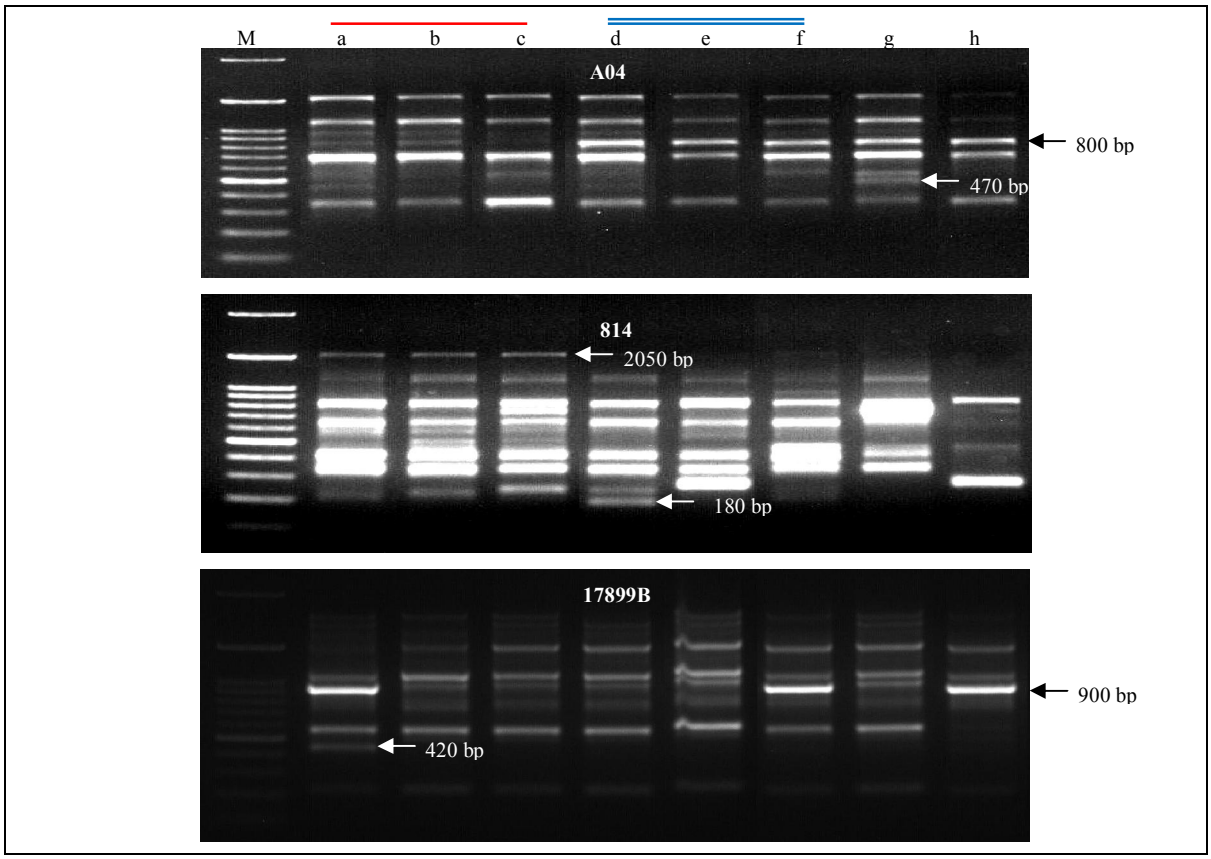

Figure 2: Models of different marker profiles including RAPD, ISSR and AFLP of the eight cultivars (a-h, see Table 1). M refers to DNA standard (100-bp ladder, Bioron). RAPD with primer A04 indicates two markers with 470 (cultivar-specific) and 800 bp (for colored petal). ISSR with primer 814 indicates two markers with 180 (cultivar-specific) and 2050 bp (for white petal). ISSR primer 17899B indicates two markers with 420 (cultivar-specific) and 900 bp (petal white eye). AFLP with primer combination M-CCA/E-ACT indicates 31 different markers (see Tables 4 & 5). Single red line represents cultivars with white flowers, while double blue line represents cultivars with pink flowers.

