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**Institute of Integrative Omics and
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Dear Esteemed Readers, Authors, and Colleagues,

I hope this letter finds you in good health and high spirits. It is my distinct pleasure to address you as the Editor-in-Chief of Integrative Omics and Applied Biotechnology (IIOAB) Journal, a multidisciplinary scientific journal that has always placed a profound emphasis on nurturing the involvement of young scientists and championing the significance of an interdisciplinary approach.

At Integrative Omics and Applied Biotechnology (IIOAB) Journal, we firmly believe in the transformative power of science and innovation, and we recognize that it is the vigor and enthusiasm of young minds that often drive the most groundbreaking discoveries. We actively encourage students, early-career researchers, and scientists to submit their work and engage in meaningful discourse within the pages of our journal. We take pride in providing a platform for these emerging researchers to share their novel ideas and findings with the broader scientific community.

In today's rapidly evolving scientific landscape, it is increasingly evident that the challenges we face require a collaborative and interdisciplinary approach. The most complex problems demand a diverse set of perspectives and expertise. Integrative Omics and Applied Biotechnology (IIOAB) Journal has consistently promoted and celebrated this multidisciplinary ethos. We believe that by crossing traditional disciplinary boundaries, we can unlock new avenues for discovery, innovation, and progress. This philosophy has been at the heart of our journal's mission, and we remain dedicated to publishing research that exemplifies the power of interdisciplinary collaboration.

Our journal continues to serve as a hub for knowledge exchange, providing a platform for researchers from various fields to come together and share their insights, experiences, and research outcomes. The collaborative spirit within our community is truly inspiring, and I am immensely proud of the role that IIOAB journal plays in fostering such partnerships.

As we move forward, I encourage each and every one of you to continue supporting our mission. Whether you are a seasoned researcher, a young scientist embarking on your career, or a reader with a thirst for knowledge, your involvement in our journal is invaluable. By working together and embracing interdisciplinary perspectives, we can address the most pressing challenges facing humanity, from climate change and public health to technological advancements and social issues.

I would like to extend my gratitude to our authors, reviewers, editorial board members, and readers for their unwavering support. Your dedication is what makes IIOAB Journal the thriving scientific community it is today. Together, we will continue to explore the frontiers of knowledge and pioneer new approaches to solving the world's most complex problems.

Thank you for being a part of our journey, and for your commitment to advancing science through the pages of IIOAB Journal.



Yours sincerely,

Vasco Azevedo

Vasco Azevedo, Editor-in-Chief
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ARTICLE

PREPARATION AND STRUCTURAL PROPERTIES OF POLYANILINE/COTIO3 NANOCOMPOSITES

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ABSTRACT

In this study, poly aniline-cobalt titanate nano composites (NCs) with two content loadings of CoTiO₃ (10 and 20 wt%) were prepared successfully. Fourier-transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), scanning electron microscopy (SEM), energy-dispersive X-ray diffraction (EDX), diffuse reflectance spectroscopy (DRS), and zeta potential were used to characterize the structure and properties of the obtained NCs. The results indicated that CoTiO₃ NPs with an average particle size of 47 nm were distributed in the poly aniline (PANI) matrix; DRS analysis indicated the presence of semiconducting behavior in the NCs. The zeta potential indicated that the fabricated PANI/CoTiO₃NCs with 10 and 20 wt% of CoTiO₃NPs were increased with 83% and 93%, respectively.

INTRODUCTION

As a typical conducting polymer, PANI is one of the most promising electricity-conducting polymers due to its unique electrical and electrochemical properties, easy polymerization, high environmental stability, and the low cost of the monomer [1-3]. The attention PANI has received is attributable to these characteristics and its widespread use in microelectronic devices, diodes, light weight batteries, sensors, and super capacitors. PANI is also used for microwave absorption, inhibition of corrosion, and other related applications [4-8]. The properties of PANI can be tailored by changing its oxidation states and dopants or through blending it with other organic, polymeric, or inorganic nano-sized semiconducting particles to obtain materials with synergistic advantage. Various composites of PANI with inorganic NPs such as CeO₂, TiO₂, ZrO₂, Fe₂O₃, and Fe₃O₄ have been reported. Metal-containing titanium-based oxides such as MTiO₃ (M: Ni, Pb, Fe, Co, Cu, and Zn) are universally known as inorganic functional materials with broad applications. These oxides can be used in a variety of industrial applications including as electrodes of solid oxide fuel cells, metal-air barriers, gas sensors, high-performance catalysts, and ferroelectric random access memory [9-20].

The interest of researchers in CoTiO₃ has increased in recent decades due to its physiochemical properties, which permit its use in applications such as pigments and magnetic recording media, as a gas sensor for alcohol content, and as a humidity sensor [21] and catalyst [22]. Oxide-based magnetic nanoparticles have been investigated by many researchers because of their interesting magnetic properties, including (among others) super-paramagnetic physical properties (mechanical, thermal, etc), which allow polymers to be improved by adding inorganic materials to polymer matrixes; relaxation phenomena; the surface effect caused by their canted spin structure; and magneto-electrical transport. They also have immense potential for applications in the areas of high-density data storage, ferro fluids, magnetic resonance imaging, color processing, and magnetic refrigeration [23]. Super paramagnetic behavior has often been observed in magnetic nanoparticles of dimensions of a few nanometers [24]. In some previous studies, the critical size was estimated to be approximately 30 nm in diameter for a spherical sample of common ferromagnetic materials.

In this study, PANI/CoTiO₃ NCs with two (10, 20 wt%) content loadings of CoTiO₃ were prepared, and the procedure and structural characterization of all PANI/CoTiO₃ NC phases have been investigated using Fourier-transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), scanning electron microscopy (SEM), energy-dispersive X-ray diffraction (EDX), diffuse reflectance spectroscopy (DRS), and zeta potential.

MATERIALS AND METHODS

Cobalt acetate, tetra-n-butyl titanate, stearic acid, potassium iodate, and sulfuric acid were used in the experiments (Merck). The composition of the sample was estimated using EDX attached to a scanning electron microscope at an acceleration voltage of 25 kV (KYKY Model EM 3200; Madell Technology Corporation, Ontario, California, USA). The FTIR spectrum was recorded with a PerkinElmer (Waltham, Massachusetts, USA) Spectrum RX1 using a KBr pellet. The XRD patterns of the powders were recorded on a Seifert Technologies (Massillon, Ohio, USA) diffractometer (Model PTS 3003) using Cu K α radiation ($\lambda=0.15418$ nm) in the range $2\theta=20^\circ$ to 70° to examine the crystallization and structural development of the PANI/CoTiO₃ nano composite. The SEM pictures were recorded with the KYKY Model EM 3200 electron microscope at the previously noted accelerating voltage. DRS patterns of the powders were recorded on a Model Scinco S-4100 (Scinco; Seoul, South Korea). Streaming zeta potential measurements were carried out on a Zeta CAD instrument (France).

KEY WORDS

Nano composite,
CoTiO₃, XRD, EDX, DRS,
zeta potential

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Synthesis of CoTiO3 nanoparticles

CoTiO3 NPs were prepared through a modified wet-chemistry synthesis method that has been described in the literature [25]. In this procedure, a fixed amount of cobalt acetate was added to the melted stearic acid and dissolved. Stoichiometric tetra-n-butyl titanate was then added to the solution, stirred to form sol, naturally cooled to room temperature, and dried to obtain dried gel. Finally, the gel was calcinated in air at 600 °C to obtain CoTiO3 NPs.

Synthesis of PANI/CoTiO3 nano composites

In order to prepare PANI/CoTiO3 NCs, the essential substances for the preparation of PANI were added Fig (1). To prepare PANI, 1 g potassium iodate was added to 100 ml of sulfuric acid (1 M), followed by magnetic mixing to create a uniform solution. After 30 min, the amount of ultra sonicated CoTiO3 NPs required preparing 10 and 20 wt% of PANI/CoTiO3 NCs was added to the stirred aqueous solution. After 20 min, 1-ml fresh distilled aniline monomer was also added. Reactions were carried out for 5 h at room temperature. The obtained product was subsequently dried at temperatures of about 60 °C in the oven for 24 h [26]. Finally, PANI/CoTiO3 NCs were obtained after heat-treatment from 60 °C to 300 °C for 2. As described earlier, the entire procedure and structural characterization of PANI/CoTiO3 NCs phases were investigated using methods including FTIR, XRD, SEM, EDX, DRS, and zeta potential. To overcome this limitation, in this study, poly aniline/CoTiO3 nano composites were prepared by using a sol-gel synthesis process, as shown in [Fig. 1].

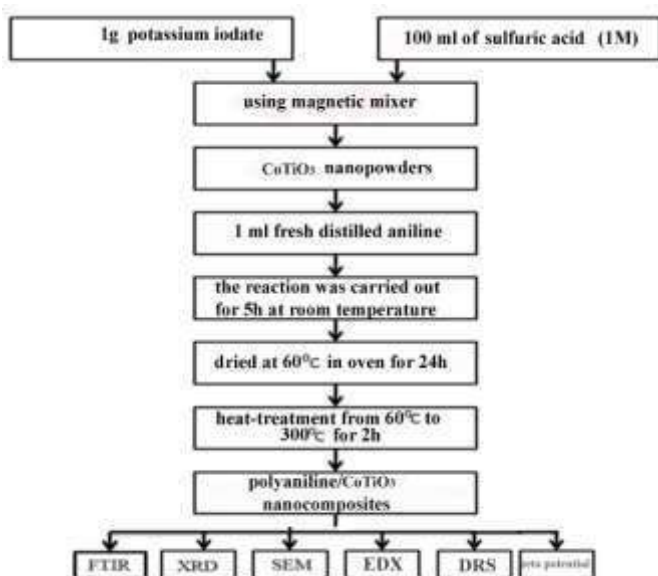


Fig.1: Poly aniline/CoTiO3 nano composites preparing.

RESULTS AND DISCUSSION

FTIR analysis

[Fig. 1] shows the FTIR spectra of CoTiO3NPs, pure poly aniline and its NCs with two content loadings (10 and 20 wt%) of CoTiO3NPs. In [Fig. 2(b)], the absorption peaks at 1480 and 1564 cm⁻¹ correspond to the C=C and C=N stretching modes for the benzenoid and quinoid rings [27]. The peak at 1293 cm⁻¹ is related to the C-N stretching vibration of the benzenoid unit; the band at 799 cm⁻¹ is assigned to out-of-plane C-H bending of the aromatic ring [28]; and, finally, the peak at 1168 cm⁻¹ is attributable to C-N stretching of the secondary aromatic amine [29]. A slight shift in the absorption peaks of composite [Fig. 2(c, d)] is observed compared to PANI and may be due to the interaction between PANI and the surface of the Mn TiO3NP. The FTIR spectra of the PANI/CoTiO3NCs, shown in [Fig.1 (c, d)], are almost the same as those of pure PANI. The absorption peaks under the 800 cm⁻¹ are attributed to the vibrations of the Co-O and Ti-O bands in CoTiO3 NPs [25], a result that indicates the PANI//CoTiO3 NCs have been synthesized successfully and the observed shift indicates the interaction between PANI and CoTiO3 NPs.

XRD study

XRD patterns were recorded to analyze the crystal phases. [Fig. 2] shows the XRD patterns of poly aniline, CoTiO3 NPs, and PANI/CoTiO3 NCs with different loadings of nanoparticles. The obtained XRD patterns of

CoTiO₃ powders after heat treatment at 600 °C in air for 2 h are shown in Figure 2b. At this temperature, the nano powders displayed sharp and intense peaks, indicating a fine crystalline rhombohedral CoTiO₃ phase. All peaks corresponding to the rhombohedral phase matched well with the database in JCPDS (file number: 77-1373). The XRD pattern of PANI [Fig. 2(a)] shows that PANI has a partly crystalline structure; the two broad peaks are observed at 2θ=20.41° and 25.61° [29]. In [Fig. 2(c-d)], the diffraction peaks at 2θ=20° and 25° correspond to PANI, and the prominent peaks at 2θ=33°, 36°, and 54° correspond to CoTiO₃ nanoparticles. On comparison of XRD patterns of CoTiO₃, PANI, and PANI/CoTiO₃ composites, it is confirmed that CoTiO₃ retained its structure on dispersion in the PANI matrix during the in situ polymerization reaction. The results show that as the CoTiO₃ content increases in 10% and 20% weight fractions, the intensity of the CoTiO₃ crystalline peaks gradually increases. With doping of the PANI matrix with CoTiO₃, the crystal structure of CoTiO₃ was still stable.

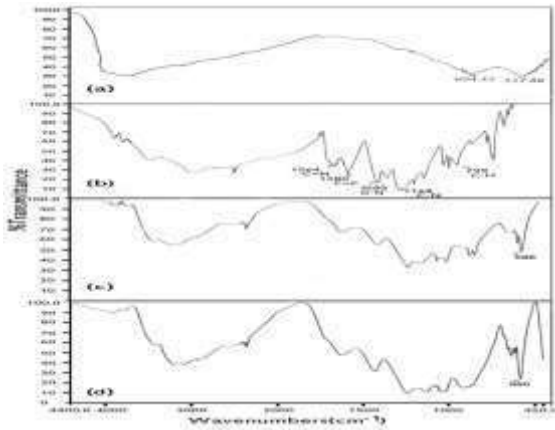


Fig. 1: The FTIR analysis Patterns of the PANI/CoTiO₃NCs.

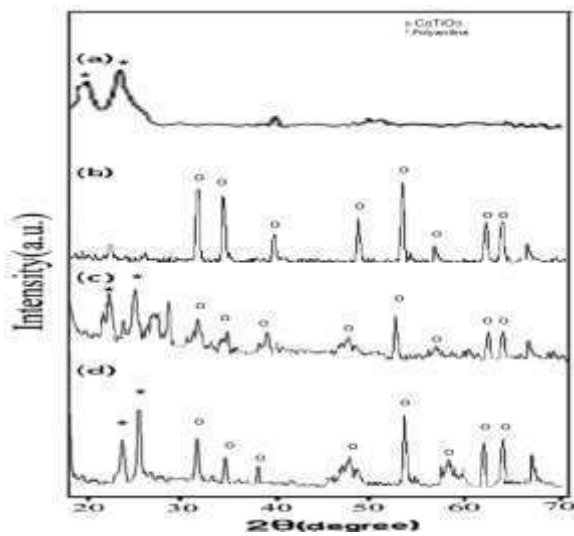


Fig. 2: The XRD Diffraction Patterns of the PANI/CoTiO₃ NCs calcined at (a) 60°C; (b) 100°C, (c) 200 and (d) 300°C.

Morphology of samples

The particle size of powders can be calculated by Scherrer's formula ($t = k\lambda / \beta \cos\theta$), where t is the average size of the particles, assuming particles are spherical, $k=0.9$, λ is the wavelength of radiation, β is the full width at half of the maximum of the diffracted peak, and θ is the angle of diffraction. The particle size was calculated by Scherrer's formula for different calcination temperatures. The crystallite size of the powders calcinated at 600 °C was about 47 nm in diameter, respectively.

$$L = \frac{K \times \lambda}{\Delta(2\theta) \times \cos(\theta)}$$

SEM studies

[Fig. 3] shows the SEM of pure CoTiO₃ [Fig. 3(a)] and the PANI/CoTiO₃ NCs with 10 and 20 wt% of CoTiO₃ NPs loading, respectively [Fig. 3(b-c)]. The particles have an agglomerated grain structure. In the SEM of the NCs, with the increase of CoTiO₃ content, the agglomeration become more appreciable and displayed connections in some regions. SEM images reveal a homogeneous dispersion of CoTiO₃ NPs in the PANI matrix.

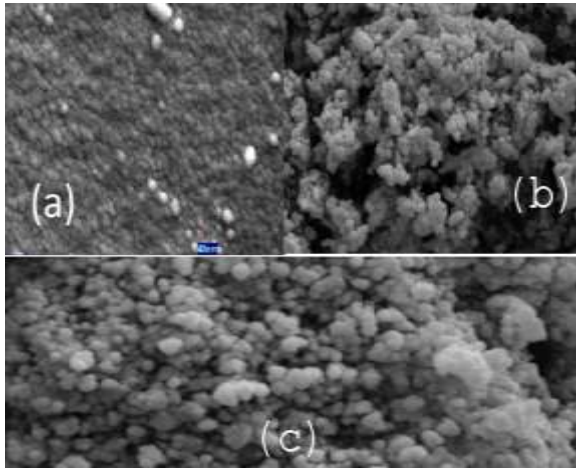


Fig. 3: SEM pictures of PANI/CoTiO₃ NCs.

EDX elemental analysis

EDX patterns of pure CoTiO₃ and the PANI/CoTiO₃ NCs with 10 and 20 wt% loadings of CoTiO₃ NPs are shown in [Fig. 4(a, b)], respectively. EDX patterns of pure CoTiO₃ show separate peaks of cobalt (Co), titanium (Ti), and oxygen; the compositional analysis performed with EDX confirmed that the CoTiO₃ nano powders were obtained. The EDX patterns of PANI/CoTiO₃ NCs with 10 and 20 wt% loadings of CoTiO₃ NPs show separate peaks for cobalt (Co), titanium (Ti), oxygen, carbon, and nitrogen (N), confirming that the sample has the desired composition with both PANI and CoTiO₃ nanoparticles. The results show that the intensity of CoTiO₃ crystalline peaks gradually increases as the CoTiO₃ content increases in the 10 and 20 wt% fractions; this finding is in agreement with the XRD results.

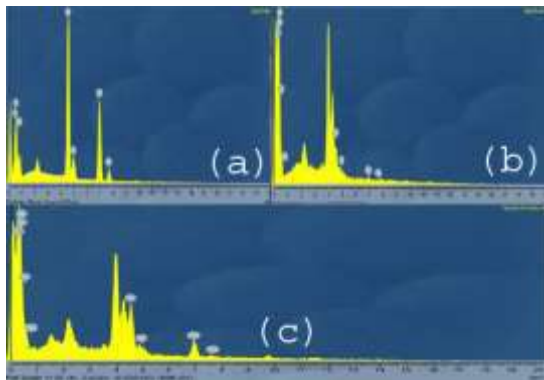


Fig. 4: The EDX pattern of the PANI/CoTiO₃ NCs in Scale Full equal at 1133.

DRS study

The absorption coefficient and optical band gap of a material are two important parameters by which the optical characteristics and its practical applications in various fields are judged. [Fig. 5] shows the DRS of pure CoTiO₃ and the PANI/CoTiO₃ NCs with 10 and 20 wt% fractions of CoTiO₃ NPs loading. In Figure 5a, a sharp absorption peak is observed around 325 nm, indicating the optical band gap attributed to the O²⁻→Ti⁴⁺ charge-transfer interaction [30]. DRS analysis provides information about the semiconducting behavior of the NCs. The value of the direct band gap for PANI/CoTiO₃ NCs with 10 and 20 wt% loadings of CoTiO₃ NPs using the direct band gap determination came out to be 1.4 and 1.3 eV. As a consequence, calculated E_g values

decrease with increasing CoTiO₃ concentration. In the PANI/CoTiO₃NCs with 10 and 20 wt% loadings of CoTiO₃ NPs, sharp absorption peaks are observed around 360 and 365 nm

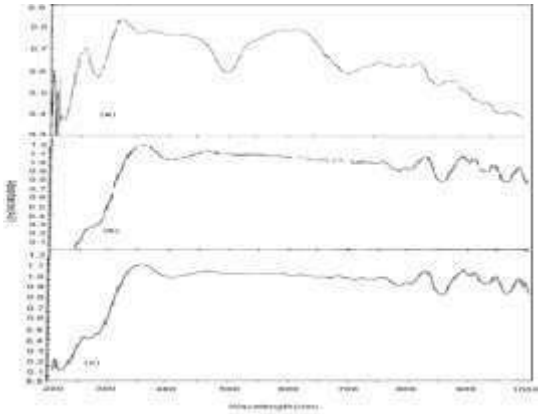


Fig. 5: The DRS chart of PANI/CoTiO₃ NCs.

Band-Gap analysis

For direct band gap determination, a plot of $(\alpha h\nu)^2$ versus $h\nu$ is presented in [Fig. 6]. Band gap value was obtained by extrapolating the straight portion of the graph on the $h\nu$ axis at $(\alpha h\nu)^2 = 0$, as indicated by the solid line in [Fig. 6]. The value of the direct band gap for CoTiO₃ was 2.4 eV; the value is about 2.2 eV for CoTiO₃ bulk crystal, which originates from the $Co^{2+} \rightarrow Ti^{4+}$ charge-transfer transition [31]. The band gap of nano metric CoTiO₃ is higher than that of the bulk crystal, and the energy and shape of the interfacial charge-transfer absorption are expected to change as the size of the particle is reduced to nanometer scale [32–33]; for semiconductors, the energy of the band gap transition increases with decreasing size [34].