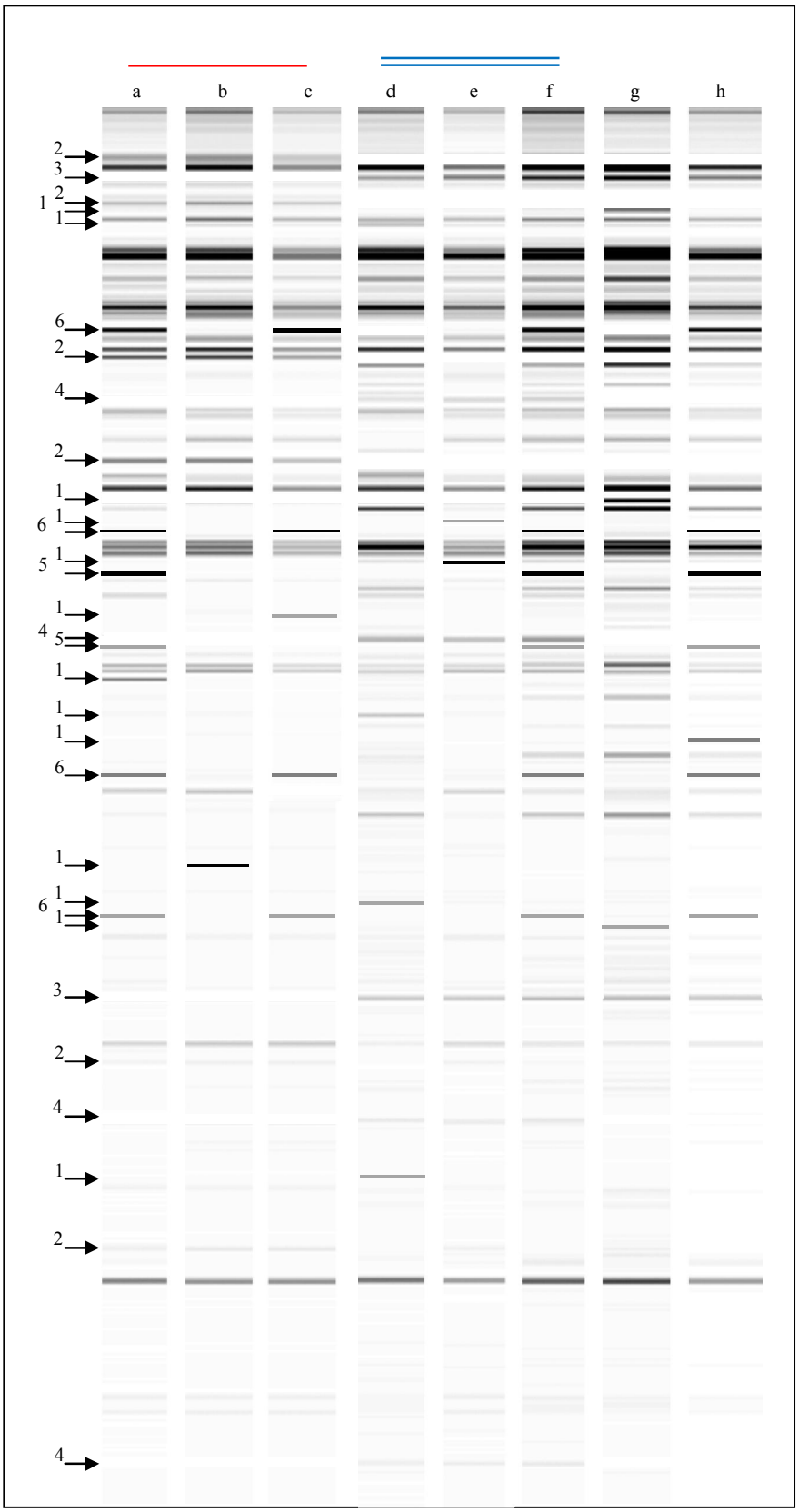

Figure 2: continued

Table 6: Similarity matrixes based on molecular data for the eight *C. roseus* cultivars (a-h, see Table 1). Single red line represents cultivars with white flower, while double blue line represents cultivars with pink flower.

Marker type	Cultivar							
	h	g	a	b	c	d	e	f
RAPD								
h	1.00							
g	0.76	1.00						
a	0.71	0.77	1.00					
b	0.79	0.82	0.83	1.00				
c	0.80	0.82	0.85	0.92	1.00			
d	0.72	0.80	0.75	0.84	0.81	1.00		
e	0.68	0.81	0.80	0.81	0.82	0.89	1.00	
f	0.64	0.76	0.77	0.76	0.76	0.76	0.80	1.00
ISSR								
h	1.00							
g	0.87	1.00						
a	0.80	0.80	1.00					
b	0.78	0.75	0.68	1.00				
c	0.74	0.74	0.79	0.69	1.00			
d	0.83	0.82	0.81	0.81	0.83	1.00		
e	0.78	0.76	0.78	0.69	0.77	0.81	1.00	
f	0.79	0.79	0.79	0.77	0.81	0.85	0.82	1.00
AFLP								
h	1.00							
g	0.81	1.00						
a	0.76	0.74	1.00					
b	0.76	0.80	0.80	1.00				
c	0.67	0.70	0.78	0.75	1.00			
d	0.79	0.75	0.77	0.76	0.75	1.00		
e	0.82	0.72	0.71	0.73	0.68	0.81	1.00	
f	0.76	0.75	0.71	0.78	0.68	0.79	0.78	1.00
Overall								
h	1.00							
g	0.81	1.00						
a	0.75	0.76	1.00					
b	0.76	0.80	0.79	1.00				
c	0.71	0.73	0.79	0.78	1.00			
d	0.80	0.77	0.77	0.78	0.77	1.00		
e	0.77	0.74	0.74	0.74	0.72	0.82	1.00	
f	0.75	0.76	0.73	0.78	0.72	0.79	0.79	1.00

Figure 3: Dendrogram based on algorithm of unweighted pair group method with arithmetic averages among cultivars (a-h, see Table 1) within or across type of marker. Single red line represents cultivars with white flowers, while double blue line represents cultivars with pink flowers.

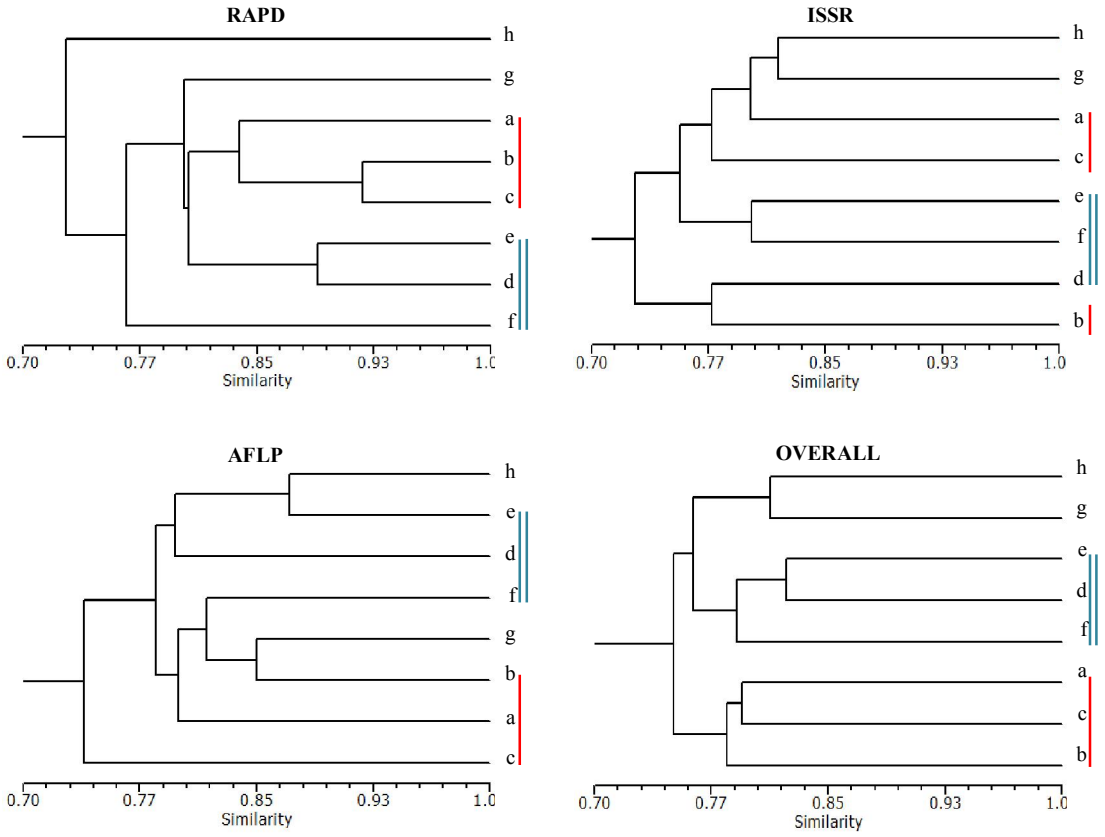

Figure 4. Similarity

Table 7: Analysis of molecular variance (AMOVA) of the different *C. roseus* cultivars.

Source	df[1]	SS[2]	MS[3]	Variance (%)
Among Pops	7	1.365	0.195	1
Within Pops	704	164.225	0.233	99
Total	711	165.590		

[1]df = Degrees of freedom, [2]SS = Sum of squares, [3]MS = Mean square

Table 8: Polymorphism information content (PIC), expected heterozygosity for polymorphic products (He), effective multiplex ratio (E) and the marker index (MI) of each marker type used across *C. roseus* cultivars.

Marker type	PIC	He	E	MI
RAPD	0.35	0.46	62	28.52
ISSR	0.37	0.49	53	25.97
AFLP	0.35	0.45	236	106.2

As being dominant markers, pooling (bulk DNA) strategy in ISSR, RAPD and AFLP analyses is thought to be ideal for saturating such an intra-plant polymorphism with no effects on the accuracy of the obtained results. Mengoni *et al*. (2000) indicated that 10% of intra-plant polymorphism, following the procedure of AMOVA (Excoffier *et al*., 1992), is statistically insignificant and acceptable.

Identification of molecular markers for cultivars and different flower traits

A high level of polymorphism was generated utilizing the 14 RAPD primers. A total of 672 amplicons, across genotypes and primers, were separated on agarose gel electrophoresis. Of these, 253 bands were polymorphic (38%). The highest number of amplicons was generated for cv. Patricia White (73 amplicons), while cv. Blue Pearl generated the lowest (57 amplicons). The highest number of cultivar-specific markers (18, see Tables 4 & 5), due to the presence of a unique band for a given plant cultivar (positive marker), was scored for cvs. Patricia White and First Kiss Polka Dot (4), while the lowest number was scored for cvs. Experimental Deep Pink and Victory Red (1).

ISSR is a relatively more recent class of molecular markers, which is based on inter tandem repeats of short DNA sequences. Such repeats were proven to be highly polymorphic even among closely-related genotypes due to the lack of functional constraints in these non-functioning DNA regions that was thought to result in the evolutionary changes in their DNA structures. Accordingly, a high level of polymorphism was generated utilizing the 17 ISSR primers. A total of 912 amplicons were

obtained in which 544 of them were polymorphic (60%) and the rest were monomorphic (40%). The highest number of amplicons was generated for cv. Patricia White (85 amplicons), while cv. Blue Pearl generated the lowest (49 amplicons). The highest number of cultivar-specific markers (see Tables 4 & 5) was scored for cv. Patricia White (5), while the lowest number was scored for cvs. First Kiss Polka dot, Experimental Deep Pink, Victory Red and Blue Pearl (2).

Four combinations were used in the AFLP analysis and revealed a total of 1533 amplicons, 981 of them were polymorphic (64%) among the different genotypes. The highest number of amplicons was generated for cv. Patricia White (221 amplicons), while cv. Blue Pearl generated the lowest (176 amplicons). The highest number of cultivar-specific markers (see Tables 4 & 5) was scored for cvs. Experimental Rose Pink (12) and Victory Red (8), while none was scored for Cooler Orchid. In conclusion, the four primer combinations of AFLP used in the present study allowed for the highest rate of distinction, as compared to RAPDs and ISSRs.

The number of cultivar-specific markers scored across cultivars and type of marker was as high as 79 in which 38 of them were generated during AFLP analysis, while 23 for ISSR and 18 for RAPD analyses (Table 5). The highest number of cultivar-specific markers across type of marker was scored for cv. Experimental Rose Pink (17), while the lowest was scored for cv. Experimental Deep Pink (5) (Table 4).

Across the different flower characteristics, a number of 100 markers were generated across type of marker (Table 5). The highest number of markers was scored for white petal trait (28), while the lowest was scored for colored petal trait. The highest number of markers was scored during AFLP analysis (65), while the lowest was scored during RAPD analysis (14).