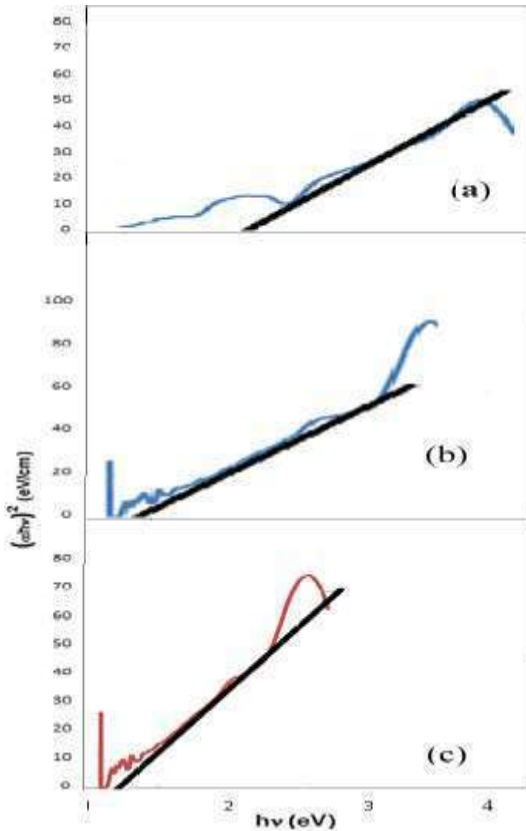


Fig. 6: The band-gap diagram of MgCr₂O₄ nanoparticles.

Zeta potential measurements

[Fig. 7] shows the zeta potential measurements obtained for pure CoTiO₃ [Fig. 7(a)] and the PANI/ CoTiO₃ NCs with 10 and 20 wt% loadings of CoTiO₃ NPs. Initially, CoTiO₃ had an average ζ of 2.27 mV and the PANI/CoTiO₃ NCs with 10 and 20 wt% loadings of CoTiO₃NPs had an average ζ of 25 and 71 mV, respectively. With respect to [Fig. 7], the fabricated PANI/CoTiO₃NCs with 10 and 20 wt% loadings of CoTiO₃NPs were increased with 83% and 93%, respectively.

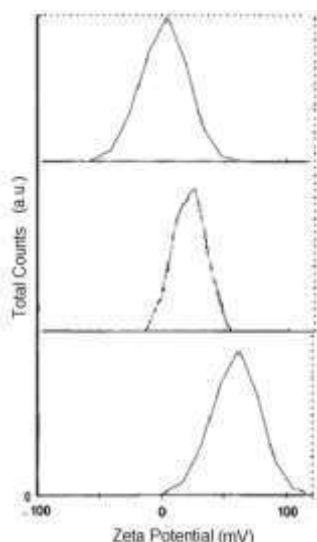


Fig. 7: Shows the zeta potential measurements obtained for pure CoTiO₃.

CONCLUSION

In this study, PANI/CoTiO₃ NCs with two (10, 20 wt%) content loadings of CoTiO₃ were successfully synthesized after heat-treatment from 60°C to 300°C for 2 h. The FTIR study of PANI/CoTiO₃ shows the shift of characteristic absorption bands of the composite due to the interaction of PANI/CoTiO₃. DRS analysis indicates the semiconducting behavior of the NCs; the zeta potential indicated that the fabricated PANI/CoTiO₃ NCs with 10 and 20 wt% loadings of CoTiO₃NPs were increased with 83% and 93%, respectively.

CONFLICT OF INTEREST

There is no conflict of interest.

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FINANCIAL DISCLOSURE

None

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ARTICLE

INSPECTION OF NUCLEAR ACCIDENTS: A CASE STUDY OF FOUR NUCLEAR TRAGEDIES FOLLOWING STRATEGIC PLANS

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ABSTRACT

The world's uranium resources is enough to supply 26 times current electricity consumption of the world forever, and the nuclear energy will be more economical rather than fossil fuels, even if the cost of electricity production doubles. But the importance of nuclear safety at all stages such as Integrated program, applying strategies beyond the probability of incidents, The necessary training for staff, The correct arrangement of personnel According to their expertise and the occasion, to provide in time decision at crisis, Modeling of countries at the higher stages, analysis of errors in recent accidents in order to avoid in future , observance of Nuclear Convention principles , and finally the management of nuclear energy use is inevitable and more considerable than the nuclear energy itself. Disregarding of the case causes not only no advantages, but to regression and going back the procedures. So its consequences such as those nuclear tragedies in recent decades; for human beings and living things are devastating and Irreversible. The survey intends to observe safety mechanism that disregarding of it, led to 3 severe nuclear accident in recent years. Also at the end of the research some solutions will be presented.

INTRODUCTION

KEY WORDS
Nuclear safety,
Irreversible nuclear
accident

Nuclear safety and nuclear security are two important issues in the nuclear energy field to establish nuclear power plants. The former one means Access to suitable operating conditions and accidents Prevention or Reduction their consequences resulting to protect employees, citizenries, and environment from radioactive radiation. The latter issue is related to any sabotage action about nuclear or radioactive material and their equipment. So the first one deals with unintentional cases while the second one is planned in intentional actions area. [1]

There have been many unexpected nuclear events in recent years such as what happened in Three Mile Island, Tokai-Mura and Fukushima Daiichi and Chernobyl in which awful and terrible Human and financial losses were outcome of inner or outer factors caused respectively by human errors and natural disasters. As a whole, a large part of these scenarios predominantly was the result of negligence about Mobilize the systems, before the case, or Inefficiency and hasty decision of operators after or during the accidents.

Three mile island plant

This accident has been considered as the worst nuclear case in America. It happened in 1979. This plant was equipped by pressurized water reactor with power of 900MW. Part of the core of unit 2 was melted and caused releasing 3 million Curie radioactive gas a way. So over 140,000 people left their homes and radioactive gases such as Xenon, krypton were released in environment. [2]

The commission after while concluded that:” to prevent nuclear accidents as serious as Three Mile Island ,fundamental changes will be necessary in the organization, procedures, and practices and above all in the attitudes of the Nuclear Regulatory commission and to the extent that institutions we investigated are typical of the nuclear industry”.[3]

Defect handling

Checking over the system illustrates that some trivial but important factors involved the case. It is evident that if the warning lights was visible, or had been set in front of the system, the rest of the perilous case would never have been occurred. Also the absence of operators or their tardiness, deteriorated the problem. The next crisis deals with negligence about fixing up the water storage; meaning, despite of being aware of failure (in its discharging) the repair project was put off several times by staff. Regarding the alternative process, Environmental Protection program should have been done in time of accident, while it started at inappropriate time and right after radiation.

Consequences

1. Breaking 2 feeder valves following abrupt plunge in water level leading to stop the turbine and reaching a peak of pressure and temperature in heart of reactor.
2. Non reversible pose of regulator after leveling off the pressure led to nonstop water flow on reactor shield and wasting cooling system.
3. Being out of order of safety locks in reactor shield.

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Tokai-mura plant accident

It occurred in 1999 when some inefficient workers used more enriched uranium in precipitation tank than amount which really should be used. So, many staff were exposed by accumulation of large amount of radioactive wave of enriched uranium. The most significant rules and instruction which ignored by management of the site, was reported by commission as general causes of the accident such as "inadequate regulatory oversight, the lack of an appropriate safety culture at the JCO facility and inadequate worker training and qualification." [4]

Deficiencies and outcomes

Reading over the incident led to some critical points that caused by violation of absolutely drastic and vital ground rule which was enacted to provide site safety programs. It is noticeable that, by them could have prevented the accident from occurring. The first and major disaster happened, when some unskilled technicians added the bucket contents directly to the precipitation tank instead of buffer tank. Also, they arbitrarily added seven times more enriched uranium than permissible values which had been defined in license of company. In other word the wrong case simply happened due to personnel's ignorance and lack of their expertise. [5] The next perilous case happened when the operators received radiation doses in high level due to lack of existing neutron detection, and protecting cover. The third problem arising the weakness of operators' performance, happened when the flow of water was discontinued and caused stopping the cooler system. As for leaving the site, it is clear cut that if the warning system functioned timely, undoubtedly fewer people would be injured by the radioactive exposure. In brief all mentioned issues were emerged because of not having appropriate predictive plan namely crisis management.

Suggested modification

It is worthwhile to say that lessons taken from such these events will be helpful to avoid doing them in future, though approximately all don't believe that such a negligence be justifiable and stands up to scrutiny. In terms of solutions, it can be noticeable that some inspection about equipment, operating procedures, plans and polices and modifications could have prevented the accident in future and made more safety." One potential design flaw was the ease by which the buffer tank could be bypassed. A different equipment layout of the buffer and precipitation tank, warning signs, and stricter adherence to proper operating protocol could have greatly reduced the potential for this type of accident. One possible design modification would be to install equipment that would prevent bypassing the dissolving tank. The operating procedures could include a better information management system in order to follow government and company restrictions. Analysis of 235U, other uranium isotopes, impurities, etc., could be made at various stages in the process to due to reactors connection, the first, third and fourth reactors destroyed by Hydrogen explosion and it resulted in seepage of radioactive material which was defused within fifty kilometers. By that the real crisis was reported to level seven.

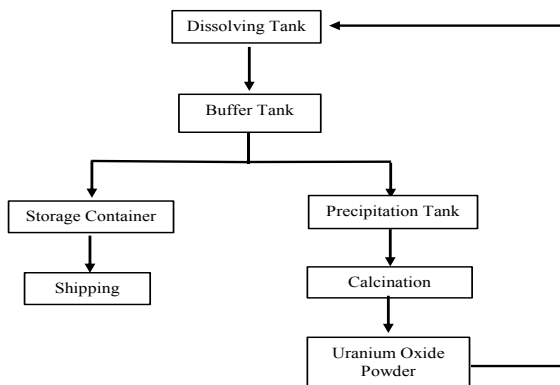


Fig.1 Block Flow Diagram for the Purification Process at the JCO Reprocessing Plant [6]

There major deficiency

It is noticeable that negligence of some small but vital and subtle factors surely leads to tragic event. In other words by elaboration in the aforesaid case, it can be investigated that some factors relating security were underestimated by managers. Two major faults became problematic about the case. Surely both of them was related to poor performance of Risk Management. It consists of:

1. Considering just Design [7] Basic Accident phase.
2. Adopting Certainty Approach as presumption

3. No considering Probability [7] Approach

According to the first one, nuclear plants are designed so that they are resistant against natural disasters such as earthquake. Fukushima Daiichi plant was designed for earthquake within 8 Richter, while the recent one was 9 Richter. The second one which also defined as Structuralist Defense in Depth, involves considering credible worst case accident scenarios and predicting safety barriers. [7] In this sense, if one system is designed and equipped against the worst case of events, then it will be protected against all kinds of accidents. But by this approach, the probability of accidents and their consequences (risk) can't be figured out at all. So it's worth mentioning that, by the effect of events, one can never indicate the possibility of their occurrence. A case in point was the nuclear plant in Japan which experienced the worst and infrequent earthquake within 9R following irremediable consequences. As for the third point, it is cut and dry, that if the security plan was comprehensive and also was examined for all possibilities about accident occurrence, and not limiting to frequent cases, the tragic case would never happen. In other words, probability Approach which is applied in order to logical [7] and quantitative control about uncertainty of accident, could be helpful to tackle the problem.

Suggested modification

According to what mentioned above, the major reason of accident in Fukushima plant was related to poor performance about risk management. Definitely it is wrong to ignore the incidents with low level of occurrence. Therefore, the Combinational Approach can really work to avoid such an accident. This advantageous trend which is known as Integrated Approach, can comprise Probability Approach and Certainty Approach at the same time. By that, Risk management strategy can be followed and achieved effectively. In brief, the combinational Approach as a supplementary approach can be effective to use the different aspects of two former approaches to make decision about safety issues.

Chernobyl plant accident

This event happened in April 1986 in one of the cities of Russia. This accident has been known as the worst nonmilitary accidents in the world. According to reports, Chernobyl case accounts for far more powerful than the atomic bomb explosion in Hiroshima and Nakazaki in Japan. This tragic case emerged from Reactor 4 in Chernobyl plant which was RBMK type. By explosion of referred reactor, a large part of 180, 000 kg nuclear fuel scattered in environment. It was estimated that the radioactive substances is equal to make 100 atomic bomb. Approximately all people left the city but a large number of them received radioactive waves.

Major deficiency

It is clear cut that this incident like three former case of accidents, predominantly caused by some how human wrong. In other words unqualified personnel and their hasty decision deteriorated the conditions. As a whole, the two major wrong was the basic and serious reason for the case of catastrophe. The first part of scenario began when some operators deactivated the safety system namely neutron moderator of reactor in order to some testing experiments. This action was the terrible and awful one that a group of working would be committed. The result was a system without inhibitor. So the temperature of the reactor reached a peak of permissible amount and also more than the heat output. After that the system was faced to power loss. In other expression, the reactor power dramatically declined and fell to low point of one percent.

The second wrong was done by the staff right after the plunge in power in order to compensational action and power soar. Then the personnel took out the total control rods from the reactor. By removing the controlling rods, the power of reactor increased shapely and hit a peak of 7 percent.

Consequences

The result of two major wrong was fearsome and terrible expulsion. The initial one, occurred in shield coverage above the reactor. Therefore, much of hot water vapor released. The latter expulsion caused by Hydrogen which was formed by combination of water vapor from broken pipe with Zirconium or Graphite of reactor core. By these two cases, nearly thirty percent of reactor core system destructed. In addition, the Graphite released from the core, caused the fearsome fire. Many workers and staff which was not dressed by protected covering, received the high level of radiation and also really injured by perilous substances such as Strontium90, Cesium137 and Iodine.

Suggested modification

The most important lessons learnt from this tragic case were the pattern which was stated by international agency of nuclear energy and followed by Russia government and other countries. It was included:

1. Major defects of VVR and RBMK following the removing defects cases
2. Making upgrade systems and facilities
3. Adopting safety ways of all kinds of reactors (RBMK)

In addition to commission rules, adopting the right policy and approach about testing case and experiment following trained and qualified staff and also appropriate management before, while and after scenarios should have been done to have a comprehensive and progressive plan.

CONCLUSION

To sum up, the basic reasons of all the aforesaid accidents, focuses on poor performance of human. Definitely lack of a comprehensive and strategic plan to provide maximum safety of a plant, results in such mentioned accidents with irreparable consequences. The rest of problematic cases partly is caused by not having sufficient personnel, and partly by lack of capable, creative, trained and skillful man power. Lack of supplies and equipment such as spare generators and cooler systems to control the emergency conditions, devices to estimate accurate amount of radioactive waves, safety cover for staff, firefighting devices, quality survey of mechanic and electronic systems, all are the results of not having a correct plan as initial requirement and prerequisite to made a nuclear plant. Hopefully, some solutions which are recommended at the end of this survey, may be useful to implement of the ultimate goal. For instance:

1. Planning the modular curriculum classes to train proficient, and adroit staff.
2. Choosing creative and vigilant operators to assign on important posts.
3. Mobilization of public to take part in crisis juncture classes.
4. Simulation of emergency accidents to practice the pivotal and drastic maneuvers.
5. Surfing recourses or different sites around the world to modify the problem.
6. Planning Corporate groups working from different nations in order to profitable interaction
In creating international projects in favor of human and nature rather than one side competition.

CONFLICT OF INTEREST

There is no conflict of interest.

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None

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ARTICLE

STEAM ASSISTED GRAVITY DRAINAGE IN HEAVY OIL RESERVOIR (SAGD)

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ABSTRACT

Heavy oil and tar sands are important energy sources, currently making a significant contribution to the overall energy of the United States and Canada. It is evident that the resource base is much larger than the in-place "conventional" oil which is about 2 trillion barrels worldwide, with about a third recoverable. In the case of heavy oil and tar sand, the recovery factor varies greatly from area to area, depending on the oil and the reservoir characteristics, as well as the process to be used. In this article investigated effect of some parameters such as initial reservoir pressure, initial reservoir temperature, molecular weight of components, energy in rock, water and oil on single horizontal well SAGD process.

INTRODUCTION

Heavy oil and tar sands are petroleum or petroleum-like or semi-solids occurring in porous formations, mainly sands, but also consisting of carbonates. Most of heavy oil deposits occur in shallow (3000 ft or less), high permeability (one to several darcies), high porosity (around 30%) poorly consolidated sand formations. The oil saturations tend to be high (50-80% pore volume), and formation thicknesses are 50 to several hundred feet. All of these characteristics are desirable for the applications of oil recovery methods.

Geology is in the single most important factor determining the success of a heavy oil recovery project. Geology is important in conventional methods such as water flooding also, but in heavy oil recovery it is more so because the injected fluids (steam, air, oxygen, hot water) are costly and it is crucial that they flow in the desired directions.

Thermal techniques aim at reducing oil viscosity in order to increase its mobility, through the application of heat. A 400°F temperature increase reduces the viscosity of most heavy oils to about 1cp. This is accomplished either by hot fluid injection or by underground combustion.

The thermal process currently in use is

Cyclic Steam Stimulation is basically a Single Well Operation

Communication between the wells are developed and the process becomes very complex. Steam is injected into a well at a high rate for a short time (10 days to one month), following which the well may be shut in for a few days for heat distribution. After that, the well is allowed to flow or pumped. The oil rate increases rapidly to a high value, and stays at a economic level for months. When the rates become uneconomic, the whole process is repeated.

Steam flooding

Much like water flooding, is a pattern drive with array of injection and production wells. In this case, the performance is strongly dependent on the pattern size, since heat loss to the surrounding rocks can consume a large proportion of the injected heat. Steam is continuously injected into the injector, resulting in the formation of a steam zone, which advances at an ever-decreasing rate. Steam overrides due to gravity. Steam reduces the oil saturation within the steam zone to very low values, of the order of 10%.

In-Situ Combustion

Is a unique process because a portion (about 10%) of the in-place oil is oxidized to generate heat. The process has a high thermal efficiency. Air must be injected to oxidize the oil. Heat is generated within a very narrow combustion zone at a high temperature (around 1100 °C). Directly ahead of the combustion zone, cracking of the oil occurs, leading to deposition of a heavy fraction (coke), which burns to support combustion.

Hot water flooding

KEY WORDS

Heavy oil, Steam injection, Gravity drainage

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Is seldom employed because heat losses in surface lines, wellbore and formation, cause a large drop in temperature and reduce its effectiveness in decreasing the oil viscosity.

Effect of temperature

A temperature increase leads to a drastic reduction in oil viscosity, much greater than that for water. The relative permeability are also affected by an increase in temperature. This is attributed to the presence of clays and minerals in the rock, as well as the wettability and contact angle changes with an increase in temperature. In most instances, the residual oil saturation decreases and the irreducible water saturation increases with an increase in temperature. Additionally, the water relative permeability appears to decrease, while the oil relative permeability increases. On the whole, the oil tends to become more mobile as a result of temperature increase, not even considering the viscosity decrease. The oil-water interfacial tension would decrease and capillary number increases considerably.

Oil displacement by steam

The displacement mechanism of oil by steam is more complex. In fact, on a microscopic basis, steam tends to behave as a viscous fluid. If a steam finger gets too far ahead of the main front, it would condense, because of the low temperatures there. The process of oil/water displacement by steam involves other important effects as well, arising from the heat transfer to the cold oil ahead of the front and the gravity segregation of steam.

In reality, the oil ahead of the steam is cold. At the same time, steam tends to segregate toward the upper part of the formation due to its low density. As a result, the oil at the top is heated and mobilized, and driven by steam. The movement and void age of oil further promotes steam flow in the upper parts of the formation. Thus steam tends to segregate and spread over the top of formation. Subsequence advance of the steam zone is downwards, which is accelerated if the wells are produced at an appreciable rate.

Steam segregation, and its spreading over the formation is advantageous, also it leads to a low vertical sweep in thick formations. If steam were of the same density as oil, and there were no gravity segregation of steam, the displacement of oil would be essentially frontal, with a stable steam front. As a result, very high injection pressure would be needed.