Genetic relationships and cluster analysis

The genetic similarities among the eight cultivars of *C. roseus* species, based on Nei's method (Nei's, 1978), within and across markers are shown in Table 6 and Figure 3. The results of similarity indices and dendrograms within RAPD, ISSR and AFLP data indicated accumulative information towards the complete separation of the cultivars with white flowers (a-c) versus those with pink flowers (d-f). The resulted dendrogram of RAPD data was the closest to that resulted across type of marker. It was obvious that ISSR and AFLP data has diluted these relationships as generated dendrograms have placed the two categories of cultivars with white and pink flowers in three subgroups instead of two. ISSR dendrogram has the advantage of separating the red and blue colored cultivars in a subgroup (Figure 3). The results of genetic relationship between cultivars with white (a-c) and colored (d-h) flowers indicated complete separation across type of marker (Table 6 & Figure 3). The most closely related cultivars were First Kiss Polka Dot (b)/First Kiss Peach (c) for RAPD analysis (similarity index of 0.92), while Victory Red (g)/Blue Pearl (h) for ISSR analysis (similarity index of 0.87), Experimental Deep Pink (e)/Blue Pearl (h) for AFLP analysis (similarity index of 0.82), and Experimental Rose (d)/Experimental Deep Pink (e) across type of marker (similarity index of 0.82). On the other hand, the most genetically distant cultivars were Cooler Orchid (f)/Blue Pearl (h) for RAPD analysis (similarity index of 0.64), while unexpectedly Patricia White (a)/first Kiss Polka Dot (b) for ISSR analysis (similarity index of 0.68), expectedly First Kiss Peach (c)/Blue Pearl (h) for AFLP analysis and across type of marker (similarity index of 0.67 and 0.71, respectively). These results indicate the inadequacy of utilizing ISSR in genetic relationship among *C. roseus* cultivars as it indicated high genetic distance between cultivars with similar flower color (Patricia White (a)/first Kiss Polka Dot (b), Figure 3).

The partitioning of variation within and across *C. roseus* cultivars was studied with the analysis of the Dice's distance matrix by the analysis of molecular variance (AMOVA) approach. A hierarchical analysis of genetic diversity using a two-way nested AMOVA was performed. Results from AMOVA within and among population are shown in Table 7. Data indicated that 99% of the genetic variation is attributed to differences among populations, while only 1% of the genetic variation is attributed to differences within populations. The values of MS indicated the high level of polymorphism among genotypes and the low level of experimental error. This reflects the homogeneity in leaf samples collected for the study as a perfect representative of the target genotypes. The polymorphism information content (PIC), average of heterozygosity (H_e), the effective multiplex ratio (E), and the marker index (MI) were computed for each assay based on experimental data (Table 8). ISSR revealed the highest PCI and H_e (0.37 and 0.49, respectively) as compared to AFLP (0.35 and 0.45, respectively), then RAPD (0.35 and 0.46, respectively). The obtained results agreed with these of Powell *et al*. (1996). Muzher (2005) found that H_e of RAPD was more than AFLP. However, the results of ISSR data analysis indicated the inadequacy in utilizing this type of marker in detecting genetic relatedness among *C. roseus* cultivars. With regard to the E value and MI, ISSR indicated the lowest records (53 and 25.97, respectively), while AFLP (236 and 106.2, respectively) and RAPD (62 and 28.52, respectively) indicated higher values. In general, the results of ISSR can be considered less reliable than AFLP or RAPD. Reliability of ISSR can be improved if more primers were used in characterizing cultivars.

It could be concluded that markers differ in their ability to differentiate individuals, in the mechanism of detecting polymorphism, genome

coverage, and the ease of application. They can be complementary to each other, as it is the case in the present study, depending on technical availability. Some of these markers can be linked to flower characteristics in *C. roseus* as well as to the levels of the anticancer compounds VC and VB. There are recent efforts towards breeding genotypes with high TIAs levels via MAS (Dekkers & Hospital, 2002, Lorz & Wenzel, 2005, Sharma *et al.*, 2012) that can be duplicated. The versatility and continuous flowering habit of *C. roseus* have enhanced breeding efforts to expand the availability of flower colors to detect economic traits (van der Heijden *et al*., 2004). Although a little is known about the effects of breeding for flower color on the levels of MIAs, there are few articles indicating that colored flower is linked to the high level of MIAs (Sharma *et al.*, 2012). For example, the accession 'Pink Delhi' has pink-colored flower petals, less salt and drought tolerance and high levels of MIAs, while accession gsr8 has white-colored flower petals, more salt and drought tolerance and low levels of MIAs. These observations were recorded in many recent works (ex., Gupta *et al*., 2007, Chaudhary *et al*., 2011, Sharma *et al.*, 2012).

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Benefits, clinical facts and potential complications associated with overnight Orthokeratology

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Abstract: Orthokeratology, also known as corneal reshaping, is a clinical technique designed to alter corneal shape, and in terms providing a temporary correction of myopic refractive error. Although there is no direct evidences showing that orthokeratology itself can halt or even reverse the progression of myopia, there are studies indicated that the procedure can suppress axial length elongation in childhood myopia. Despite its low incidence rate, microbial keratitis is a potential complication of overnight orthokeratology that may cause significant visual impairment. In this article, we will focus on the benefits, clinical facts and potential complication such as infectious keratitis associated with orthokeratology.

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Keywords: Orthokeratology, Corneal reshaping, Microbial keratitis, Myopia progression, Axial length

1. Introduction

Myopia is one of the most common ocular conditions in humans, affecting 25% of the United States population between the ages of 12 and 54 years.[1] The prevalence of myopia varies in different regions of the world, being higher in Asians (38.7%) than in Caucasians (17%).[2,3] In the adult Hong Kong Chinese population, prevalence of myopia is as high as 71%.[4] It is a fact that the earlier the patient diagnosed as myopic, the higher chance he or she will have more severe myopic side effects later in life and these include retinal detachment, macular degeneration, glaucoma, and ultimately blindness. The associated risk of these complications developing increases with the severity of myopia and axial length.[5] The World Health Organization identified myopia as one of the five leading causes of blindness and visual impairments in the world.[6] Progression of youth-onset myopia is attributed widely to axial length elongation, which cannot be compensated by reductions in the corneal and crystalline lens power; however, the detailed mechanisms involved in the etiology of myopia remain unclear.[7]

Orthokeratology has gain popularity, with predictable results of reverse geometry lens, patients only have to wear the lenses at night during sleep and able to see clearly without aids after removal on awakening, and continue to have relatively clear vision at the daytime. In addition, there are hypotheses suggesting the possibility of orthokeratology retarding myopia progression. We will discuss several clinical facts of orthokeratology and hopefully allow readers to better understand the mechanism behind it. Microbial keratitis is the most severe, adverse response associated with orthokeratology contact lens wear. In this article we will also discuss orthokeratology related infectious keratitis and to discuss the potential reasons causing it.

2. Material and Methods

Best corrected visual acuity was done by using Topcon phoroptor. Documenting ectatic condition was done by Dicon topographer (Paradigm Medical, USA) and keratometry reading via Topcon keratometer. Corneal pachymetry performed by Orbscan II. Contact lenses used are Dreimlens Orthokeratology lens, Euclid Orthokeratology lens, and Paragon (CRT) Orthokeratology lens.

3. Results and Discussion

The reverse geometry of orthokeratology contact lens has a flat central curvature with a steep secondary curve. (Fig. 1 and 2) The flat central area exerts a positive pressure on the cornea and induces flattening. These lenses are advised to be worn during sleep and allow the patient to achieve improved uncorrected visual acuity during the daytime.

The followings are the clinical facts and hypotheses of overnight orthokeratology generally accepted by Eye care practitioners today.

1. Acceptable vision without aids at daytime: As the designed reverse geometry lenses are worn, the cornea is reshaped, and the predicted amount of myopia is reduced as the patient sleeps. After removal of the lenses upon wakening, relatively good

vision is maintained without any optical aids during the daytime.

2. Suppression of axial length elongation in childhood myopia: In 2005, Cho et al. reported that axial length in children increased over a 2-year period by 0.29 ±0.27 mm in an OK treated group and by 0.54 ±0.27 mm in a control group treated with spectacles.[8] In 2009, Walline et al. reported similar findings, whereby the mean increase in axial length after 2 years was 0.25 mm in the OK group and 0.57 mm in the control group.[9]Sinceprogression of youth-onset myopia is attributed widely to axial length elongation, this may imply the use of orthokeratology may slow down the progression of myopia in children.

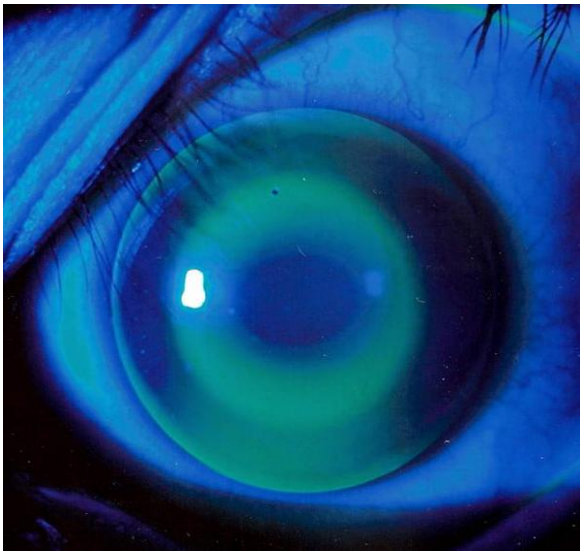

Fig. 1. Spherical orthokeratology lens fitted on a cornea with high astigmatism.

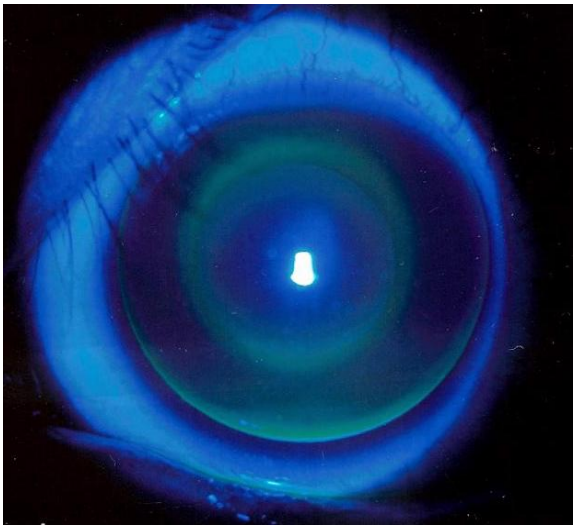

Fig. 2. Spherical orthokeratology lens fitted on a cornea with mild astigmatism.

3. Less effective in slowing axial elongation in lower degree of myopia: It has been reported in a previous study that OK is less effective in slowing axial elongation in low compared to higher degrees of myopia.This may be a good hypothesis because it means that with orthokeratology, the axial length of higher degree of myopic patient would elongate less than that of lower myopic patients in the same amount of time.

4. Creating myopic defocus in the periphery in myopic children may provide a potential mechanism for myopia control: There are studies showing that inducing hyperopic defocus on the peripheral retina promoted the development of central axial myopia in infant monkey. [10]Therefore, by converting peripheral hyperopia measured at baseline to relative peripheral myopia, one would expect less central axial elongation in myopic children with orthokeratology lenses. This hypothesis suggests that the earlier the orthokeratology lens been worn, the better retardation on axial length elongation.

5. Corneal epithelium is the principal structure affected by the mechanical forces exerted by the OK lens: Central corneal epithelium undergoing significant cell shape and size alteration in response to orthokeratology contact lens. On the other hand, no much change happened on the cells of corneal endothelium or stroma. Total peripheral corneal thickness is hence increased in comparing to that of baseline values.

6. Superior inhibitory effect on axial length elongation: The inhibitory effect of OK on axial length elongation was superior to that of progressive addition lenses wearing and topical administration of pirenzepine ophthalmic gel.[11]

All of these studies and findings demonstrateda clinical benefit of orthokeratology in retarding axial growth in myopic children.