Heat transfer mechanism

When a hot fluid, gas, liquid or mixture of two is injected into an oil-bearing porous medium, heat is transferred to the rock matrix and the interstitial fluids, as well as to the adjacent nonproductive formations, often referred to as overburden and under burden. Such heat transfer is primarily due to conduction and convection; it is complicated by phase changes and the resulting heat exchange.

In hot fluid injection, heat is transferred to the rock matrix and the fluids by conduction and convection. As the injected fluid partially displaces the oil, water and gas in place, it carries the heat into the pore spaces. The in-place fluids are heated by conduction, and the displaced fluids are heated by conduction and convection, with either predominating, depending on the injected fluid type, and the oil viscosity. The conductive heat transfer to the rock matrix helps to equalize the solid and the fluid temperature, which are usually assumed to be equal in hot fluid injection computations. However, the type of fluid will determine the time to reach such thermal equilibrium. For instance, the heat transfer coefficient in the case of condensing steam is much higher than in the case of hot water. Usually there is a vertical temperature gradient in a formation into which fluid is injected parallel to the bedding plane. In some heat injection calculations, the temperature is assumed to be constant along any vertical plane.

Formation heating by steam injection (marx-langenheim model)

At a given temperature, while hot water carries only sensible heat, steam additionally contains latent heat. This difference in the nature of steam and water is responsible for the contrast in formation heating by either fluid. Hot water must experience a temperature drop in order to transfer heat to the rock and the fluids. Steam on the other hand, can transfer all of its latent heat without any change in temperature.

When steam is injected into an oil-bearing formation at temperature T_R , it displaces a certain fraction of the in-place oil, while condensing and heating the rock and the fluids simultaneously. The condensate formed, still at temperature T_s (saturation temperature) move ahead of the freshly injected steam, preheating the rock farther ahead. Under idealized conditions it could be postulated that the heated zone is at a constant temperature, T_s , extending from the injection end to the point where the temperature abruptly drops from T_s to T_R .

[Fig. 1] shows the idealized temperature and steam quality distributions for steam injection into a formation under idealized conditions. The heated zone, called "steam zone" encompasses the volume of rock and fluids heated to steam temperature, T_s , regardless of steam quality.

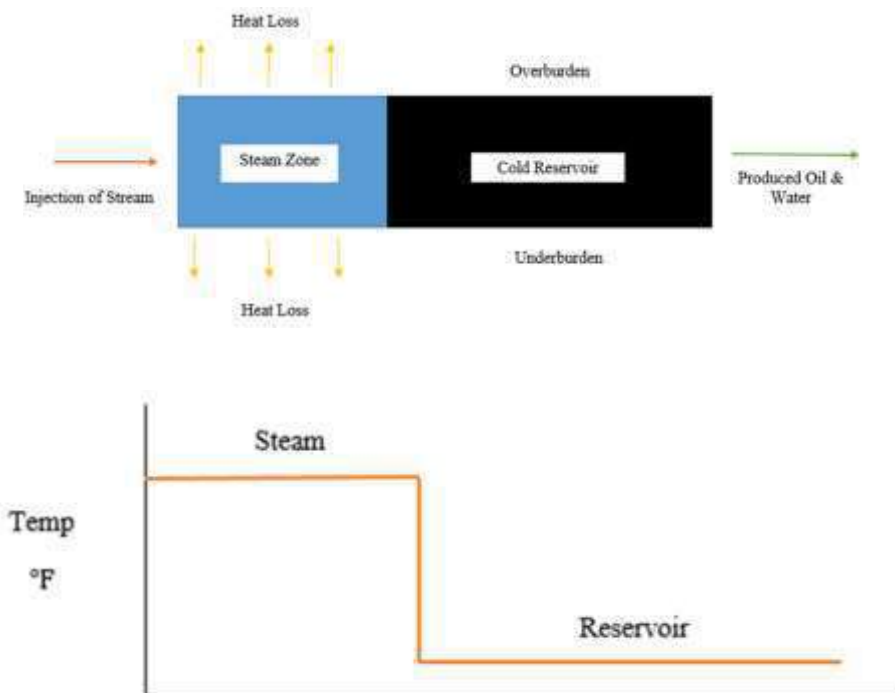


Fig. 1: Schematic Representation of Marx-Langenheim Model for Reservoir Heating By Steam Injection.

$$\text{Heat Injection Rate} = \text{Heat loss rate to the overburden and under burden} + \text{Heating rate of the rock and fluids to temperature, } T_s$$

Steam flooding mechanisms

Steam flooding, steam drive or steam displacement is an important heavy oil recovery method. In some instances, it has been shown to be effective in low viscosity oil formations as well. Steam flooding is analogous to water flooding, in that steam is injected on a pattern basis, much like water flooding.

Consider a five-spot pattern, consisting of a center steam injector and four corner producers. As steam is injected into the center well, an expanding steam zone is formed. The hot condensate leaving the steam zone creates a hot water flood effect ahead of the steam zone. Finally, as the condensate cools down to the formation temperature, it gives rise to a cold water flood. Thus, the steam drive process consists of a steam zone, a hot water flood zone, and a cold water flood in the remaining pattern volume. Oil recovery is a result of mechanisms operating in each of these zones.

The most important part of a steam drive is the steam zone, which is approximately at a constant temperature. The oil within this region is highly mobilized, and displaced by the gas drive effect of steam. Many pore volumes of steam reduce the oil saturation in the steam zone from an initial saturation S_{oil} , to a steam flood residual saturation S_{orst} . Thermal expansion of oil further helps increase its mobility; steam distillation of lighter fraction also occurs, further lowering the oil saturation. Other complex effects are also present. For example, the relative permeability to oil increases, and that to water decreases, as a result of temperature increase.

Gravity segregation

It is believed that the gravity segregation is one of the prime factor in overcoming viscous fingering to achieve an efficient displacement process and oil recoveries of 60 to 70%. When we inject steam, it first fingers through a relatively small area of the sand and soon arrives at the producing well. However, due to gravity, with time fingers rise to the top of the sand and spread out a really. In fact, areal coverage is probably close to 100% in many thick, permeable sands. With more time and steam injection steam zone growth downward. Oil at the interface is hot and can thus be stripped off and flows toward the producing well along with hot water falling out the steam zone.

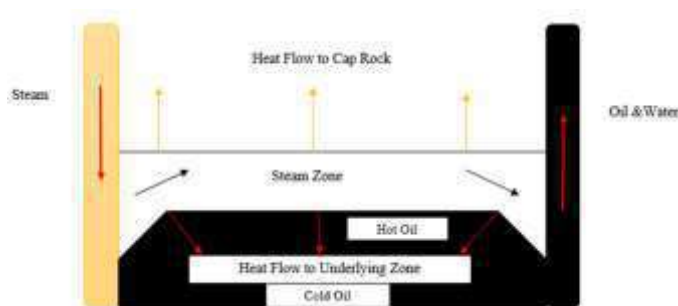


Fig. 2: Recovery Mechanism.

Simulation

Oil component specific heat

Oil component specific heat specifies the first coefficient of the oil component liquid specific heats, for each EOS region. For multicomponent simulations, the oil phase molar enthalpy is the mole fraction weighted sum of the component enthalpies:

$$h_o = \sum X_c \cdot h_c \cdot mw_c \quad (1)$$

Where

X_c = is the mole fraction of component C in the oil phase

mw_c = is the component molecular weight

$$h_c = C_{p_{l,c}} \cdot (T - T_{st}) + \frac{1}{2} C_{p_{2,c}} \cdot (T - T_{st})^2 \quad (2)$$

$C_{p_{l,c}}$ = is the first coefficient of the component liquid specific heat

$C_{p_{2,c}}$ = is the second coefficient of the component liquid specific heat

T_{st} = is the standard temperature

Gas component specific heat

Gas component specific heat specifies the first coefficient of the gas component specific heat, for each EOS region. For multi-component simulations, the gas phase molar enthalpy is a mole fraction weighted sum of the component enthalpy values:

$$h_g = \sum y_c \cdot h_c \cdot mw_c \quad (3)$$

Where

y_c = is the mole fraction of component C in the gas phase

mw_c = is the component molecular weight

$$h_c = h_{v,c} + C_{p_{g,c}} \cdot (T - T_{st}) + \frac{1}{2} C_{p_{2,c}} \cdot (T - T_{st})^2 \quad (4)$$

$h_{v,c}$ = is the heat of vaporization at T_{st}

$C_{p_{g,c}}$ = is the first coefficient of the component gaseous specific heat

$C_{p_{2,c}}$ = is the second coefficient of the component gaseous specific heat

Reference pressure

In a live-oil thermal run with N_c components, reference pressure specifies the reference pressures at which the hydrocarbon liquid densities are defined.

The expression used to calculate oil component liquid densities is the following:

$$\rho_c = \frac{\rho_{r,c}}{1 - C_{p,c} \cdot \ln \left(\frac{P_c}{P_{r,c}} \right)} \quad (5)$$

Where

$\rho_{r,c}$ = is the reference density

$C_{p,c}$ = is the oil component liquid compressibility

$P_{r,c}$ = is the reference pressure

$T_{r,c}$ = is the reference temperature

C_{TE} = is the thermal expansion coefficient

Introducing the reservoir

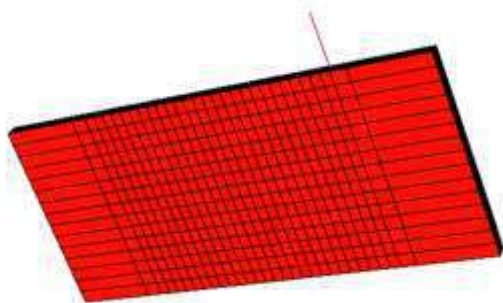


Fig. 3: 3D View of the reservoir.

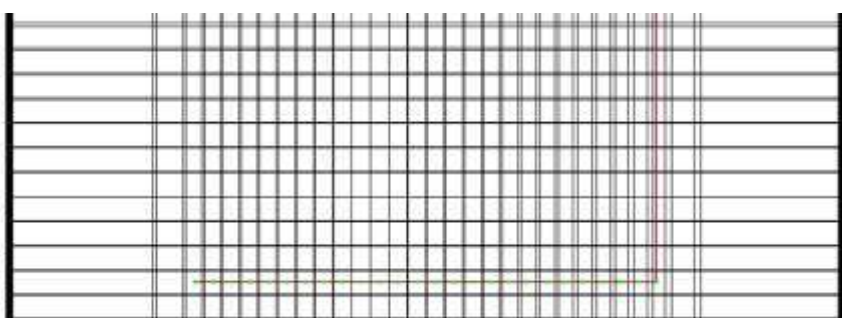


Fig. 4: Well Pattern, Single Horizontal Well SAGD.

Table 1: Reservoir Dimension

X	Y	Z
1400 m	30 m	40 m

In this simulation investigated some parameters such as:

- Initial Reservoir Pressure.
- Initial Reservoir Temperature.
- Molecular Weight of Components.
- Energy Percentage in Rock.
- Energy Percentage in Oil.
- Energy Percentage in Water.

RESULTS

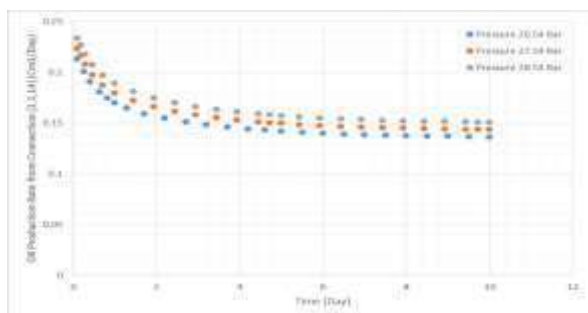


Fig. 5: Effect of Initial Reservoir Pressure on Oil Recovery.

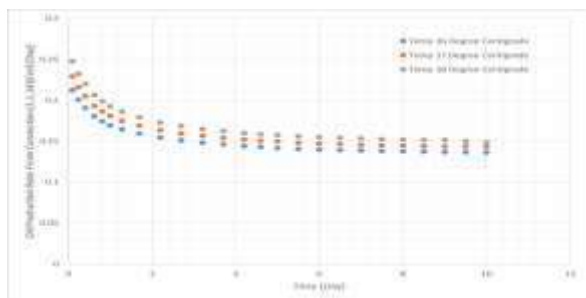


Fig. 6: Effect of Initial Reservoir Temperature on Oil Recovery.

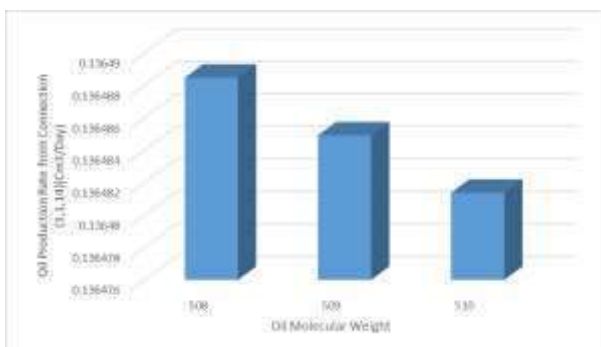


Fig. 7: Effect of Oil Molecular Weight on Oil Recovery.

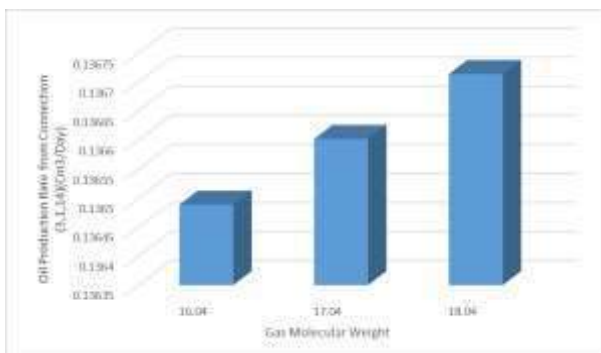


Fig. 8: Effect of Gas Molecular Weight on Oil Recovery.

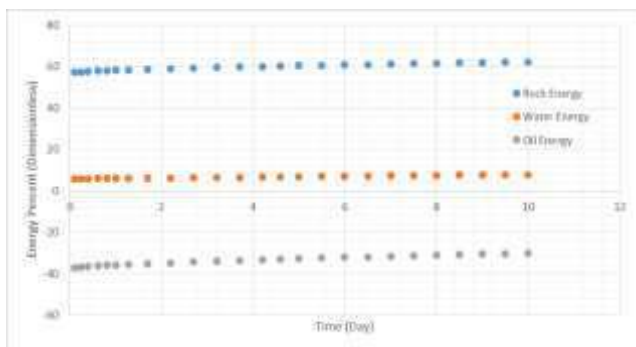


Fig. 9: Energy Percent in Oil, Water and Rock.

CONCLUSION

In steam-assisted gravity drainage, the use of horizontal production wells provide a large contact with the reservoir and this allows provides a large contact with the reservoir and this allows operation at economic rates without bypassing of steam . Reduction in oil prices caused economic issues be more sensible and crucial in compare with last decade , one factor that considered in this simulation is one single horizontal well instead of drilling two horizontal wells , injection through inner tubing and production through outer annulus.

According to the obtained results by increasing the reservoir pressure and temperature the amount of oil recovery increased, one proof for this result is [Fig. 10].

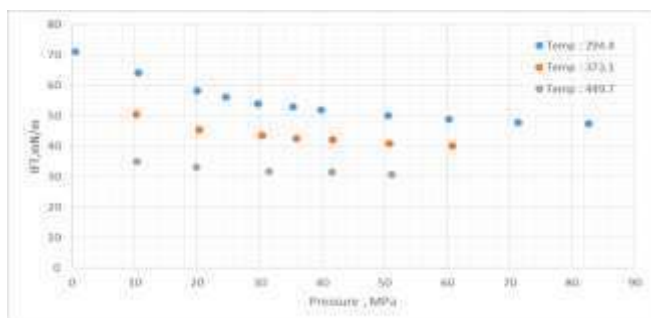


Fig. 10: Effect of Pressure and Temperature on IFT.

By increasing the oil molecular weight the amount of oil recovery decreased and this influence is vise versa for gas . One reality that govern in the reservoir is “oil and gas achieve complete miscibility and the vapour-liquid interface vanishes. At the pore level, the miscible displacement is practically 100% efficient, as the lack of interface eliminates the retainment of the oil in pores.” It mean oil and gas should be similar to each other to form one phase to increase oil recovery.

CONFLICT OF INTEREST

No conflicting interests in relation to the work

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To my parents

FINANCIAL DISCLOSURE

No financial in relation to the work

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ARTICLE

THE EFFECT OF SALICYLIC ACID FUNCTION ON VASE LIFE AND ACTIVITY OF THE PHENYLALANINE AMMONIA LYASE ENZYME OF CUT FLOWERS (ROSA HYBRID ACV. BLACK MAGIC)

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ABSTRACT

Ornamental products such as cut flowers have a limited display life so the effect of some effective chemical holding treatments on vase life of Ross (*Rosa hybrida* L.) cv. Black magic cut flower was studied. In this research conducted the effects of two levels salicylic acid (100 and 200ppm) treatment along with sucrose (3%) was conducted in a factorial arrangement, carried out in a completely randomized design. The recorded traits included: vase life, fresh weight, dry weight, ion leak, water absorption, anthocyanin content, total chlorophyll content and phenylalanine ammonia lyase enzyme activity. The results showed that the greatest delay in senescence was obtained in cut rose treated with salicylic acid 200 mg/l (7/8 Day) as compared to control treatment (distilled water, DW) in addition, the application of salicylic acid due to the impact of the Phenol cycle and Antioxidant role, reduces the activity of the Phenylalanine ammonia lyase enzyme.

INTRODUCTION

In Iran, more than any other flower, the rose has a long history, European travelers who come to Iran (Orient) were named Iran as the source of Roses. Rose is one of the most important Ornamental and commercial plants in the world plants and is belongs to the Rosaceae family and is Rosoideae subcategory and as semi-permanent green to decidua, with a wide range of growth habits can be found in Asia, North Africa, North America and Europe. Within the Rosaceae family, there are 100 kinds and about 3100 species. Black magic flower is the hybrid of tea rose that has a dark red color and sweet fragrance.

Rose flower pot life is usually short. Flowers wilting and axis of flowers in such a way that is bend just below the neck. Develop or grow is one of symptoms that have been affected by vascular occlusion and inhibit water supply. Many methods published to extend the life of cut flowers and keep them fresh for a longer duration and provide freshness. Therefore further research needs to be done in the field of maintenance of cut flowers and its different varieties. Four major factor play a role in determining the storage and longevity of products, which are: 1 (Temperature, 2 (water relations, 3 (carbohydrate supply and 4 (growth regulators.

Salicylic acid

Salicylic acid (SA) is considered an important signaling molecule that involved in immune response against biotic and abiotic stresses. Salicylic acid, in a period of time, was the best salable pharmaceutical composition in the world that were produced in Germany in 1898 (Raskin, 1992) although, John Buchner in 1928, isolated salicylic alcohol glucoside from willow bark in Munich, but later Rafacle Piria in 1938 was named it salicylic acid (SA). The word salicylic acid (SA) derived from the Latin word "Salix" means willow tree and the reason is that in all the whole plant kingdom (Raskin, 1992) SA has dedicated diverse role in regulating metabolism in plants (PoPova et al., 1997).

In terms of chemical structure, SA belongs to the diverse group of plant phenols which have aromatic ring with a hydroxyl group or a function of its derivatives (Figure 1). Released SA is a crystalline powder and can melt at a temperature of 157-159Centigrade. SA relatively is soluble in water and polar organic solvents that have greater solubility and its PH in aqueous solution is 2.4. Aspirin, has similarity with SA, and the result of a spontaneous hydrolysis is aqueous solution. Scientists largely believe that (ortho-hydrobenzic acid) is a natural derivative of cinnamic acid, is an intermediate in path of Shikmic acid and affecting factors in Synthesis of Phenolic Compounds. However, is provided two possible ways in this direction. [Fig. 2]. Salicylic acid to form compounds is known with the number of Glycosylation molecules and less often by esterification. Compare the effect produced by 22 phenolic compounds indicate that SA and ASA are prevented ethylene production. SA also ethylene enzyme inhibitor has dinitrophenyl (Leslie and Romina, 1980).