Although the risk of infection with overnight orthokeratologyis rarely reported, this complication can be devastating and potentially vision-threatening. Besides, it is likely that many cases of infection are not reported. The availability of high-DK materials for rigid gas-permeable contact lenses and reverse-geometry design has not completely eliminated infectious keratitis as a complication of

orthokeratology. There are many risk factors for microbial keratitis (Fig.3, 4 and 5) associated with orthokeratology contact lens, and they include overnight lens wear, prolonged corneal hypoxia, and poor patient compliance with lens(Fig. 6) and lens case hygiene.[12] It has been known that overnight wear is the most important risk factor for infectious keratitis among all types of contact lens users. Several studies have shown that overnight contact lens wear, including wear of high oxygen

transmissibility RGP lenses, impairs theepithelial barrier because of the reduced oxygen transmissionthrough contact lens. In addition, lack of eye movements thathelp disrupt the bacterial glycocalyx and spreads lysozymeover the corneal surface can render the eye more susceptible tobacterial infection.[13]

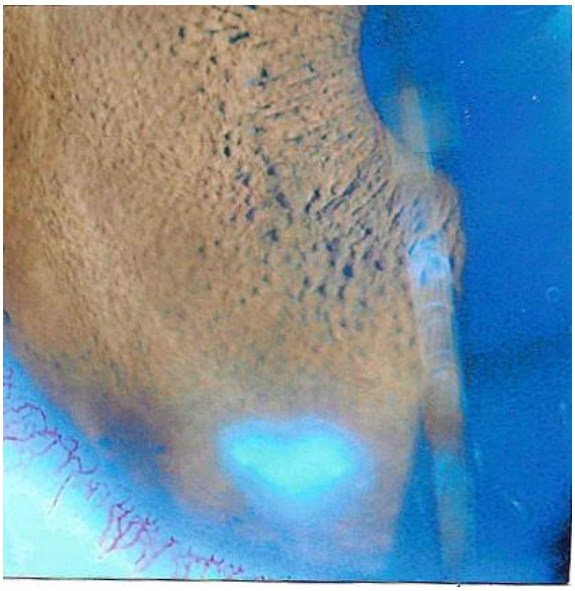

Fig. 3. Microbial keratitis ulcer at inferior peripheral cornea.

Fig 4: Microbial keratitis ulcers at central cornea.

Many species of microorganism have been cultured and identified from the Overnight orthokeratology infectious keratitis, and they include Pseudomonas aeruginosa , Staphylococcus species , Serratia marcescens, andAcathamoeba species. Pseudomonas aeruginosa is the most frequently isolated pathogen, because it is known to be the most common pathogen of contact lens–related corneal ulcers. In view of the high prevalence of *Acanthamoeba* keratitis reported, indicating the importance of eliminating the use of tap water in care regimens for overnight orthokeratology. Most of the infected patients responded well to treatment with antimicrobial medication, but often recovered with worsen corrected visual acuity range from 20/20~20/100 depends on the location of ulcer, severity of infection, and any delay in seeking urgent ophthalmic care. With recent raised popularity of orthokeratology, eye practitioners including optometrists and ophthalmologists, should be more careful in monitoring patients wearing theses lenses and to take extra step in educating both the parents and patients the importance of keeping proper contact lens hygiene.

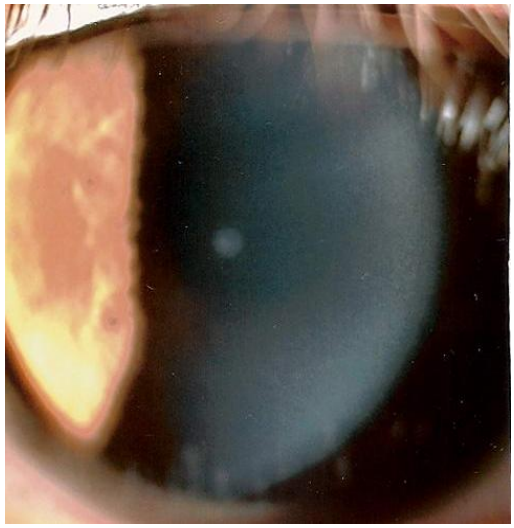

Fig. 5. Asmall central microbial keratitis ulcer.

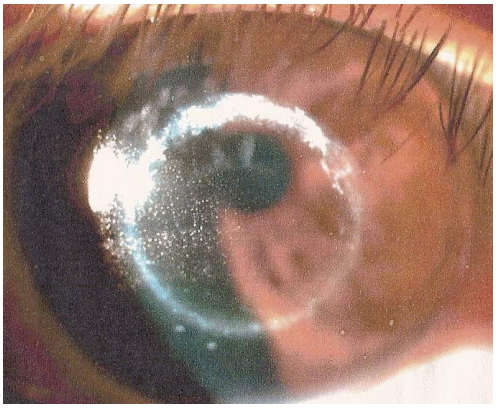

Fig 6: Heavy deposit at reverse curve on an orthokeratology lens.

4. Conclusion

Although the detailed mechanisms of myopia remain unclear, orthokeratololgy's effectiveness in slowing axial elongation may suggest its capability in retardation of myopia progression. In view of benefits and risks of orthokeratology, it is important to make sure both the parents and the wearers understand the pros and cons of the treatment, especially the potential complication of infectious keratitis associated with it. Patients wearing orthokeratology lenses should be instructed to remove their lenses and seek immediate medical treatment, if any symptoms of eye discomfort should occur.

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12/21/2012

Comparison the Energy Consumption in Modern and Ancient Green houses and its Effective Factors

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Abstract: Agricultural development and increasing the amount of producing factor profits related to this part such as energy has very importance in our country economic. So in recent years, energy consumption optimization in agriculture department and its role on performance recovery and profit and in result its diligent profitable was paid attention with researchers. Different factors such as applied technology in greenhouse constructions could be effective on energy consumption optimization. So by attention to this important subject related to energy consumption and technology role of green house construction in agriculture department, aim of this research is evaluation the applied technology role in construction of treed cucumber green houses of Tehran province on related energy consumption to this department. The current article is applied using the mining data from 22 completed questionnaires by managers of treed cucumber green houses of Tehran province in 2011 using the logic method. In this research, two models are formed to hypothesis evaluation. In first model, the main independent variable (which we was discussed) was applied technology in greenhouse (ancient or modern) and the dependent variable is energy consumption amount and rate in each m^2 of greenhouse under cultivation area .In second model, the main independent variable was applied technology in greenhouse construction and the dependent variable is energy profit amount and rate. This study results show that contemporary to up to dating and more modernity applied technology in green house constructions of treed cucumber green houses of Tehran province, we will need to lower energy for producing distinct amount and rate of the same product.

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Keywords: Energy Consumption, logic method, Tehran province, Green houses

Introduction:

Above human population developing and their nutrition need preparations is
propelled the humankind towards dense agriculture. Green house cultivation is one of the most important methods related to this kind of agriculture which it has some characteristics such as: characteristics related to greenhouse using for more production in ideal and desired time but with more energy consumption in comparison to the natural and normal cultivation. Hence, economic and energy analysis in addition to technical analysis are among important necessities in greenhouse project evaluations.

This method has some virtues and defaults. One of its virtues is more production rate in area as we can take up to 10 times product more than normal method in the same area (Bakker, 1999).One of other its virtues is out time product crop that it is caused to high rate resources consumption (in money and energy) by farmer to apply this method but greenhouse construction has some defaults, too.

The main default of this method is anomalous energy consumption by producers. Somehow the producer is cultivated by high energy consumption that in our country, energy consumption is more than other countries because of subsiding energy consumption by our farmers and as a result of low cost related to energy, the farmer doesn't any action to energy consumption reduce. But finally, the main part of the farmer income will be consumed to energy preparation (for green house cooling and warming).

Therefore, by cultivation method evaluation and also definition the energy consumption steps we could make possible more production by lower energy consumption to energy consumption reduce (Elbatawi, 1998).

Nowadays many studies are applied related to industry and using the machines and instruments role in environment destruction and in according to this, some terms are created such as permanent development. Meantime, energy consumption role and permanent development are important subjects related to development somehow nowadays, some developed countries to evaluation the economic development use to green internal impure production instead of evaluation the internal impure production changes during a distinct period and in this manner, it considers effect of environment destruction costs, contemporary .Greenhouse cover causes to greenhouse effect creation and jailing the solar energy within the greenhouse. Greenhouses which are different from their size will be kept the plants against the severe cold in winter or severe heat in summer.

Green house assigns to a limited space which it has ability the appropriate environment conditions to growth the different region plants during different seasons of a year. According to this definition, some things such as

green house action and preparation the necessary environment conditions and necessary products are defined, too. Green houses will be divided to constant and mobile on the basis of their applied building materials. Constant greenhouses assigns to green houses with stable and durable applied building materials in their construction. So we must use them many years.

In general, green house is a covered building with different materials such as plastic roofs, glazed roofs and plastic and glazed walls. Green house is warm because of absorption the visible solar light (because of glass transparency) by plants, soil and other parts of the building. Hot air with internal hot surface will be kept by the building walls and roofs. In addition to, structers and hot plants within the green house radiate again some of their thermal energy in infrared spectrum which the glass is some deal filmy into it. So, some of this energy will be kept in greenhouse, too but the second process roles as second role in comparison to the previous process (is thermal).This theme shows as opening the small window near the green house roof and the temperature will be reduce, remarkably. Then, applied window in the greenhouse performed as a barrier related to air outflow and its effect is energy keeping within the green house. Hot air near the ground set up a barrier against its unlimited increasing and its exit. However, thermal exit will be happened because of within glass and other building material's thermal conduction and also, pure energy within the green house (and in result temperature) increases.

In Varamin despite constructing many green houses and such other construction request, evaluation on constructed green houses from the point of view of consumed energy rate is very necessary and it can be very important. So tender any method that can has the positive role on energy consumption reduction, could cause to reduce the final product cost and in result producer's increasing income.

Theoretical literature:

Concerning internal researches, it can point at related accomplished studies such as Tachi et.al (2011) in their study as name the analysis of energy utility related to greenhouse cucumber product attended to data covering analysis related to Shahreza located in Isfahan province and showed that fuel with 47% and consumed water with 2 % allocate maximal and minimal energy consumption portion, respectively. These results indicated that in return to constant indicator as a model, 24% and in return to variable indicator as a model, 36% of whole units had 100% as utility and other units will be inefficient in different degrees. Means of technical utility, pure technical utility and indicator utility evaluated as 90/37, 95/09 and 94/6, respectively. Also, Mean of technical utility related to inefficient units was evaluated as 87% in constant indicator that it means 13 % whole resources could be saved by increasing these unit utilities. In this research, maximal incorrect energy consumption and also maximal whole saved energy is related to the consumed fuel. Also, Marsalis et.al (2005) about evaluation the northwest green houses of Europe expressed that these greenhouses consume lots energy which most portion of the consumed energy uses to green house heat and ventilate. In their applied study, they showed that by technology changing such as replacing the using anti perspiration materials in tomato, pepper and cucumber, respectively could reduce the energy consumption rate as 5/5-10/4, 5-9 and 2 to 5%.This energy consumption reduce has not any effect on performance reduce.

Medina et.al (2006) also expressed that greenhouse technology enhancing can increase the performance and quality rate. Whole consumed energy for 1 ton tomato is equal to 1108/7 Mega jowl in tone which it is so lower than the same in north of Europe. Ground size in a year for 1 ton is 3/85 meter and water amount is 28 liter/kg. They resulted in the end that Tomato performance and output recovery and also Water consumption (usage) efficiency (WUE) create in result of technology increasing which it is one key factor for environmental effects. Chetin et.al (2008) during evaluation the tomato produce greenhouses as industrial found that tomato produce needs to 455/3GJ/1000m2 as energy consumption that their 34/82% is related to fuel energy and then to compost and following to machine energy. Energy rate is 0/8 and energy profit is equal to 0/99 kg/MJ. Iera yeozoz et.al (2003) evaluated two green house products means tomato and asparagus in Navaria related to Spanish and they evaluated the technical efficiency related to these two product crops. Their results showed that farmers could reduce the produce costs using the high output choose and also, they cause to performance and profit increasing.