Phenylalanine ammonia lyase

Plant produces a large group of secondary products that contains a phenolic group. Phenolic according to their chemical diversity in plants play a diverse role. In plants most secondary groups of Phenolic compounds by removing an ammonia molecule derived from phenylalanine into cinnamic acid. This reaction catalyzed by phenylalanine ammonia lyase (PAL). PAL activity increases by environmental factors such as lack of food, light and fungal contamination. Control appears in the transcription initiation. During invasive fungal being targeted which encoding messenger RNA to PAL therefore PAL is increased in plant and then phenyl synthesis is stimulated. There is a positive correlation between the activities of PAL, total

KEY WORDS

Salicylic acid,
Phenylalanine Ammonia
Lyase Enzyme,
Postharvest, Vase life

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phenol and total flavonoids and there is a negative correlation between activities of PAL and antho cyanins content in leaves and flowers. Phenylpropanoid is derivatives of trans-cinnamic acid that of L-phenylalanine in a reaction catalyzed by the enzyme has been established L- phenylalanine ammonia lyase. (Vogt, 2010)

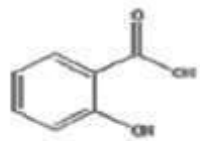


Fig. 1: Salicylic acid structure.

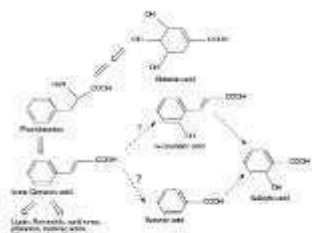


Fig. 2: Synthesis of Phenolic Compounds.

Cinnamic acid is a white crystalline organic compound, which is slightly soluble in water. It's Biosynthesis done by the phenylalanine ammonia lyase enzyme. PAL has central role in the synthesis of phenol and many reports has presents on the relationship between genetic PAL / protein expression / activity and increase phenolic compounds in response to different stimuli. The Phenyl propanoid direction includes a wide range of polyphenols with low molecular weight. These compounds and their derivatives are the largest and most important group of polyphenols. Biochemical studies in plants using the isotope show that the biosynthesis of SA in plant, from the cinema (the phenylpropanoid) and another way of isomerism to form SA. Phenyl propanoid course, will be the main course of the production of secondary metabolites in plants, which ultimately led to the production of different kinds of combinations, such as anthocyanins, flavonoids, guards UV rays, anti-microbial keromaryn furan, Iso flavonoides, Finno auxin, lignin and phenolic esters. Cinnamic acid hydroxylase (C4H) trans-cinnamic acid that produced by the PAL activity of the precursor material of Phenylalanine converts to Kumarat [Fig. 3].

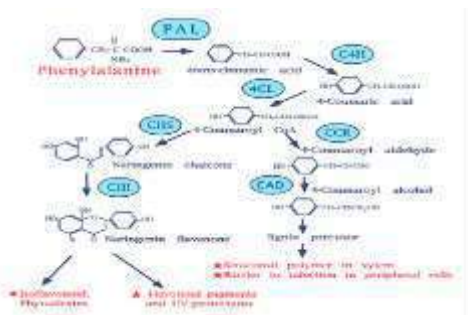


Fig. 3: phenylalanine ammonia lyase Cycle.

MATERIALS AND METHODS

In this research cut flowers rose of Black magic type, from the greenhouse of Mr. Hussein banaian that has standard conditions and provided in the paktasht city and in favorable conditions transported to the laboratory. The present research was conducted in the October, 2012 in the garden laboratory of Islamic Azad University of Garmsar in Khak Behin Azma laboratory. During experiment, the laboratory temperature setting on $2 \pm 22^{\circ} \text{C}$, relative humidity on 55 to 75 percent and light cycle to 12 hours of light and 12 hours of darkness. Cut flower rose to minimize experimental error again in terms of uniform the stem length and after cut flowers stems diagonally and first we have the flowers with a similar stem and height and second if air bubbles in the vessels created during the harvesting which can impede water movement to the ends of the flowers and this will remove bubbles and water will more easily transfer within. This research in order to investigate long-term treatment effect of salicylic acid on two levels of 100 and 200 ppm with 30 mg distilled water and 3% sucrose was used as control. This experiment with four treatments and three replicates and each replicates containing five experimental units (Table 1) was conducted as the

factorial experiment in a completely randomized design. Assessment and characteristics of sampling were performed on zero, 2, 4 and 6 days.

Table 1: Diseases abbreviations list

Abbreviation	Treatments name	.No
Control Dw	Distilled water control	1
Sucrose	Sucrose	2
SA100	Salicylic acid 100 ppm	3
SA200	Salicylic acid 200 ppm	4

Indicators of longevity

Durable cut flowers which is one of the most important factors of post-harvesting were calculated as the number of days of post-harvesting from the chemical treatments to appearance of symptoms such as wilting petals, bending the flowers neck or petals change color or petal fall. The life of cut flowers, which is considered as the number of days from harvest to aging flower, is one of the important characteristics to assess the effect of different treatments and new varieties and species.

Fresh weight

Changes in fresh weight of flowers have a role in determining the durability of cut flowers because decreases the fresh weight causes wilting petals and ultimately reduce the ornamental value. In this experiment, fresh weight weighed by a digital scale, with 0/01 precision and was expressed based on percentage (Celice, 2002).

Dry weight

Flowers after the end of their life weighed inside the oven with 62 temperature for 96 hours were dried and then by a digital scale with 0/05. By subtracting the dry weight can be achieved as well as the amount of water content (Jones et al, 1993).

Absorbance

Obstruction of the vessels stems for various reasons, such as the enter of air bubbles during the cutting or microbial growth in the dilution is created due to the presence of sucrose and lead to the reducing water absorption and ultimately accelerated wilting flowers. In this research, the volume uptake solution was measured by measuring the decrease in volume of the solution in the flask containing flowers and was expressed as mL (Zamani et al, 2011). To measure this feature, then put the flowers in the vase solution in the graduated cylinder, the entrance of the container will be completely blocked to prevent evaporating the solution and reduce the amount of solution in the container is only due to its absorption by flowers. The following formula was used to calculate the amount of absorption solution:

(Formula 1) $(\text{ml} \cdot \text{day}^{-1} \cdot \text{stem}^{-1}) = (V_T - V_1)$ the amount of uptake solution

Where V_T is solution size in measured days and V_1 is the volume of the solution in the day before (Hetarachi, 2005).

Anthocyanin leakage

To measure the petals of anthocyanins was used (Sankhla et al, 2005) method so that 1.0 grams of fresh flower petals weighing and turned into small pieces and then pulverized in a mortar and to extract anthocyanins to each sample was added 5 cc of the extraction solution that containing a mixture of methanol and hydrochloric acid (1%) and the samples were on overnight at 4 ° C, and finally in the absorption solution was read using spectrometers at wavelengths of 530 and 657 nm and then were the following formula (Sevelius, 2003).

(Formula 2) Anthocyanin = $A_{530} \frac{1}{4} A_{657}$

Leaf chlorophyll

For the measurement of chlorophyll was used the Arnon (1949) method. Thus, 1 gram of fresh leaf was pulverized in a porcelain mortar with 10 ml of 80% acetone and the clear solution after centrifugation was measured by light absorption spectrophotometry at a wavelength of 645 and 663 nm and finally the chlorophyll content was measured based on milligrams per gram of tissue by the following formula.

(Formula 3) chlorophyll a = $(12/7 \times A_{663}) - (2/69 \times A_{645})$

(Formula 4) chlorophyll b = $(4/68 \times A_{663}) - (22/9 \times A_{645})$

(Formula 5) total chlorophyll = $(8/02 \times A_{663}) - (20/2 \times A_{645})$

Ionic leakage

Measurement of ion percentage can be a good indicator in determining the stability of the membrane in water with high EC. Salinity stress, leads to the oxidative stress, osmotic stress and ion toxicity. To assess the extent of damage to the membrane ion leakage, were used the Ben Hamed et al, 2007 method. In this way, 5.0 g of flower petals were placed into Falcon 10 ml and added distilled water. Then put the Falcon in 30 minutes in a hot water bath (Ben Murray) with a temperature of 60 degrees and then examples electrical conductivity (EC1) were measured using the EC meter model Metrom (Switzerland). The Falcon at 120 ° C for 20 minutes and then after cooling to a temperature of 25 degrees, re-measurement the electrical conductivity of the samples (EC2) and ion leakage was calculated by the following formula (Kazemi et al, 2012).

(Formula 6) ion leakage percentage= EC1/EC2 X 100

Phenylalanine Ammonia Lyase Enzyme (PAL)

3.0 g of fresh petal tissues weighed and in 5.6 ml of buffer Tris-HCl 50 mM(pH)8.8, that containing 15 mM beta-mercaptoethanol, pulverize and extract was placed for 30 minutes at 5000 g cm. The supernatant was used for identification. Mixture of 1 ml of extraction buffer, 5/0 mL of phenylalanine 10 mm, 4.0 ml water and 1.0 ml of enzyme extract were placed in hot water bath 37 ° C for one hour. Then the reaction was stopped by 0/6 ml of chloric acid in 6 M. Finally, the resulting solution was added 15 ml of ethyl acetate. Oil phase detached and remaining at put in laboratory to evaporate. then remaining, that is the same cinnamic acid solved in 3 ml of 0/05 molar and cinnamic acid concentration was obtained by measuring the absorption at a wavelength of 2 nm using the extinction coefficient of M⁻¹cm⁻¹ 9500. The activity of this enzyme is determined based on the speed of converting phenylalanine to trans-cinnamic acid. A unit of PAL activity equivalent to 1 micromole of produced cinnamic acid in one minute. (Wang et al., 2006)

RESULTS AND DISCUSSION

Flavonoids and anthocyanins are remarkable and diverse group of secondary products with a wide range of biological functions, including protection under stress conditions. Poly phenolic compounds are in a wide variety of chemical compounds in plants that has significant physiological importance in plants. It is thought that the molecular basis for plant protection practice, are in the inhibitory properties of antioxidants and free radicals. Based on the above, salicylic acid caused antioxidant protection and stability of plant pigments [Fig. 1 and 2] and decrease electrolyte leakage due to the strength of the cell wall [Fig. 3].

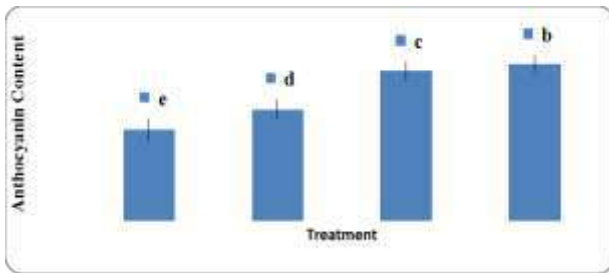


Fig. 1: Effect of experimental factors on anthocyanin petals of cut flowers.

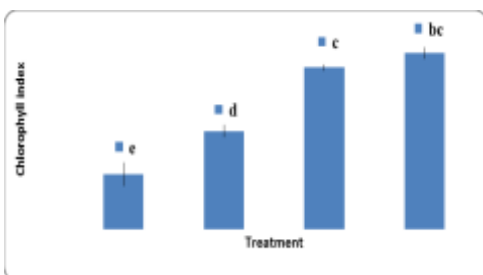


Fig. 2: Effect of experimental Factors on chlorophyll index of cut flower.

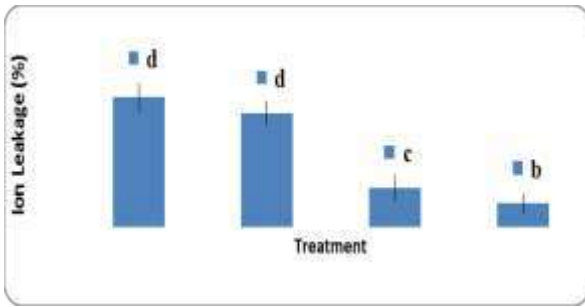


Fig. 3: Effect of experimental Factors on ion leakage of cut flower.

Plants in response to infections that cause by fungal or bacterial, to produce compounds phenylpropanoid and this combination will be largely responsible for plant defense mechanisms.

Salicylic acid due to the presence of acidic environment PH to control the growth of microorganisms and followed by its absorbance, increase relative fresh weight [Fig. 4 and 5].

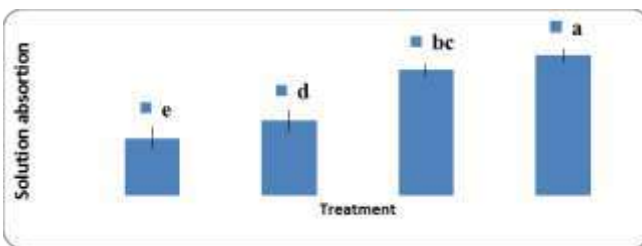


Fig. 4: Effect of experimental Factors on water absorption of cut flower.

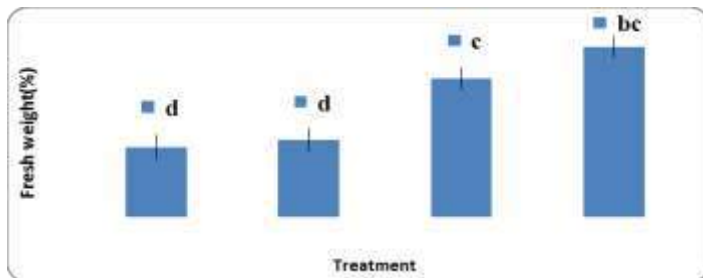


Fig. 5: Effect of experimental Factors on fresh weight of cut flower.

Phenylalanine ammonia lyase has central role in the production of phenolic compounds, which is responsible for defending in difficult environments in response to different stimuli. Usage of salicylic acid due to the impact of the phenolic cycle and antioxidant role, reduces the downward trend of Phenylalanine ammonia lyase enzyme [Fig. 6]. Improve all traits compared to the control group showed that reduced activity of microorganisms and thus extend the life of treated flowers with salicylic acid [Fig. 7].

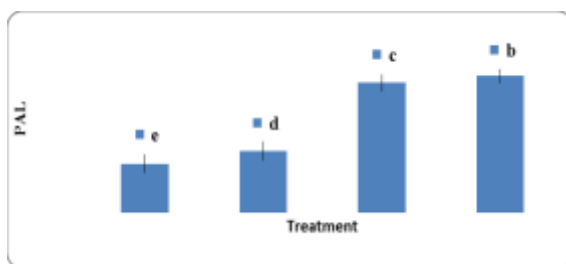


Fig. 6: Effect of experimental factors on PAL activity of cut flowers.

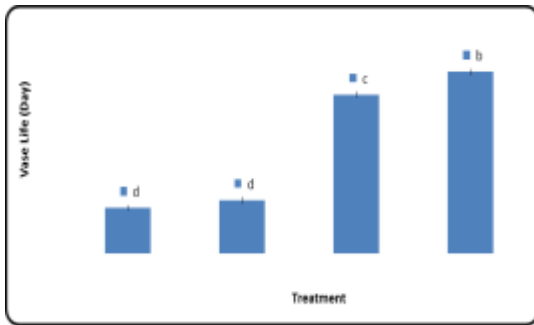


Fig. 7: Effect of experimental factors on vase life of cut flowers.

CONFLICT OF INTEREST
There is no conflict of interest.

ACKNOWLEDGEMENTS
None

FINANCIAL DISCLOSURE
None

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ARTICLE

ANALYZING AND RECOGNIZING CAUSES OF DRUG TENDENCY AND CHANGING CONSUMER PATTERN FROM LOW-RISK DRUGS (TRADITIONAL) TO HIGH RISK (SYNTHETIC)

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ABSTRACT

Addiction is a serious damage in personal, family and social areas. By identifying and investigating the causes of changes in patterns of drug use can have guidance and support programs which are related to drug control and prevention of drug industry. The purpose of this study is analyzing and recognizing causes of drug tendency and changing consumer trends from traditional drugs to synthetic in Ardabil Province, 2014-2015. The research method is a survey and questionnaire was used to collect the required information. The statistical population clients rehab centers and drug rehabilitation camps of welfare organization in Ardabil Province and sampling was done randomly for this purpose 150 addicted to the narcotics industry trends that have been eligible to participate in this study and 120 of them were selected and accepted to cooperate. The validity of research tools was based on expert opinion and the validity of the questionnaire with Cronbach's alpha coefficient was used to change the pattern of drug use that was 97%. Based on data analysis, descriptive and inferential statistics and using SPSS software it was summarized and concluded and also with regard to the issues raised in this project proposals have been discussed.

INTRODUCTION

Methamphetamine addiction is a public health problem that has spread around the world and especially areas such as East and South Asia, Australia, America and Britain more than the rest of the world. As it was highlighted in the 2002 report of the UN Office for Drug Control and Crime Prevention to a growing trend of methamphetamine seizures was mentioned 28% and methamphetamine production is estimated up to 500 tons.

Today, drug use among the population has increased alarmingly. That made drug use as the positive norm and has become a part of life and social habits in different groups of society. Drug use in the current situation is gradually exited from the traditional approach and young people have turned to use synthetic chemicals drugs. Some officials and experts of social problems, the cause of this is social and cultural changes together with the modern world knowledge and believes that due to social and cultural changes, it is affected traditional and developing societies and faced people with large volumes of information, and this makes some young people to use drugs in order to gain new experiences, fun, happiness, recreation and relief from loneliness and isolation. The expansion of synthetic drug is rooted in people wrong beliefs. Due to lack of knowledge of the hazards and consequences of synthetic materials and ignoring the effects of a group of community with false beliefs, so that in their imagination the recreational use and experience the enjoyment and pleasure is just once and will not cause addiction. Unaware of the fact that many addicts of synthetic drugs action taken with the same motivation and using once creates positive sentiment to continue in their consumption and cause psychological dependence on such materials. Also the average of age of synthetic drug has declined. Today, young people at the beginning of their smoking use crack and heroin. Being cheap, imitation of others, diversity, satisfaction of the drug and no evil drug friends at parties, other factor, including changing patterns among the young of traditional and synthetic drug use. Socio-cultural problems, lack of religious beliefs and convictions, poverty and economic problems have increased personal problems and those who are not able to solve the problem, the shortest and riskiest way is using drug. Although addiction in general will not be eradicated but knowing factors in changing patterns of drug use from traditional to synthetic optimized scheduling led by experts in order to reduce injuries in today's society. The purpose of this study was to determine factors that change the pattern of psychotropic drug use from traditional to synthetic. Traditional drugs, growing from the soil, affect the body more and relax the body and relieve pain. Synthetic stimulant drugs are substances that stimulate nerves and, by acting on the brain's reward center pleasurable effects such as euphoria, fatigue, feeling more alert, raising the mood. Drug use, although not the same as before need fire and charcoal, but by changing the consumption patterns of traditional to synthetic, we see an increase in risks to users of such material. If in past there were only a few drugs on the market and consumers had to rely on the same traditional materials; but today narcotics industry, has provided wide market and variety of choices for the addict.

Statement of the problem

According to the Iranian Drugs Control Headquarters has identified a million and 200 thousand number of who are addicted thousand people and also 800 use drugs for fun. The exact number is not known in Iran's dependence on methamphetamine, but in the past few years has been a growing trend. Widespread prevalence of methamphetamine use is very worrying and the spread of methamphetamine in America requires research on the etiology of effective treatments. Addiction treatment was planned based on the

KEY WORDS

Addiction, traditional drugs, synthetic drugs, addicts, drug consumption patterns

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needs of men in the past, but in the past few years, research has shown that therapies for women have effective results. Changing patterns of drug use from traditional materials and chemical industries and the use of psychotropic pills is a serious threat to modern societies which are in crisis. The identification of more than 4,000 psychotropic tablets in recent years in the country, showing a tendency to consume synthetic drugs among today's generation and while the harms of these drugs, is far more grievous than traditional drugs. June 26 is named as the World Anti-Drug Day. World Anti-Drugs Day slogan for 2015 is "Let's live together and make our community and our identity free of drugs". It is hoped that with regard to this motto and in line with the anti-drug policy that the Islamic Republic of Iran is running, with public efforts we can take basic steps for a world free of drugs. One of the adverse effects of the modern world is expansion of synthetic drugs and expands the use of such material and change the traditional way of using drugs to synthetic have followed by social, judicial and police response. Now the cases where had serious concerns of families, the community and the authorities is expanding the use of synthetic drugs among young people, regardless of its effects. The youth of today prefer instead of traditional drugs such as opium, consume chemicals and new synthetic drugs. Today, the modern world has made things easier for everyone. One of the consequences of the modern world is the expansion of modern lifestyle in the shortest possible time man meets their needs. In other words, the use of traditional drugs requires time as well as equipment and accessories, but chemical drugs and its use do not take much time and synthetic drugs can be quickly used in every situation.

The research objectives

- Recognizing causes of drug tendency and changing consumer trends from traditional drugs to synthetic in Ardabil Province
- Review and understand the current situation of the use of synthetic drugs
- Analyzing the causes of expansion of drug use

METHODS

The research method is a survey and questionnaire was used to collect the required information. The statistical population clients rehab centers and drug rehabilitation camps of welfare organization in Ardabil Province and sampling was done randomly. The participants were people who have dependence on methamphetamine and at least two weeks have passed from their hospital stay and physical symptoms were left behind and they were willing to be interviewed and were able to express the experiences of everyday life.

Research hypothesis

- 1- There is a significant relationship between friendship and changing patterns of drug use.
- 2- There is a significant relationship between drug diversion and changing patterns of drug use.
- 3- There is a significant relationship between religious beliefs and changing patterns of drug use.

First hypothesis

There is a significant relationship between friendship and changing patterns of drug use.

Table 1: The relationship between friendship and changing patterns of drug use

Variable	Frequency	Pearson coefficient	The significance level
friendship and changing drug patterns	120	0.312	0.006

According to data analysis there is a significant relationship between friendship and changing patterns of drug use. Therefore, this hypothesis is confirmed. The likelihood of addiction in people who have addicted friends several times is more than others. According to research and interviews with consumers of synthetic drugs, most of them have begun addiction in their friend's home. Thus we should be careful about our children friends. Maybe one day they offer drug to our children. Do we have thought about to avoid the impact? Is he aware of the effects and harms of substance? If we do not give correct answers about drugs and psychotropic substances to our children questions, they will learn wrong answers from their friends. If in rehab centers we are facing with synthetic drug addicts, it has been proposed to invite addicts who quit smoking synthetic drugs or are recovering to come and provide the necessary training to these people as they face the most influential educational, and transfer their experiences in friendly and informal meeting to other addicts. Because they can easily meet with addicts and points out their mistakes. By using this method a significant percentage of the changing drug consumption pattern towards hazardous materials was reduced.

Second hypothesis

There is a significant relationship between drug diversion and changing patterns of drug use.
Drug diversion and changing patterns of drug use

Table 2: The relationship between drug diversion and changing patterns of drug use

Variable	Frequency	Pearson coefficient	correlation	The significance level
Statistical index				
Drug diversion and changing patterns of drug use	120	0.500		0.000

According to data analysis there is a significant relationship between drug diversion and changing patterns of drug use. Therefore, this hypothesis is confirmed. A variety of synthetic drugs is growing rapidly as far as families and schools and provincial education authorities are not familiar with new synthetic drugs and students without complete information will be drawn to these materials. Now a massive community campaign against false and misleading advertising on different networks and satellite channels where police and relevant agencies should attempt to be dominant on these ads and introduce the nature of such material to community to induce the message of hatred toward drugs in the minds of the community and strongly and decisively fight the those who promote and profit from synthetic drugs and drug addiction.

Third hypothesis

There is a significant relationship between religious beliefs and changing patterns of drug use.
Religious beliefs and changing patterns of drug use.

Table 3: The relationship between religious beliefs and changing patterns of drug use

Variable	Frequency	Pearson coefficient	correlation	The significance level
Statistical index				
Religious beliefs and changing patterns of drug use	120	-0.39		0.599

According to data analysis there is a significant relationship between religious beliefs and changing patterns of drug use. Therefore, this hypothesis is rejected. Addiction in religious family is much less than others. The findings show that religious young people less than others are caught in the trap of addiction. Surely those who accept religious principles and have sense of coherence to it are less than people who are not religious use drugs. Given that the respondents in terms of religious beliefs, such as participating in the ceremony of months (Muharram and Ramadan) was not serious on their duties, and even in these days the synthetic drugs are underused, therefore it is recommended to use religious symbols and religious reference groups, scientific, literary, artistic, sports and cinema are used for addicts modeling. Religious member of society should be invited to address the issue of prevention of addiction in the organs, agencies, and universities and schools.

CONCLUSION

The results show that from the four hypotheses proposed three hypotheses have been confirmed and one was rejected. Of these three; the positive and significant relationship of friendship and drug diversion can be mentioned. The one that was rejected is the negative and not significant relationship between religious beliefs can be mentioned.

CONFLICT OF INTEREST
None

ACKNOWLEDGEMENTS
None

FINANCIAL DISCLOSURE
None

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ARTICLE

STUDY ON PREVALENCE OF COCCIDIOSIS IN POULTRY IN FOUR AREAS OF SISTAN

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ABSTRACT

Coccidiosis is one of the most important and common diseases that affect poultry, it results in a great economic loss all over the world. A study was conducted to determine the prevalence of poultry coccidiosis and to assess its relationship with different risk factors in different regions in Sistan. **Objective:** The present research aimed to determine the frequency and diversity of *Eimeria* species in native poultry of different areas of Sistan. **Method:** Flotation and McMaster counting techniques were used for qualitative and quantitative studies, respectively. 2792 fecal samples were collected from Zabol, Hirmand, Adimi, and Zahak regions in Sistan by random cluster sampling and then tested based on flotation technique. The study involved questionnaire survey, fecal examination and identification of coccidial species based on their morphology and sporulation time. **Results:** 5 species of *Eimeria* including *Eimeria acervulina* (35.23%), *Eimeria maxima* (20.70%), *Eimeria brunetti* (19%), *Eimeria necatrix* (15.23%), and *Eimeria tenella* (4.76%) were observed. *Eimeria acervulina* (35.23%) and *Eimeria tenella* (4.76%), respectively, had the highest and lowest infection rates in domestic poultry in four parts of Sistan. In addition, *Eimeria maxima* (20.70%) and *Eimeria brunetti* (19%) ranked second and third, respectively. **Discussion:** the present study showed that presence of coccidiosis of poultry in the study area and appropriate strategies have to be designed to reduce the effect of the disease.

INTRODUCTION

The traditional poultry production system in Sistan is characterized by minimum inputs from the owners, usually kept in small numbers and fed leftovers including occasional grain feed and household wastes. Coccidiosis is an important parasitic disease that induces great economic loss particularly in poultry industry all over the world [9]. It is caused by different species of the genus, *Eimeria*. In domesticated chickens, at least nine species of have been recognised [8] The infection occurs through ingestion of feed or water contaminated with sporulated oocysts [1]. The place of parasite establishment and the severity of injuries, shape and size, evolution of parasite inside the body, symptoms of the disease and mortality rate are not the same in different species.

Coccidiosis causes large economic losses that are unique in their kind. This disease annually causes financial damages of approximately 60 to 120 million dollars around world. In addition, large costs are annually spent on medication, treatment, and prevention of coccidiosis.

The use of anti-coccidian drugs is considered a necessity in any country. The most important issue about coccidiosis is the selection appropriate drug for its treatment. Different methods such as vaccination, medication, genetic modification, and nutrition improvement are used for combating this disease. However, medication is usually associated by some disadvantages such as high cost of drugs, drug resistance, weakening of the immune system, cellular poisoning, and reduced production efficiency.

Coccidiosis transfer between the hosts is done through the oocyst shedding. Coccidia parasite multiplies in the intestine and causes tissue irritations and bleeding in the gastrointestinal tract [9]. On the other hand, due to the proliferation of the protozoon in the tissues of the digestive system, intake of nutrients and their absorption will face difficulty. With the expansion of injuries, other infections such as intestinal inflammation caused by bacteria may occur. The present study aims to determine the prevalence of coccidiosis among poultry in four areas of Sistan (Zabol, Hirmand, Adimi, and Zahak), compare the histopathological changes caused by coccidiosis in these areas, determine the relationship between infection with coccidiosis and habitat of domestic poultry, and determine the percentage of infected poultry with coccidiosis in different seasons using laboratory methods.

METHODS

This survey was carried out in Zabol, Zahak, Adimi and Hirmand County which are located in Sistan and Baluchestan province are located in east of Iran and are bordered with Afghanistan country. Of the 2792 fecal samples were collected from Zabol, Hirmand, Adimi, and Zahak regions in Sistan by random cluster sampling. The faecal samples were collected directly from the rectum and put in plastic bottles from each chicken and brought to the laboratory of parasitology in faculty of veterinary at university of Zabol for examination. During sampling age, breed and sex were recorded. The presence of fecal oocysts was determined using the concentration by flotation (Eslami and Ranjbar Bahadori, 2004). The presence of fecal oocysts was determined using the concentration by flotation method. The principle of this method allowed the eggs to float to the surface of the solution of higher specific gravity, which concentrates at the top and leaves debris lower down. The higher the specific gravity of the solution, the more the eggs of different types will float. One gram of fecal sample was weighed using a top loader balance. Put into a beaker and mixed with saturated Sodium Chloride solution. Then it was thoroughly mixed and strained using 100 mesh sieves into another beaker. The filtrate substances of fecal samples were placed in test tube stands. Then each tube was filled to the brim with saturated Sodium Chloride solution. After that,

KEY WORDS

Coccidiosis; *Eimeria*;
Domestic poultry; Sistan

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cover slip was placed on test tube surface and was left to stay for 15 minutes and then they are gently lifted. The cover slips were placed on microscope slides and viewed under the microscope by using ×40 objective lens [4].

The sporulation time of the oocysts was determined at 29-30 c using the technique described by Conway and McKenzie [4]. The sporulation time was considered when 90% of the oocysts were sporulated. The raw data were entered and managed in Microsoft Excel worksheet and descriptive statistic was utilized to summarize the data. The point prevalence was calculated for all data by dividing positive samples by total number of examined samples and multiplied by hundred. The association between the prevalence of the disease and risk factors was assessed by Chi-square, whereas student t-test was used to examine the difference in mean oocysts count between positive samples. A statically significant association between variables was considered to exist if the computed p value was less than 0.05. All statistical analyses were done using SPSS statistical software.

RESULTS

Out of the total 2792 chickens examined, 100 (3.58%) were positive for coccidian oocysts of domestic poultry in Sistan in different seasons. The rate of infection were related to *Eimeria acervulina* with 37 oocysts per gram of fecal sample (35.23%), *Eimeria maxima* (20.70%), *Eimeria brunetti* (19%) and *Eimeria tenella* (4.76%) [Table 1].

Table 1: The average contamination of different species of *Eimeria* in 2792 fecal samples collected from poultry in four areas

Eimeria species	acervulina	maxima	brunetti	necatrix	tenella
Av. number of oocysts per gram of stool	37 (% 35/23)	27 (% 25/71)	20 (% 19)	16 (% 15/23)	5 (% 4/76)

In Adimi area, 557 fecal samples were collected from domestic poultry in different seasons. According to the results, the highest and the lowest rate of infection were related to *Eimeria acervulina* with 10 oocysts per gram of sample and *Eimeria tenella* with 2 oocysts per gram of sample, respectively. *Eimeria maxima*, *Eimeria brunetti*, and *Eimeria necatrix* with 6, and 3 oocysts per gram of sample ranked after *Eimeria acervulina* [Table 2].

Table 2: The average contamination of different species of *Eimeria* in 2792 fecal samples collected from poultry in four areas of Sistan 2015 separately

Eimeria species	acervulina	maxima	brunetti	necatrix	tenella
Av. number of oocysts per gram of 557 fecal samples Adimi	10 (% 37/3)	6 (% 22/22)	6 (% 22/22)	3 (% 11/11)	2 (% 7/40)
Av. number of oocysts per gram of 1011 fecal samples Zahak	12 (% 37/41)	7 (% 24/13)	4 (% 13/79)	5 (% 17/24)	1 (% 3/44)
Av. number of oocysts per gram of 344 fecal samples Zabol	7 (% 33/33)	6 (% 28/57)	4 (% 19/04)	4 (% 19/04)	- -
Av. number of oocysts per gram of 880 fecal samples Hirmand	8 (% 28/57)	8 (% 28/57)	5 (% 18/85)	5 (% 18/85)	2 (%7/14)

In Zahak, a total of 1011 stool samples were collected from the domestic poultry in different seasons. According to the results, the highest and the lowest rate of infection were related to *Eimeria acervulina* (37.41%) and *Eimeria tenella* (3.44%), respectively. *Eimeria maxima* and *Eimeria necatrix* showed the highest rate of infection after *Eimeria acervulina* in this area.

In Zabol, a total of 344 fecal samples were collected from the domestic poultry in different seasons. According to the results, the highest and the lowest rate of infection were related to *Eimeria acervulina* with 7 oocysts per gram of sample and *Eimeria brunetti* and *Eimeria necatrix* with 4 oocysts per gram of sample, respectively. *Eimeria maxima* had the highest rate of infection after *Eimeria acervulina* with 6 oocysts per gram of sample .

In Hirmand, 880 fecal samples were collected from the domestic poultry in different seasons. According to the results, the highest and the lowest rate of infection were related to *Eimeria acervulina* (28.57%) and *Eimeria tenella* (7.14%), respectively. *Eimeria maxima* and *Eimeria necatrix* showed the highest rate of infection after *Eimeria acervulina*.

DISCUSSIONS

In traditional poultry production system, the input required is minimal and is considered as secondary to other agricultural activities by the smallholder farmers. Housewives and children are usually responsible to undertake poultry production around the homestead. Since these social groups usually stay longer around the home, they can easily look after the chicken. The income obtained from poultry production may also be most accessible source of income during need of cash for women and youths. Thus, from this point of view, poultry production may address the social and economical problems of gender issues and improve the income source and long-term economic potential of women in the rural community.

Coccidiosis outbreak can be very severe or mild. In mild cases, despite infection, no clinical or subclinical symptoms are shown. The disease can infect poultry at any age and situation, but it can make great losses in the first week of culture. In the present study, mucosa, intestine, and cecum were used for preparation of smears. In addition, flotation method was used for determining the number of oocysts per gram of fecal sample. This method requires very high accuracy. Sistan region, with its certain geographical and climatic conditions, can be a suitable place for incidence of different parasitic diseases. Coccidian infection occurs in all ages but its clinical protests are restricted to young birds. Severity of coccidiosis in young birds depends on the number of ingested sporulated oocytes, parasite species, the immunity level, nutritional conditions of the host, and presence of other infectious diseases [9]. Since infection with coccidiosis in local poultry is often subclinical, no action is usually taken against them. This causes adverse effects such as weight loss, delayed growth, and decreased egg production.

Since the infection of local poultry of Sistan with *Eimeria* species had never been studied, the present study aimed to clarify the status of coccidiosis and determine the diversity of *Eimeria* species in local poultry of Sistan region. During this study, 2792 fecal samples were collected from domestic poultry in four cities of Sistan and Baluchestan Province in different seasons. According to the results, coccidiosis infection in domestic poultry of this region was mainly clinical and its acute form was observed less frequently. In the studied areas, 5 species of *Eimeria* including *Eimeria acervulina*, *Eimeria maxima*, *Eimeria brunetti*, *Eimeria necatrix*, and *Eimeria tenella* were observed. *Eimeria acervulina* (35.23%) and *Eimeria tenella* (4.76%), respectively, had the highest and lowest infection rates in domestic poultry in four parts of Sistan. Coccidiosis is a disease that should be always taken into account in terms of economic losses and health problems that may cause. Although Eimerial infection in poultry has been reported from different parts of the world and Iran, its distribution and species diversity are associated with the host and conditions of culture such as density, diet, ventilation, and preventive treatments. In this study, the prevalence of *Eimeria* in domestic poultry of different areas of Sistan have been reported to be 21%. This figure is significantly different from other reports in other regions of Iran such as Mashhad (38%), Golestan Province (36%), Tabriz (56%), Mahabad (42%), and Hamedan (75%). This difference in the prevalence of infection with other parts of Iran can be attributed to the conditions of culturing the domestic poultry, weather conditions of Sistan and Baluchestan Province, and humidity rate.

Many studies have been conducted on coccidiosis in Iran. Charkhkar *et al.* carried out a study in order to identify *Eimeria* species in poultry based on morphological characteristics [3]. In their research, 17 samples from five climatic zones were tested and a total of 25 *Eimeria* oocytes were identified. The highest frequencies were related to four species including *Eimeria tenella*, *Eimeria maxima*, *Eimeria acervulina*, and *Eimeria necatrix* which was consistent with our study.

In poultry farms of Tabriz, 5 species of *Eimeria* including *Eimeria tenella*, *Eimeria maxima*, *Eimeria acervulina*, *Eimeria necatrix*, and *Eimeria mitis* have been reported [5] which was consistent with our study.

In Ethiopia, a study was conducted in the case of coccidiosis in broiler chickens from November 2009 to April 2010 and four species of *Eimeria* including *Eimeria tenella*, *Eimeria acervulina*, *Eimeria necatrix*, and *Eimeria brunetti* were identified. Among these species, *Eimeria brunetti* (34.3%) and *Eimeria tenella* (5%) showed the highest and the lowest prevalence, respectively [6].

In another study conducted by Muazu *et al.* in Niger, among the 100 collected carcasses, 30 cases were infected with coccidiosis [10]. The highest prevalence was related to *Eimeria tenella* (10%) and then *Eimeria maxima*, *Eimeria acervulina*, and *Eimeria necatrix* ranked second to fourth with percentage of 9, 6, and 5, respectively.

In another study carried out by Razmi *et al.* in Iran, the highest prevalence of coccidiosis was reported from poultry aged above 6 months [12]. According to the results, *Eimeria acervulina*, *Eimeria maxima*, and *Eimeria tenella* were observed in 97%, 41%, and 12% poultry farms, respectively.

The present study provided useful results on the prevalence of coccidiosis in domestic poultry of Sistan in four areas, the effect of different seasons on infection with coccidiosis, and optimum conditions for culture of poultry in this region in order to reduce the severity of infection.

It should be noted that due to the presence of pathogenic species in domestic poultry of Sistan, periodic or strategic treatments can greatly reduce the negative side effects of this parasite such as weight loss and decreased egg production.

CONFLICT OF INTEREST

None

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None

FINANCIAL DISCLOSURE

None

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ARTICLE

EFFECTS OF SALT STRESS AND SALICYLIC ACID ON VEGETATIVE AND REPRODUCTIVE TRAITS OF POT MARIGOLD

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ABSTRACT

A factorial experiment with two factors using the randomized complete block design with four replications was carried out in the greenhouse of the Shirvan Branch of Islamic Azad University in 2015 to evaluate the effects of salicylic acid sprays on vegetative and reproductive traits of pot marigold under salt stress. The experimental factors were four levels of salt stress (0, 50, 100, and 200 mM), and four levels of salicylic acid sprays (0, 1, 1.5, and 2 mM). Sodium chloride was used to induce the levels of salt stress. Results showed all of the studied traits including number of flowers and flower diameter, flower dry weight, number of buds, plant height, leaf surface area, chlorophyll content, fresh and dry weights of aerial organs, and root dry weight and length were influenced by salicylic acid, salt stress, and by their mutual effects at the 1% level. Comparison of the means indicated that raising the level of salt stress to 200 mM reduced the above-mentioned traits by 89, 73, 94, 52, 90, 46, 78, 67, 83, and 69%, respectively. Moreover, salicylic acid sprays improved vegetative traits, and the dry flower yield per plant of 3.21 grams was achieved by applying 1 mM sprays of salicylic acid without salt stress. The maximum dry plant weight (10.62 grams) was observed in the treatment of applying 1 mM salicylic acid under 50 mM salt stress. In all, salicylic sprays improved plant growth and modified the negative effects of salt stress on plants.

INTRODUCTION

Salt stress is considered one of the limiting factors in the production of agricultural products in many regions of the world, and about 30-50% of irrigated land is affected by salinity. About half of the 9.5 million hectares of land under cultivation in Iran is faced with the salinity problem (Safarnezhad et al., 2007). Salt stress restricts crop plant growth and yield through reducing osmotic potential and by disrupting absorption of some elements. Plants growing in saline soils also face water deficit stress in addition to salt stress due to osmotic properties, and this water deficit stress reduces plant growth rate, which disrupts cell division, causes enlargement of cells, and influences all the metabolic reactions in plants. Moreover, increased levels of sodium and chlorine ions decrease absorption of necessary ions including potassium, calcium, ammonium, and nitrate ions, reduce activities of enzymes, and disrupt membrane structure (Demir Kaya et al., 2006; Netondo et al., 2004).

At present, medicinal plants are among important economic plants utilized raw or in processed forms in traditional or modern industrial medicine (Akbarinia, 2010). Pot marigold is an annual or perennial plant of the Asteraceae family, its flower, in addition to edible uses (as a flavoring and coloring agent of food), contains active ingredients and compounds that have applications in industry (manufacturing dyes and industrial nylons) and in pharmacy. Its seeds contain 15-20 percent oil, 45-60 percent of which consists of calendic acid (Martin and Deo, 2000). The active ingredients of this plant are produced and stored in its flowers, and the most important of them are water-soluble flavonoids, carotenoids, essential oil, and mucilaginous compounds (Edla, 3000; Baco et al. 2002).