Discussion and conclusion:

In this section after date mining related to 2011 to some of green houses of Tehran province which they were holding the cucumber cultivation, using logic method and creation the proper function to the scientific framework, this measurement applied. Onset, in the first model, some variable effects such as manager's education level, greenhouse age, and ownership kind and finally the applied technology will be evaluated on energy consumption in under studying greenhouses. In second model used to independent variables .To evaluate these variable effects on energy profit uses of the first model. In this section, at first above mentioned subjects is Reviewed in summary and then a description related to these variables and also research method will be introduced. At the following, extracted results of this research and research hypothesis tests will be evaluated. And in the end, in according to these results, some recommendations will be introduced to energy consumption reduce and its profit management in our country greenhouses. In this conclusion must say that in this study, two models will be created to research hypothesis Tests. In first model will be attended to

effective elements on energy consumption in treed cucumber greenhouses .In this model we will try to test the zero hypothesis related to that energy management in modern greenhouses is better than ancient ones and it will be caused to better energy consumption. Hence, in this model is used to energy consumption rate in each m^2 from cultivated area as the dependent variable. In dependent variables are also such as green house age, greenhouse ownership kind, manager's education level and applied technology in the green house.In this model, applied technology in the green house was as the most important designed variable and so we want evaluate its effect on the dependent variable. In second model is used to energy profit as the dependent variable to evaluate the effective elements on energy profit in under studying green houses and most important of whole, to evaluate the applied technology role in the greenhouse in energy profit in this section. In dependent variables are as same the first model means green house age, greenhouse ownership kind, manager's education level and applied technology in the green house. In this model, applied technology in the green house was as the most important designed variable and so we want evaluate its effect on the dependent variable. One special kind of statistic evaluates are regression pattern that dependent variable in it will be defined as a qualitative variable. So in many regression analysis, dependent variable not only is under effect of quantitative variables (such as: income, cost and price (with the current indicators, but also it follows the qualitative variables in their nature, too. On this basis qualitative variables, in general, indicates being or not being a quality or a character. So that one related method to numeration these characteristics is considering some imaginary variables with accepting two amounts: zero and one for it that the zero number expresses its character inexistence and one shows its existence. Thus in this study two above models will be studied using the logic method. Now a days, this method calculates as one of most applied statistic methods that it has a special position and level in different kinds of experimental studies and it uses in the current study to its qualitative data and also logic method benefits. In this section defined that many elements will be effective on energy consumption profits in green houses and also energy consumption rate evaluating such internal and external studies related to the current study subject.Which model measurements will be showed that independent variables, that it's most important is applied technology in the greenhouse; will be effective on the dependent variables. In according to hypothesis and current related studies to agriculture development and growth, one of most important necessities related to agriculture development and growth in every society is saving and best energy using. Hence, discussion of best energy using management and its following energy consumption costs and prices are from diplomat and economic office manger's principal aims related to each active office in our country agriculture department. Nowadays not only in Iran but also in the universe, energy lack and .In result its high energy consumption costs is changed as one serious problem to agriculture department and society economics. Because that management discussion and also best energy using has a definite role in agriculture activities and need and necessary nutrient preparations not only in its economic aspect but also in social and political aspects,too.On one hand nowadasys introduces that we could using the new technologies, reduces energy consumption price and cost by saving in its use and following increases the profit amounts of agriculture department which it is one of most vital related to economic departments, using development the new science and techniques and using the appropriate and suitable instruments and tools to energy consumption rate reduce and high energy profit. It can be addressed that agricultural economic development and raise in European societies in recent decades shows results of using the new techniques and minimizing energy consumption rate. Also applied studies related to agriculture economic shows that the government could has an effective role in development of our country agriculture department by itself punitive and /or bonus tools and techniques. Therefore, governor protection from our country agriculture department is located a lot importance. One of the most current ways related to protection from economic offices is presentation the credit facilities for preparation the suitable condition to use of new techniques and also prevention of energy consumption more than need limit. Because that best energy using is one of most important problems which all societies are in confronting to it, there are many studies and hypothesis in this field. Which each of them (whether internal or whether external) is often studied one variable effect on energy profit. In current study, by adding and summing up whole these studies and hypothesis, we attended to evaluate the green house construction technology role (how modern or ancient) on energy profit and consumption in our country green houses. These model estimated results showed that up to dating the technology related to green house construction has the positive and significant role on energy profit and its suitable management related to energy consumption as this with more up to dating these green house constructions, product cost of each product will be decreased in corresponding to energy consumption decrease and it will be following caused to profit and development of agriculture department. So greenhouse modernity indicates as one important element in energy consumption decrease and also development the energy profit rate in our country green houses. Also green house age as a variable has a negative and significant effect on energy profit and against it will be caused to more energy consumption. Green house age rising for necessary attrition and inefficiency cause to lower energy preparation cost for each product crop. Kind of green house ownership is another important element in energy consumption by our country green houses; too,

somehow concurrent to rising rate of private ownership, energy consumption management will be more appropriate, too. In result, we will expected that private green houses have better energy consumption management than others and in these greenhouses, energy profit rate will be upper and better and then energy consumption costs will be decreased, considerably.In addition, according to extracted results, manager's education level is another important element on energy profit so; there is a significant and positive relation between energy profit and green house manager's education level. In result we expect that energy consumption rate and amount for each product crop will be decreased with rising green house manager's education levels and the following it, energy profit rate will be increased because that high educated managers will be noted as social capital and source that this social capital has the positive effect on product function and also increasing the whole product elements profit rate. Therefore, it can be concluded that green house manager's education level will finally caused to product cost reduce and the following agriculture department development and growth.Most important extracted results in this study are as follows in summary:

a) Using of the new technologies as one important tool for rising energy profit and recovery rate in our country green houses is posed.

b) There is a positive and significant relation between energy profit and green house manager's education level so green house manager's education level can cause to product cost reduce and also agriculture department development and growth.

c) Green house ownership kind is one other important involved element on energy consumption rate in our country greenhouses so concurrent to rising private ownership, energy consumption management will be more appropriate, too.Undoubtedly, increasing rate of energy profit and recovery will be one defined element in future economic level of both developing and developed countries. Therefore, attention to this economic phenomenon in strategy writing and economic growth policies especially in agriculture economic is one necessary work and one of agriculture policies and manageress's important aims. Here about, attention to related applied studies could more effective help in increasing the energy profit and recovery rate in our country green houses. So on these research findings, the following cases will be recommended:

1-Using of the new technologies in our country greenhouse constrictions

2- Using of high educated managers and employers in our country green houses.

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