Salicylic acid (SA) is an antioxidant, a plant hormone, and an important signaling molecule in plant reactions to environmental stresses, is produced by root cells, and plays a pivotal role in regulating various physiological processes such as growth, plant evolution, ion absorption, photosynthesis, and germination. It has been discovered that salicylates accumulate in many plant species (Hayat and Ahmad, 2007).

Salinity had negative effects on growth, protein content, and nutrient absorption in strawberry, but plants treated with SA often had greater stem weight, higher dry weight of stems, more fresh and dry root weights, and greater quantities of chlorophyll under saline conditions (Karlidag et al., 2009).

Salinity treatment decreased growth parameters, but application of SA increased protein content and changed leaf and root fresh and dry weights in artichoke (Bagherifard et al., 2013).

Nasiri and Izan (2014) studied the effects of SA and salt stress on yield of the medicinal plant dragonhead, and showed the mutual effects of salinity and SA on plant height and yield and plant chlorophyll content were significant.

Therefore, this research intended to study the effects of various salinity levels on vegetative and reproductive traits of pot marigold.

KEY WORDS

Pot marigold, salt stress, vegetative and reproductive traits

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MATERIALS & METHODS

A factorial experiment was conducted in this research with two factors using the randomized complete design with four replications in the research greenhouse of the Shirvan Branch of Islamic Azad University in 2015. The first factor was four levels of SA spray (0, 1, 1.5, and 2 mM), and the second factor four levels of NaCl salinity (0, 50, 100, and 200 mM). Pot marigold seeds were bought from the Pakan Seed Company in Isfahan.

The seeds were planted in 64 plastic pots at an identical depth with 10 seeds per pot in soil of known composition and were irrigated. The plants grew in the open air at $20\pm 5^\circ\text{C}$, and, when established and at four-leaf stage, were thinned to have three plants per pot. Salt stress was applied 45 days after thinning using various concentrations of NaCl solutions. Once every 10 days, normal water was used in irrigating the pots to prevent salt shock. The experiment continued for 100 days (until the end of the flowering stage). Taking samples started at 50% flowering and every 20 days (after the flowers opened) flower samples were taken. The studied traits included number of flowers, flower diameter, flower dry weight, plant height, leaf surface area, chlorophyll content, fresh- and dry-weights of aerial organs, root length, and root dry weight. MSTATC was employed to analyze the data, EXCEL to draw the diagrams, and the LSD test at 1% probability to compare the means.

RESULTS

Results of ANOVA showed that the effects of SA concentration, of the various levels of salinity, and their mutual effects on all the measured traits were significant at the 1% probability level.

Number of flowers

Comparison of the means indicated the maximum number of flowers per plant (9.83) belonged to the treatment of spraying mM SA with no salt stress, and the minimum (1.08) to the treatment of 2 mM SA and 200 mM salt stress, with a difference of 80% between the two treatments. In general, number of flowers per plant declined with increases in the level of salt stress [Fig. 1].

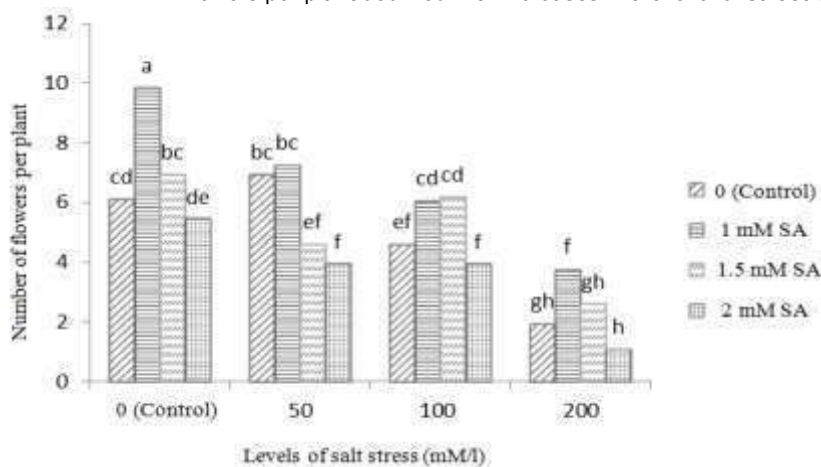


Fig. 1: Comparison of the means of number of flowers per plant at various levels of SA concentrations and salt stress

Flower diameter

The largest flower diameter (2.97 cm) was that of 1 mM SA spray with no salt stress, and the minimum (0.8 cm) that of 2 mM SA spray and 200 mM salt stress, with a difference of 73 percent between the 2 treatments. Flower diameter decreased under the influence of salt stress, and low and moderate concentrations of SA sprays were able to somewhat increase flower diameter at high levels of salt stress [Fig. 2].

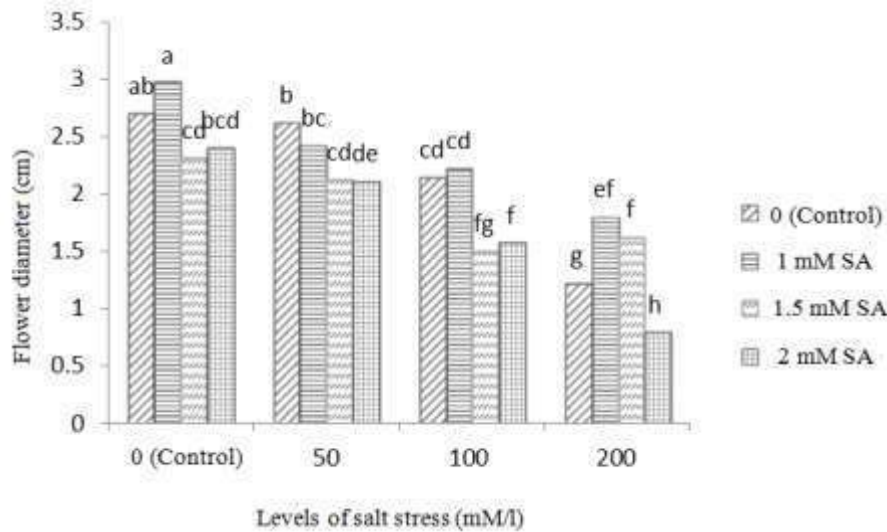


Fig. 2: Comparison of the means of flower diameter at various levels of SA concentration and salt stress

Dry flower weight

The maximum dry flower weight (3.21 g/plant) was achieved in the treatment os spraying 1 mM SA and no salt stress, and the minimum (0.19 g/plant) in the treatment of 2 mM SA and 200 nM salt stress, with a difference of 94% between the two treatments [Fig. 3]

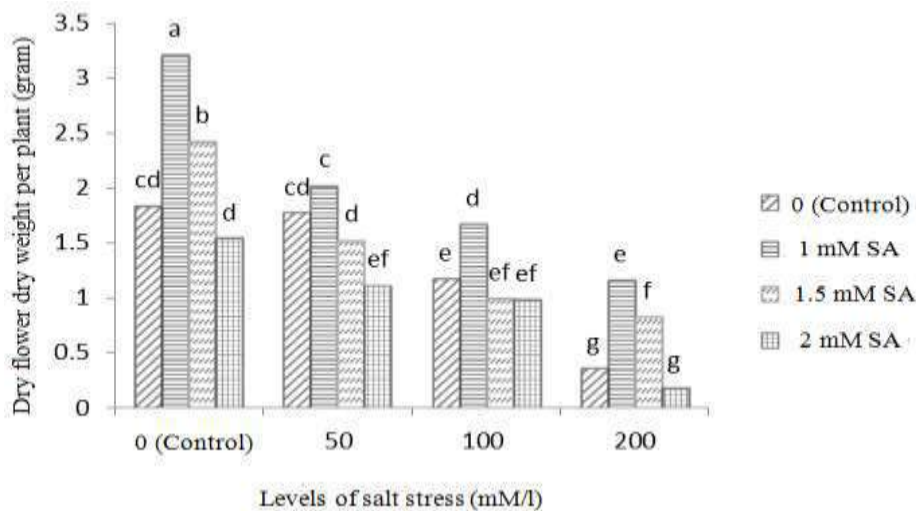


Fig. 3: Comparison of the means of dry flower weight at various levels of SA concentrations and salt stress

Plant height

Results revealed the tallest plants (54.00 cm) were observed in the treatment of spraying 1 mM SA with no salt stress, and the shortest (25.50) in the treatment of not spraying SA acid under 200 mM salt stress conditions, with a difference of 52% between the two treatments. In general, plant height declined under the influence of salt stress. Spraying SA at low concentrations under low levels of salt stress increased plant height, and at higher levels of salt stress higher concentrations of SA increased plant height the most [Fig. 3].

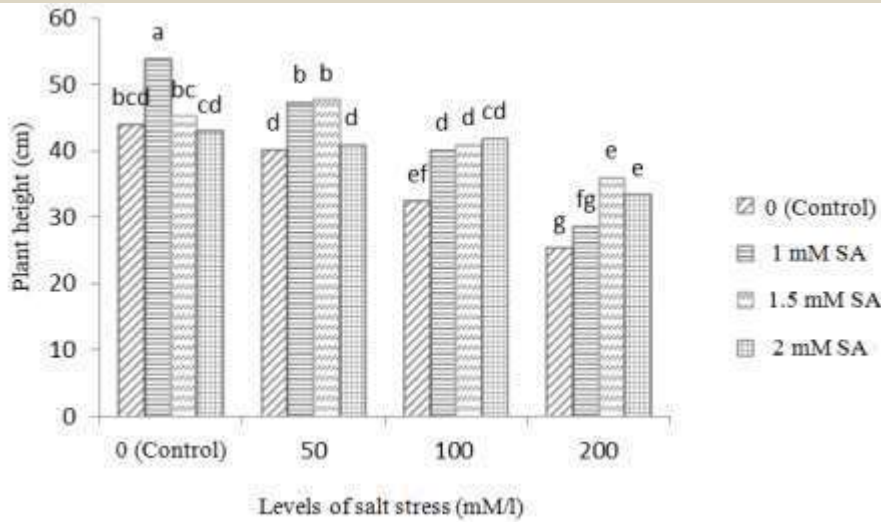


Fig. 4: Comparison of the means of plant height at various levels of SA concentration and salt stress

Leaf surface area

Comparison of the means showed that the largest leaf surface area (411.64 cm²) belonged to the treatment of spraying 1.5 mM SA and no salt stress, and the smallest (38.45 cm²) to the treatment of not spraying SA and 200 mM salt stress, with a 90% difference between the two treatments [Fig. 5].

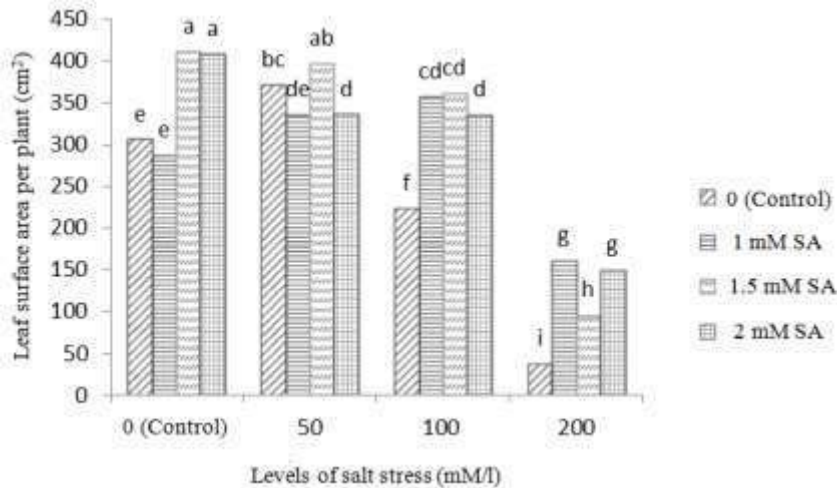


Fig. 5: Comparison of the means of leaf surface area at various levels of SA concentration and salt stress

Chlorophyll content

The highest chlorophyll content (SPAD 46.00) was achieved in the treatment of spraying 1 mM SA with no salt stress, and the lowest (SPAD 24.42) in the treatment of spraying 1.5 mM SA and 200 mM salt stress, with a difference of 46% between the two treatments [Fig. 6].

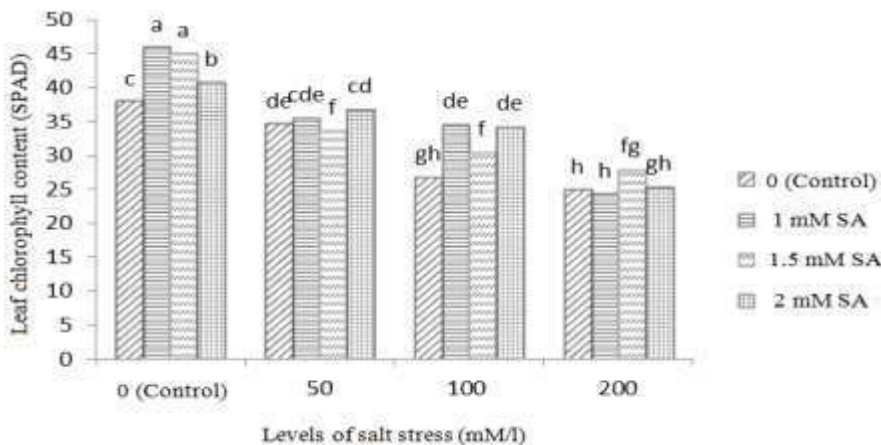


Fig. 6: Comparison of the means of chlorophyll content at various levels of SA concentration and salt stress

Fresh weight of aerial organs

The largest fresh weight of aerial organs (62.97 g/plant) was obtained in the treatment of spraying 1.5 mM SA with no salt stress, and the smallest (13.52 g/plant) in the treatment of not spraying SA and 200 mM salt stress, with a difference of 78% between the two treatments [Fig. 7].

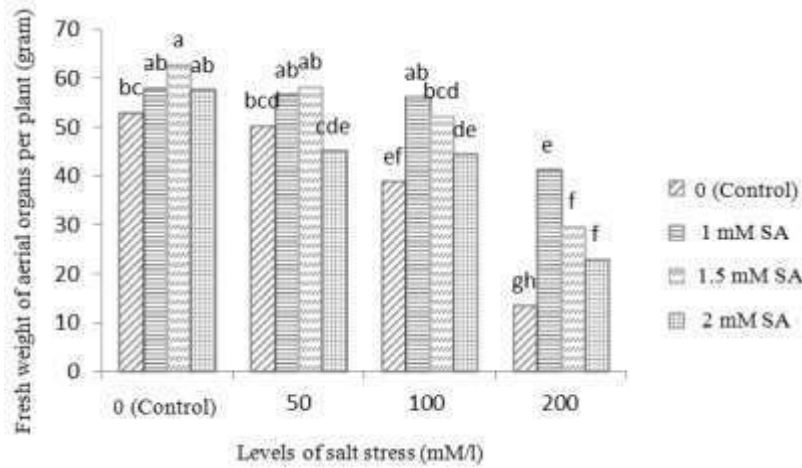


Fig. 7: Comparison of the means of fresh weight of aerial organs at various levels of SA concentration and salt stress

Dry weight of aerial organs

The maximum dry weight of aerial organs (10.62 g/plant) was observed in the treatment of spraying 1 mM SA and 50 mM salt stress, and the minimum (3.41 g/plant) in the treatment of not applying SA and 200 mM salt stress, with a difference of 67% between the two treatments [Fig. 8].

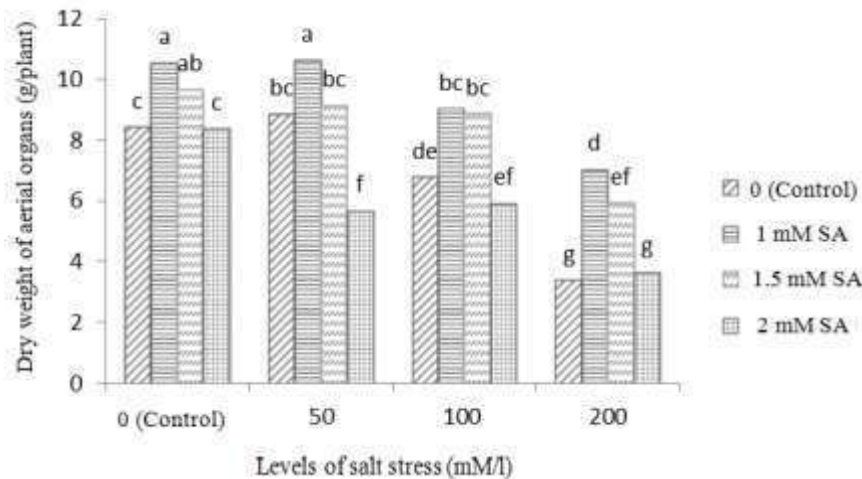


Fig. 8: Comparison of the means of dry weight of aerial organs at various levels of SA concentration and salt stress

Root dry weight

The largest root dry weight (6.30 grams) belonged to the treatment of spraying 1.5 mM SA with no salt stress, and the minimum (1.02 grams) to the treatment of not spraying SA and 200 mM salt stress, with a difference of 83% between the two treatments [Fig. 9].

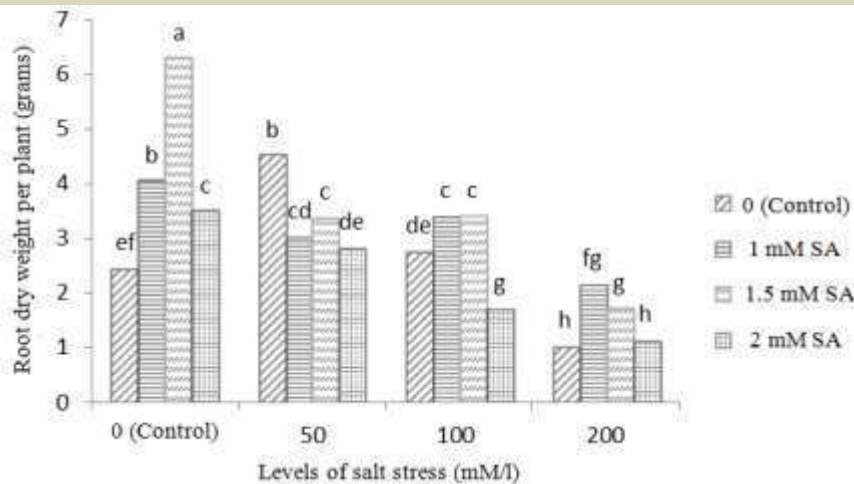


Fig. 9: Comparison of the means of root dry weight at various levels of SA concentration and salt stress

Root length

The longest roots (31.12 cm) were observed in the treatment of spraying 1.5 mM SA and 100 mM salt stress, and the shortest (9.50 cm) in the treatment of not spraying SA and 200 mM salt stress, with a difference of 69% between the two treatments [Fig. 10].

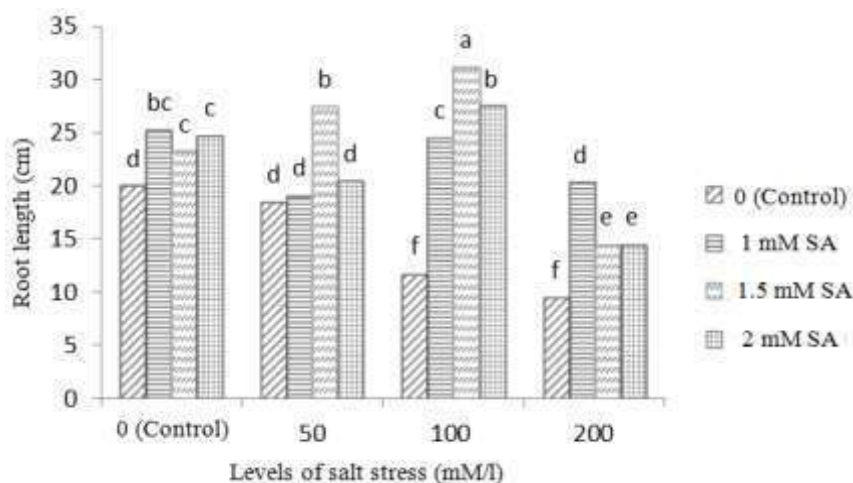


Fig. 10: Comparison of the means of root length at the various levels of SA concentration and salt stress

DICUSSION

Considering the above results, spraying 1 mM SA alone increased number of flowers per plant. Moreover, the minimum number of flowers per plant was produced under conditions of 200 mM salt stress. Plants normally produce fewer flowers under saline conditions to maintain assimilation and food reserves (Aldosivi et al., 1998). In relation to the effects of salicylic acid, Glass and Dunlop (1974) also reported SA treatment increased number of flowers in African violets. Furthermore, Kamali et al. (2012) noticed 300 mM sodium chloride reduced number of flowers by 66.4% compared to the control. In addition, 200 ppm was the most suitable concentration of SA spray in the experiment and resulted in the largest number of flowers. Salicylic acid stimulates flowering in some plants. In tobacco tissue culture, use of SA caused flowering in tobacco plants. Moreover, SA together with kinetin and IAA stimulate bud formation. Since other photosynthetic materials can also cause these effects, researchers believe this effect of SA is not a direct one but rather SA stimulates flowering through stimulating some other reactions.

In the present research, SA at 1 mM increased height of plants that were not under salt stress and, under conditions of salt stress, 1.5, and 2 mM SA sprays significantly improved plant height. In all, studies carried out by other researchers also proved the positive effect of SA in increasing internode distance. Hegazi and El-Sherif (2007) showed that application of 1 mM SA on beans increased plant height by 58% compared to the control. Furthermore, research by Martin Max et al. (2005) indicated SA treatment on African violets increased length of petioles. In another study conducted by Amin et al. (2007), foliar sprays of edible onion plants improved most growth parameters including plant height and length of petioles.

Results of this research showed that leaf surface area decreased under salt stress conditions, increased in the treatment of spraying 2 mM SA, and this increase was significant compared to the control when 1.5 mM SA was sprayed. The reason for this increase is the positive effect of SA on improving growth characteristics. Research conducted by Amin et al. (2007) revealed that foliar sprays of SA on edible onions increased leaf surface area by 8% compared to the control. Furthermore, the reduction in leaf surface area under salt stress that they observed was in agreement with results Rodriguez et al. (2005) found regarding reduction in leaf surface area of strawberry under salt stress conditions.

In this study, leaf chlorophyll content was influenced in the treatment of spraying SA and under salt stress conditions at the statistical level of 1%: SA sprays increased chlorophyll content but salt stress decreased it compared to the control. Misra et al. (2000) reported salt stress caused destruction of chloroplasts and reduced chlorophyll content. It seems chlorophyll content decreases under salt stress conditions because it is not synthesized and ethylene concentration increases (Khan, 2003). Moreover, chlorophyllase becomes more active under salt stress conditions (Singh and Jane, 1981). Therefore, chlorophyll content decreases under salt stress conditions both because chlorophyll is not synthesized and since its degradation and destruction increases (Singh and Jane, 1981). One of the most important reasons for the reduction in chlorophyll content is its destruction by active oxygen species. Moreover, competition of glutamyl kinase with glutamate ligase (the first enzyme in the route for chlorophyll biosynthesis) and its greater content under salt stress conditions cause the precursor of glutamate to be used more for the production of amino acids, especially proline. Consequently, chlorophyll synthesis will face restrictions (Games et al., 2000). Research carried out by Gharib (2006) on two medicinal plants (marjoram and basil) proved that spraying them with SA could increase their fresh weights. In another study conducted by Kanaki (2008) on radish seedlings, it was proved SA treatment increased fresh weight of aerial organs.

CONFLICT OF INTEREST

None

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ARTICLE

EXPLORING ADDICTION AS A MORAL AND BIOLOGICAL DISEASE: A CASE STUDY

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ABSTRACT

Introduction: Addiction has been and is one of the very important social and psychological human problems in various societies. In parallel with the increase of human knowledge, addiction has been expanded and gotten more complex. The aim of this study was to evaluate addiction as a moral and biological disease. **Method:** The present study is a primary review which has been done with the participation of two researchers. In this research, first, databases including: iranmedex, sid, pubmed, proquest-elsevier and articles published in prestigious journals on addiction as well as Persian and English books related to the topic of addiction were studied using keywords such as addiction, addiction and moral illness and addiction and biological disease. **Results:** Based on the findings, addiction is a moral disease, but biological problems and manifestations can be its consequences. This is discussed about mainstream addiction, although it cannot be denied that there may be some physical ailments such as uncontrollable pain in advanced stages of cancer underlie addiction. **Conclusion:** Although addiction is a multi-faceted disease, and a variety of factors like social, family, psychological, biological and pharmacological parameters are involved in its development, central role of morality in its formation and emergence cannot be ignored.

INTRODUCTION

Drug addiction is a biological, psychological and social diseases and imposes profound damage to society and especially undermines social safety [1]. Our country, Iran, is next to the world's largest opium producer and has about 900 km common border with Afghanistan and Pakistan. According to the most recent statistics in Iran, there is a population over one million and two hundred thousand habitual addicts and about eight hundred thousand non-habitual addicts [2]. Research shows that, in recent decades, the rate of drug abuse, in various countries, particularly among adolescents and youth, has increased. One area of concern related to the problem of drug addiction in our country is the burden of its abundance to the extent that the head of the prevention and treatment of drug abuse in Ministry of Health announced: According to a study, the number of addicts in the country has reached to 3 million and 700 thousand people. Another concern is the changing qualitative patterns of addiction so that it is said that the mean age of addiction in Iran has reached 14 years. In this respect, the next generation of country is in danger [3]. The impact of addiction is important because its dire consequences not only suffer the addicts, but family, friends and colleagues are also vulnerable to its devastating consequences. High prevalence of drug addiction is important from the viewpoint of health. [4]. One of the basic questions in this respect is whether addiction is a biological disease or an ethical disease? That "whether addiction is a crime or a disease?" has been one of the most challenging debates in recent decades and casts an undeniable impact on macro and micro policy and how to deal with this problem. From the perspective of causation (etiology), two practical approaches toward addiction have been established: because of some biological evidence and brain changes, some researchers believe that addiction is a biological disease. On the contrary, some experts look at this issue from a moral and legal perspective and ascribe a criminal nature addiction. [5]. Due to the aforementioned issues, and given that addiction is one of the significant social and psychological problems of human in different communities and in parallel with the increase in human knowledge, addiction has been expanded and gotten more complex. Addiction and drug abuse, as a social problem, is a phenomenon that comes with inability to organize and maintain the existing order of society and leads to structural changes in economic, social, political and cultural systems in a society. In our today society, drug abuse has occurred under the guise of a social problem or issue. This social ailment has harmed large numbers of people and is increasingly interacting with other social problems and taking on the appearance of a foundation-breaking threat. Prior to being considered a social phenomenon, addiction is psychological phenomenon that emerges in different forms; As a human being can be addicted to gambling or to even initially normal behaviors (such as shopping), addiction has taken on the shape of abnormalities. Drug addiction is one of those forms and imposes high moral and material costs on society. Hence, the aim of the present study was to evaluate addiction as a moral and biological disease.

METHODS

Among many essays, articles related to addictive drugs, moral diseases and addiction and biological disease were studied in terms of the following variables:

Field of study

By research filed it means the overall field of science and study of the subject and certain categories in which research has been done.

KEY WORDS

Addiction, moral disease, biological disease

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Study method

The research method is the methodology used in the research.

Place of study

The place of study is the location of data collection and includes geographic extent and the location of data collection. The present study is a primary review which has been done with the participation of two researchers. In this research, first, databases including: iranmedex, sid, pubmed, proquest-elsevier and articles published in prestigious journals on addiction as well as Persian and English books related to the topic of addiction were studied using keywords such as addiction, addiction and moral illness and addiction and biological disease. Searched keywords are on the basis of international EndNote Library of Science Medicine (NLM). After removing the old and repetitive content, the summary of articles were examined and those articles that were less related to the subject were excluded.

RESULTS

Addiction as a biological disease

In recent years, an attitude has developed in various communities that considers addict as a disease. And its trend seems to be a growing one. "Based on the example of UNDP proposed legislation in the field of drug trafficking and its related crimes, addiction is not a crime and the addict is punishable solely because of addiction." The followers of this view consider addicts as patients in the first place that should be treated. Research that has been done in this regard on the brains of addicts shows chemical and even physical changes in the brain tissue and this issue is raised as evidence that reveals addiction as a biological disease. Nowadays, the experts know addiction as a chronic and recurrent disease that emerges in the form of intermittent attacks of need for drug consumption. In terms of ethics, we can deal with this subject through two approaches, namely "addiction: biological disease or crime": Outcome-oriented approach and principled-oriented approach. If we want to discuss in terms of an outcome-oriented or teleological perspective, we can say that each of the two views can cause negative consequences: If you consider addiction as a biological disease: First indecency of addiction is deemphasized. Having a social evil, in itself, is a very important preventive factor against the development and exacerbating this problem. It seems that if we want to remove the stigma associated with this issue, this actually results in a surreptitious encouragement to lead a healthy portion of society towards addiction. Secondly, the addict's will power and decision-making will weaken because he considers his illness as a chronic brain disease and also justifying his addiction becomes possible for him. In contrast, if addiction is solely considered as a moral disease or a crime this may have consequences [6]: First, harsh methods such as imprisonment, rejection, isolation and social elimination of drug addict or mandatory camps with harsh approaches impose economic, psychological, cultural and social consequences on the addict and his family and intensify hidden, and namely, underground activities (such as trafficking and sexual misdemeanors, etc.), because the ostracized person grabs each way for his survival. Secondly, predisposing factors such as unemployment, like the addict himself, can be trimmed and we're away from realism. Likewise, elucidations used to plan and manage removing or reduction of the effects of this problem disappears or fades away. For example, the number of infectious diseases such as hepatitis and AIDS has become less accurate. But if addiction is investigated from the perspective of fundamentalism (regardless of outcome), we've looked deeper into the problem: Accordingly, we are required to look for reasonable and solid evidence so that we can better analyze the nature of the problem. As we have seen, evidence of the role of dopamine or changes in other neural systems with the help of imaging methods and other preclinical diagnostic methods concerning addiction have been obtained that it is beneficial to consider addiction as a biological disease. On the other hand, we see that social and cultural problems cause addiction. So we can assume that moral factors are effective in the development, emergence and incidence of addiction, because social and cultural phenomena are not irrelevant to ethics [7]. In the treatment process, it is recommended that the patient accept responsibility for his work! Accepting responsibility makes sense only when it has moral and legal foundations. It means that the patient does not tolerate a kind of compulsion (inside or outside). It is also a reason to approve that the moral aspect of the issue is of high magnitude. On the other hand, drug addiction is not only drug abuse but addictive behaviors, before resorting to drugs addiction and behaviors following addiction are significant from the perspective of behavioral and ethical dimensions. In addition, some of new forms of addiction are of virtual nature and there are no actual addictive materials. In explaining the biological basis of addiction and addictive behaviors, different opinions and views have been presented such as the impact of genetics in the emergence of addiction, biochemical changes such as changes in mediated neurotransmission (neurotransmitters). In recent years, extensive electro-physiology and neuropsychology studies have confirmed this theory that are involved in creating rewarding behavior of multiple neurotransmitter systems, among which one can enumerate dopaminergic systems, GABAergic, glutamatergic, serotonergic, adrenergic and endogenous opioid peptides. Among several neurotransmitter systems involved in reward and reinforcement, it seems that Mesolimbic dopamine system plays an important role. Based on these studies, A10 dopaminergic neurons that have originated from the abdominal tegmental area and their nerve fibers are sent to the nucleus accumbens, can be affected by bonuses including natural rewards (food, beverages, response to sexual issues) as well as electrical stimulation and some

drugs. In such a situation, inhibiting inter-neurons tonic of (neurons Interface) GABA ergic interneurons in the ventral tegmental area is removed from the dopaminergic neurons which results in increasing their neural firing and the subsequent increase extracellular dopamine levels in the nucleus accumbens. Many researchers introduce mesolimbic dopamine system as a substrate of neurochemical rewards due to its unique involvement in regulating reward-related behavior. Based on the theory of cerebral-behavioral systems, Gray (1994) assumed that psychiatric disorders arise from dysfunction of some (more active or less active) systems or from their interactions. Since the introduction of Gray's model, the researchers hypothesized that abnormal sensitivity of these systems indicates the predisposition and tendency to multiple forms of psychopathology. Gray, believes that the release of dopamine in the nucleus Akvmyns is associated with high emotional which has been observed in alcohol and drugs users [12-7, 5].

Addiction as a crime

The existence of a direct relation between drug abuse and committing crime has rendered addiction as a crime from this perspective. Due to severe mental and physical drug dependency on the one hand and discomfort and complications due to the cessation of drugs that are sometimes very severe, painful and dangerous and the fear of its recurrent reappearance on the other hand, the addict is impatient to get drugs, to the extent that he refrains from no evil things to do and so committing various crimes and even dangerous crimes is predictable. Even each of the drugs can exacerbate certain categories of crimes. In general crimes such as murder, robbery, sexual promiscuity, etc., can be associated with the use of different drugs.

DISCUSSION

The present study was carried out with the aim of evaluating addiction as a moral and biological disease. In the emergence of any crime, with careful analysis, we can reach the conclusion that social media has provided a platform perfectly suited to the criminal and has been an important factor for the incidence of criminal behavior. If corruption and promiscuity are dominant in society, liable people are trapped in the vortex of its destruction and if social systems are based on the norms and value patterns and purposeful and specific programs are planned, the possibility of social deviance in society and in many people will be weak. According to a researcher, the environment plays an effective and crucial role in shaping human character and human behavior, as a sign of his character, origins largely from the education acquired from the environment. So, contaminated environments will ruin people and healthy and lively environment set the stage for growth, prosperity, vitality and joy in individuals. Despite efforts made in recent years to remove stigma from addiction, it seems that the criminal nature of addiction, especially among the masses of the people, still remains .However, even if addiction is not considered as a crime, the role of ethics in this issue cannot be ignored (13).Of course, the main burden of moral responsibility may not be on the addict, for example, a child who redeploing parents, goes towards addiction. Accordingly, addiction can be considered as a moral-biological disease. It means that it can be dealt with through two approaches. Sometimes, in some people, ethical issues play a major role in its development and sometimes environmental issues take on an important role. The World Health Organization defines health which has four dimensions such as: physical, mental, social, spiritual. It seems that these four dimensions in relation to the treatment of addiction can be raised. So a mere concentration on biological field takes only one dimension of addition into account that is the physical aspect and consequently is an incomplete perspective. Accordingly, if we consider addiction only as a brain disease, we are on the wrong way. Although addiction can be considered as a multi-faceted disease that various factors such as social, family, psychological, biological and pharmacological parameters are involved in its genesis, the central role of ethics in its formation and development cannot be and should not be ignored.

CONCLUSION

Accordingly, addiction is a moral disease, but health problems and manifestations can be among its consequences. This issue is the case with mainstream addiction, although it cannot be denied that there may be some physical ailments such as uncontrollable pain in advanced stages of cancer, and not the ethical problems, that lead to addiction. This means that in a minority of patients the underlying cause of addiction is biological problems rather than not moral issues.

CONFLICT OF INTEREST

None

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ARTICLE

ATTITUDES OF MEDICAL STUDENTS TOWARD THEIR
CAREER FUTURE AT JAHROM UNIVERSITY OF MEDICAL
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ABSTRACT

Background: The career attitude is a positive feeling toward the job which is affected by several factors. The aim of this study was to determine medical students' attitudes toward their career future at Jahrom University of medical sciences and its relationships with demographic variables. **Methods:** This cross-sectional analytical study was conducted on all medical students of Jahrom University of Medical Sciences in 2014 [No: 200]. The data were collected through valid and reliable researcher made questionnaire including 10 questions about demographic information and 20 questions in three socio-individual, educational, and economic subscales. The questions were scored based on the five-point Likert scale, ranging from strongly agree [5] to strongly disagree [1]. **Results:** The attitude of medical students towards their career future was positive [195 students [95%]]. Socio-individual, educational, and economic subscales had a direct and positive relationship with the attitude of medical students towards their career future [$p < 0.001$]. There was a significant difference between first-year and seventh-year medical students in terms of their attitudes toward their career. The mother's education, economic situation, the interest in the field of study, and awareness of career future of students were effective in career attitude [$p < 0.05$]. There was no significant difference between male and female students, basic sciences and clinical students in terms of attitude towards career future [$p > 0.05$]. **Conclusions:** The mean score of individuals' attitude towards their career future was higher than expected, indicating that the majority of students have a positive attitude towards their career future. Detecting effective demographic factors on positive attitude such as interest in the medical profession and awareness of career future for short-term and long-term planning is helpful to make a background for creating and maintaining a positive attitude.

INTRODUCTION

Today, the study of attitude has a special place in research as the most important concept in socio-psychology [1]. Generally speaking, the combination of knowledge, feelings and readiness to act with respect to a problem is called the individuals' attitude toward the problem [2]. Career attitude is a kind of positive feeling about individual's job is rooted from factors such as working conditions, career organization, relationships ruling on the work environment which is influenced by cultural factors [3]. Success in any job usually requires a kind of positive attitude toward that goal or action. Awareness of attitude would be useful both to predict social behaviors and interpret post occurrence [1].

There has been concern about career future decades ago and other countries have considered this issue. Concerning the career future is an issue which has been growing in medicine and other affiliated fields [3]. Since the universities have been the origin of changes in society in various fields and the students constitute the main foundation of universities, and in the future build the main body of different organizations of the society, awareness of their attitude toward their future career is highly important [1,4].

Evidence shows that each year, enthusiasm or, in other words, a number of young people entering university is growing more and more, but after entering the university they become discouraged and frustrated for some reasons in which the most important include insufficient awareness to the university and hasty decision to choose the field to be and reduce their motivation arises which affect the quality of education. Experts believe that there are several complexity and various factors for this and one of the factors is lack of familiarity with the new environment and inadequate recognition of the field of study and the future of Education in University [5]. Meanwhile, medicine has long been the first priority in science field in Iran. In many other countries top students continue their studies in medicine [6].

Research shows that although increasing the number of medical school and medical students eliminates the shortage of doctors in Iran, young doctors encounter problems such as a shortage of learning environment, restrictions on the acquisition of skills based on knowledge, low income, lack of job security, and consequently decline in interest [7]. However, the motives, belief and values of medical students during study and their attitudes toward their future career affect their willingness to accept training

KEY WORDS

career, attitude,
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programs and learning and academic performance, as well as the choices made for their future career course [8, 9]. Job motivation is considered necessary and essential for useful and efficient employment. If a person is not interested in his job, continuation of the jobs would be tedious and even impossible. If a person is not interested in their jobs, more jobs would be tedious and even impossible. Positive attitude towards the future career will follow job motivation that would lead to job success as well [10].

The results of the study conducted on the job attitude of medical students in basic and clinical sciences at Jahrom University of Medical Sciences in 2002 showed that the general attitude of the students to their field of study is negative [11]. Participants in the study of Nejat et al did not consider the job status of general practitioners appropriate as well [6].

Investigations of the late twentieth century and early twenty-first century show that 30 to 40 percent of doctors would not choose medicine again if they were asked to decide their future [12]. Obviously, the employment of trained forces would reduce the concern of current students about their future career [13].

Given the importance of medical profession and that medical students are responsible for providing, maintaining and promoting public health as a subset of the main forces in the healthcare sector which should be able to play their roles as skilled forces, managers, or at least therapist, knowing the attitude of students towards their future career is important. On the other hand, despite the fact that medical training programs are the most expensive educational programs which imposes a high cost to the system annually, the previous research reflects the negative attitude of students toward their future job. With regard to the implementation of family medicine programs in Iran and in Fars Province and recent changes in the health reform plan, a review of the attitudes of medical students towards their future careers seems essential which could have a significant role in future planning to make necessary changes. The aim of this study was to determine medical students' attitudes toward their career future at Jahrom University of medical sciences and its relationships with demographic variables.

METHODS

Design & Setting

This cross-sectional study was conducted in 2014 with the participation of students of Jahrom University of Medical Sciences.

Sample

First year as well as seventh year students who were studying in medicine included in this study in census method those students who were not inclined to participate in the study were excluded. 220 questionnaires were distributed, total of 200 completed questionnaires were returned to the researcher [response rate 90%].

Tool

The data collection tool is researcher-made questionnaire and the researchers extracted the desired points by reviewing books and articles in the fields of attitudes towards the future career. Considering the nature of the questions, they were categorized into two parts of demographic features [10 questions] and career future [20 questions] in 3 subscales of socio-individual, educational, and economic. Content and face validity of the questions were reviewed by dozens of professors from Jahrom University of Medical Sciences regarding the relatedness of questions to the subject of research and understandability of questions. To determine the reliability, 20 medical students were asked to complete questionnaires and reliability was calculated and confirmed using Cronbach's alpha coefficient 0.85. Also, Cronbach's alpha coefficient in the areas of socio-individual, educational, and economic were calculated 0.90, 0.80, and 0.86 respectively which were appropriately reliable. It is worth noting that students who participated in the pilot study were not examined in the original study.

The questionnaire was ranked based on five-point Likert scale ranging from 1 to 5, strongly disagree to strongly agree and the scores of others responses were placed between these two scores. Based on this, the score 20 represents the lowest tendency and the score 100 indicates the highest positive trend toward future career. To evaluate the students' attitude toward their field of study, the scores of students were compared with average of test scores which is 60. The scores lower than 60 were considered as negative attitude and scores above 60 as a positive attitude.

Procedure

Institutional review board authorization was gained from the Human Subjects Committee at the Jahrom University of Medical Sciences in Iran. After approval of the research project and receive Ethics Committee code and coordinating with the dean of the faculty of medicine, the researchers provided some explanations to the research units such as participation in the study is voluntary, questionnaires are completed anonymously and data collected remains confidential. The researchers distributed the questionnaires in free time between classes and in the students' free time in the hospital and the students filled out the questionnaires through self-reporting.

Statistical analysis

Questions regarding the attitude of future career were completed through descriptive statistics such as mean and standard deviation of the mean scores and to compare the means, t-test, ANOVA, Tukey test and binomial nonparametric test were applied through software SPSS.v.16. The Pearson correlation coefficient was used to investigate the relationship between attitudes toward career future and the dimensions of the questionnaire.

RESULTS

Among 200 medical students participated in the study, majority were female [65.5%], non-native [63.0%] and had a good economic condition [44.5%]. The mean age and the average of student's were 22.67 ± 4.59 and 15.58 ± 1.84 respectively. 59% [118 students] reported their interest in the medical field as high and 89.0% [178 students] expresses awareness of their career future as moderate and high levels [Table 1].

Table 1: Characteristics of the participants [N=200]

Demographic Variables		N [%]
sex	male	69[34.5%]
	female	131[65.5%]
Academic year	First	41[20.5%]
	Second	33[16.5%]
	Third	35[17.5%]
	Fourth	17[8.5%]
	Fifth	7[3.5%]
	Sixth	26[13.0%]
	Seventh	41[20.5%]
location	Non-native	126[63.0%]
	Native	74[37.0%]
edu.fath	< Diploma	39[19.5%]
	Diploma	63[31.5%]
	Bachelor	70[35.0%]
	Master of science	19[9.5%]
	PhD	9[4.5%]
edu.moth	< Diploma	47[23.5%]
	Diploma	75[37.5%]
	Bachelor	58[29.5%]
	Master of science	14[7.0%]
	PhD	6[3.0%]
awareness of career future	Low	22[11.0%]
	Moderate	90[45.0%]
	High	88[44.0%]
Interest rate	Low	9[4.5%]
	Moderate	73[36.5%]
	High	118[59.0%]
Economic situation	Very Poor	8[4.0%]
	Poor	17[8.5%]
	Average	82[41.0%]
	Good	89[44.5%]
	Excellent	4[2.0%]
Level	Basic science	126[63.0%]
	Clinical students	74[37.0%]

The average score of students' attitude was 76.29 ± 10.27 . The average score of students in socio-individual, educational, and social were 37.46 ± 4.97 , 22.07 ± 4.02 , and 16.96 ± 3.98 respectively. To evaluate students' attitudes toward their field of study, non-parametric binomial test with a cut-off point of

60 was used. Lower than 60 and above 60 were considered as the negative attitude and as a positive attitude. The results showed that the attitudes of medical students toward their career future were significant and higher than the cut-off point 60 [Table 2], [p < 0.001].

Table 2: The frequency distribution, mean and standard deviation of medical students' attitudes towards their future career.

attitude	[N]%	Mean±SD	p-value
negative attitude[≤ 60]	10[5]	49.36±8.69	<0.001
positive attitude[> 60]	190[95]	77.86±8.53	
Total	200[100]	76.29±10.27	

Pearson correlation coefficient showed that three socio-individual, educational, and economic subscales were strongly correlated with the attitude of the students; in other words, students' socio-individual, educational, and economic attitudes had a positive and direct relationship with job future. [Table 3], [p < 0.001].

Table 3: Correlations Between career attitude subscales and total attitude

Scale		Socio-individual	educational	Economic
Total attitude	Pearson correlation coefficient	.841**	.739**	.757**
	p-value	<0.001	<0.001	<0.001

Based on analysis of variance [Anova] there was a significant difference between seventh-year and first-year medical students' attitudes toward career future. Tukey test showed that there was a significant difference only between first-year and fifth-year students as well as first-year and seventh-year students. The mother's education, economic condition, the interest in the field of study, and students' awareness of their career future is effective in attitudes toward career future of their field of study [p < 0.05].

According to independent sample t-test there was no significant difference between male and female students in terms of attitudes toward career future of their field of study. Also, despite the difference in students' attitude towards career future of their field of study and high score of clinical students to basic science levels, this difference was not statistically significant [Table 4], [p > 0.05].

Table 4: Relationship between demographic variables and career attitude

demographic variables		Attitude			
		Mean	Standard Deviation	Statistics	p-value
Sex	male	67.13	11.65	-0.367	0.714
	female	76.69	9.35		
Academic year	First	81.46	9.94	3.552	0.002*
	Second	75.58	7.61		
	Third	75.62	10.74		
	Fourth	75.88	12.40		
	Fifth	66.14	7.99		
	Sixth	74.32	8.54		
	Seventh	74.32	10.20		
edu.father	School education	76.10	12.41	0.505	0.732
	Diploma	75.41	9.17		
	Bachelor	77.80	10.21		
	MA	76.63	9.79		
	PhD	75.33	7.25		
edu.mother	School education	73.02	12.29	2.46	0.047*
	Diploma	77.50	9.34		
	Bachelor	77.21	8.12		
	MA	80.93	12.71		
	PhD	73.83	8.42		
Knowledge about medicine field	Low	70.00	12.474	13.819	<0.001*
	Average	74.43	8.97		
	High	80.22	9.375		
Interest to field	Low	63.3333	14.45683	19.289	<0.001*
	Average	73.2740	8.95709		
	High	79.4915	9.14811		

Economic condition	Very weak	68.5000	15.30686	3.718	0.006*
	Poor	76.6875	7.39115		
	Average	75.3537	10.31883		
	Good	78.7079	8.60919		
	Higher	64.7500	25.44766		
Level	Basic science	77.54	10.24	3.691	0.056
	Clinical	74.70	9.86		

DISCUSSION

In this study, the majority of medical students had a positive attitude towards their career future. Likewise, the results of the same study showed that the majority of medical students at the American University of Pennsylvania were optimistic toward their career future [14]. Also, in the study of Gasiorowski et al, (2014) medical students allocated the highest score to their fields part of the medical profession due to doing an important and interesting job, ensuring of finding job and having more facilities which reflects the positive attitude of the students toward their career future [15]. In a study conducted in the UK, 64% of medical students were highly satisfied with the medical profession [16].

But the results of studies are not consistent with the studies which show students' negative attitude to career future. Reviewing attitudes of students of Jahrom University of Medical Sciences toward career future arranged in 2002 showed that the general attitude of the students to their field of study is negative and more than half of the students stated that if they're-examine, they would not choose medical field [11]. The results of the study of Hajian and Nasiri [2005] also showed that despite the fact that 74% of medical students have chosen this field with awareness and interest, but 60% of them have changed their attitudes towards this field and career future and the majority had negative attitudes [17].

The results also showed the negative attitude of medical student's towards their career future at Isfahan University of Medical Sciences [10]. In another study, medical students stated that the career future of general practitioners has unfairly been treated in comparison with other disciplines, and some of them evaluated studying medicine more difficult than other disciplines [6]. This negative attitude has also been observed in studies in other countries. In a study at the University of Minnesota, most medical students were concerned about the status decline and income [18]. In Britain, most GPs did not have enough confidence in their career future [19] and in France, 60% of medical students believed that medical workers exceed the population need [20]. In fact, when a specialty is available more than the society needs, makes the income reduce among graduated students, desire to study and work in the field gradually decreases [21], and this can make the students change their attitude toward career future.

This study also showed that there was a positive and direct relationship between socio-individual, educational, and economic views and the students' attitudes towards their career future. In fact, attitude and career future plans and individual satisfaction are in relation to several factors, including demographics, personality, and factors related to medical school, ethics and curriculum, learning environment, and students' attitudes towards expertise and values [15, 22]. In fact, the attitude of students to the medical profession and their performance during the training and education is influenced and their attitude affects their performance and decisions after graduation [23].

The results showed that despite the higher scores of attitude among clinical students to basic science level, this difference was not statistically significant. The study of Hajiani and Nasiri (2005) showed no statistically significant relationship between the level of education and their attitudes towards career future [17] which is consistent with the current study. However, it's recommended that further studies be conducted with a larger sample size.

In this study, there was a significant difference between the attitudes of the first-year and the fifth-year students and the first-year and seventh-year students. In explaining this problem it can be acknowledged that students' perception from gaining clinical skills play an important role in enhancing the satisfaction and attitude of the students. Since the promotion of students' skills are achieved in the final years of the study, in fact, the difference in attitude is between the first year and clerkship and internship courses that are reconsidered main courses of clinical training in medical students.

A review of studies shows other conflicting results. The study conducted at Tehran University of Medical School indicated that as the students age, their evaluations from career future change negatively, so that as they age, the possibility of continuing their education and finding a job with enough income and in the right place become harder than other fields which is not inconsistent with this study [6]. The study conducted in 2002 at Jahrom University of Medical Sciences also reflected more negative attitudes of students in the clinical course than basic Sciences [11]. In the study of Hasanzadeh, et al, (2006) there was a significant relationship between level of education and attitude to the field at the beginning and internship students had more negative attitudes to other levels [24].

Regarding the positive attitudes of students in conducted studies in the last years, implementation of family physician at the beginning of the 2006 and the healthcare reform plan programs could be mentioned

at the beginning of 2002[25]. However, the implementation of the program in the right way at the start of their implementation, and their effectiveness is noticeable in changing the attitudes of students and physicians that requires exclusive and further research. Some consider the origin of students' negative attitude of students in the final years encountering the realities of the society and medical profession [7]. In other studies, sleep deprivation of last-year medical students, the disruption of sleep hours due to night shifts, unsupportive atmosphere and changes in the scheduling of lessons, the high volume of materials and references, numerous instructors, treatment with the hospital staff have been mentioned and pointed out[27,26].

In this study, mother education, economic condition, the interest in the field of study and awareness of career future is effective in students' attitude toward career future. The results of the study of Gaşiorowski et al.[2014] showed that the majority of students who enter medical school have parents with higher education, and almost one-fifth of students had at least one parent who had medical education[15]. In fact, parents' education, especially in the field of medical education creates awareness of the field of study and career future and increases their interest to study in this field. Results of the study conducted on neither young physicians nor way showed a doctor father's job as a physician has a significant role in job satisfaction in young physicians [22]. In other studies the relationship between interest in the field of study and positive perception of self as professional person has been pointed out [28].

There is no significant difference between male and female students in terms of attitudes toward career future. No statistically significant relationship was observed in the study of Hajiani et al, (2005) regarding gender and attitude of students towards career future [17]. Although the study conducted on medical students in Poland, there was a significant relationship between gender and type of expertise and it seems that gender demography has the greatest influence on choosing the type of expertise [15]. A study conducted in Canada also showed that job dissatisfaction is more common in women than men [29]. In another study, the sex was a predicting factor in job motivations of medical profession [22, 30].

CONCLUSION

The mean score of attitude towards their career future was higher than expected, indicating that the majority of students have a positive attitude towards their career future which makes a ground suitable among medical students as service providers in the future. As an individual's attitudes change in different periods of life in harmony with the environment, detecting demographic factors influencing the positive attitude such as early interest and awareness of career future for the short and long plans is helpful to create a suitable structure to make and maintain a positive attitude.

CONFLICT OF INTEREST

None

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FINANCIAL DISCLOSURE

None

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SUPPLEMENT ISSUE

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ARTICLE

PHARMACOLOGICAL AND NON-PHARMACOLOGICAL METHODS OF PAIN RELIEF IN VENIPUNCTURE AND HELP TO MAINTAIN THE ARTERY FLOW IN CHILDREN, WITH TOOLS SUCH AS SMART IV

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ABSTRACT

Introduction: In response to pain, children get irritable, restless and excited. Most children predict the pain caused by injection and prevent it by non-conformist behavior associated with anxiety before the injection. It usually takes them a lot of time to accept the injection. Hence, the present study tackles with examining ways to reduce pain in venipuncture and help to maintain and intravenous line in children. **Materials and methods:** Studies selected for this article had the design of a descriptive article, case-control, cohort and clinical trial. The keywords in articles published during 2003 to 2016 were searched and articles in English and Farsi were selected and studied. **Results:** The results of different studies show that implementation of various distraction programs lead to reducing pain and anxiety caused by a painful and stressful procedures in different age groups. Also, using tools that increase the durability of intravenous route, such as Smart IV, can help to alleviate pain and anxiety for children by reducing the number of venipuncture. **Conclusion:** Given that prevention is an essential part of nursing care, providing health and disease prevention are the objectives that should be considered by nurses. Health professionals should strive to accompany painful procedures with interventions so that the patient suffers from the minimum and in order to minimize the adverse effects of the disease.

INTRODUCTION

Pain is derived from the Greek word "Peon" meaning suffering and punishment. [1]. According to the International Society of Pain [IASP or International association for the study of pain], pain is an unpleasant feeling derived from a sensory or emotional experience associated with actual or strong damage. American pain society defined pain as the fifth vital sign in 2000 and called the decade 2010-2001 [2] as the decade of pain control [3]. This association stresses the initial forecast of pain and preventing pain and pain relief in case of incidence and states that adequate treatment of pain needs checking its severity and the individual's response to the prescribed treatment. [4]. Due to illness and hospital admission, children are subjected to many painful and uncomfortable cares. Venipuncture is among painful procedures that is part of the child's everyday experiences. Many children consider venipuncture a painful and terrifying act, because this procedure is an invasion to the spiritual, mental and physical medium of child for the child and involves some threats for the child. [5]. Observational studies of pain average prevalence among preschool and elementary school in daily care units for each child has been reported to be between 41% - 34% per hour. In response to pain, children get irritable, restless and excited and they may even have nightmares, sleep disturbance and malnutrition and those who have not relieved from the pain may feel victimized, depression, isolation and loneliness. Their parents often feel distrust and anger toward health systems and feel depressed and guilty for failing to prevent pain and that nothing they can do. Therefore, children who require frequent invasive medical treatments experience long-term helplessness and distress. [4] In a study by Turk. And Melzak, more than 64% of children aged 3 to 6 years reported IV venipuncture and blood sampling to be very painful and annoying, because young children are extremely sensitive to your body and show more sensitivity to venipuncture procedures since, compared to other procedures, the plastic venous catheters remains in body. If no appropriate soothing measures are applied at the time of performing painful procedures, this will ensure that children consider all nursing activities and actions painful and associated with pain perception and has this fear adulthood. Such physical and mental tensions in childhood will be the basis of lifestyle in other periods of life [3]

MATERIALS AND METHODS

Studies selected for this article had the design of a descriptive article, case-control, cohort and clinical trial. The keywords in articles published during 2003 to 2016 were searched and English articles with keywords like children, pain, distraction cards, Venipuncture Touch on Intensity, and Persian keywords such as pain, distraction, touch, children, anxiety, venipuncture, etc., were entered in the study.

RESULTS

In 2001, some standards for evaluation and pain management were proposed by JCAHO. The statement acknowledged that pain should be regularly reviewed and response to its treatment should be controlled and except in cases where pain is necessary for a treatment, in other cases, pain should be minimized or eliminated. Pain management includes using all the ways to prevent, reduce or relieve the pain. [6]. That is

KEY WORDS
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why the measures done in the field of relieving children's pain during and after venipuncture can be divided into two general ways:

Pharmacological and non-pharmacological strategies

In pharmacological management of pain, a variety of local anesthetics like Emla cream or other medical practices such as sucrose and oral melatonin etc. are applied and in non-pharmacological approaches, methods of distraction, relaxation with the help of music, cold therapy, touching, watching animations etc. all of which leads to decreased pain and greater tolerance of the child can be used.

Pharmacological strategies

In their study, Kazemi and his colleagues evaluated the effect of EMLA cream on pain of venipuncture in 12- to 6-year-old children in hospitals of Rafsanjan. 80 children were randomly examined in two groups of control and intervention [n = 40 per group]. In the intervention group, EMLA cream was applied 60-45 minutes before venipuncture in position and was dressing while the usual venipuncture was performed for the control group. The results showed that pain intensity during venipuncture in the two groups showed a statistically significant difference to the extent that the average pain intensity in the intervention group is greater than in the control group. [7]. The results of the study done by Khalili Shumia and his colleagues with the aim of assessing the impact of anesthetic EMLA ointment on the severity of the pain caused by venipuncture with IV revealed that the pain of venipuncture using EMLA ointment significantly lessens compared to the pain of venipuncture with Vaseline ointment. Short-term side effects and discoloration in the area of application were observed in 20% of subjects [8]. Chyarty and colleagues [2011] carried out a study with the aim of the efficacy of a calming protocol on the basis of nasal lidocaine spray and midazolam [INM] on 46 children ages 5 to 50 months. 1 puff of spray [10 mg] was applied prior to venipuncture. The results showed that using a combination of lidocaine spray and midazolam [INM] seems to be a safe and effective method to achieve short-term sedation in children in order to facilitate the care and medical procedures. [11]. In their study with the aim of assessing the effect of oral melatonin as a sleep-anesthesia agent in reducing pain and anxiety in 60 children aged between 1 to 14 years old during venipuncture in Italy, C. Kuo Pari et al. [2015] concluded that the use of 0.5 mg oral melatonin per kilogram of body weight [up to 5 mg], 30 minutes before blood sampling could have a significant impact in reducing pain and anxiety in children. [12]. The results of the study conducted by Wilson and colleagues [2013] with the aim of using oral sucrose to reduce neonatal pain during venipuncture in infants aged 6-1 months showed that 25% ml2 sucrose has a significant effect in pain relief in infants. [13].

Non-Pharmacological strategies

Non-pharmacological strategies are widely used in pain management and coping with emotional distress [14] that can be divided into two categories: cognitive interventions [behavior therapy] and interventions and means influencing mechanisms of pain. The most important non-pharmacological intervention for pain relief is behavior therapy method among which one can mention distraction. In this method, the subject's attention is diverted from painful stimuli and his attention is attracted to pleasant stimuli which in general reduce the perception of pain. Apart from having fewer side effects compared to pharmacological methods, this method is also less expensive. Besides, this method is devoid of toxic and destructive psychological effects on the child. This method is comfortable to use, requires little training and more importantly, is of independent nursing interventions and it is very attractive for young children. [3]. In a study, Allawi and his colleagues examined the effect of bubble blowing on pain of venipuncture performed in children with thalassemia. In this method that is a combination of regular breathing and visual distraction by watching the bubbles, the child's concentration is drawn up on making bubbles. On the other hand, this method reduces muscle stiffness through relaxation, slacken pleura relax and the child feel freedom and lightness with each deep breathing. The results showed that the bubbling method reduces the pain of venipuncture. With respect to the fact that the bubble blowing method is more economical, using different techniques of distraction by nurses during venipuncture will promote life quality of children with thalassemia. [15]. The results of the study conducted by Vosoughi and colleagues showed that distraction through the bubble blowing reduces the physiological responses and the pain of venipuncture in children aged 6-3 years old. [3]. Dalla Kvist et al. [2002] carried out a study with the aim of determining the effects of distraction on the pain of injection procedures performed on six children aged 8-25 years old. The results of this study showed that different methods of distraction reduce pain in children successfully. [16]. Gupta and colleagues [2014] conducted a study to explore the impact of animation on the amount of pain during venipuncture on 70 children under 7 years old in Punjab, India. Children were divided into two 35-member groups. In group A, only family members accompanied the child during venipuncture while in group B, in addition to family members' accompaniment, animations and video clips were used. Then FLACC scale was used to measure pain intensity. The results showed that pain severity in group A was 3.86 and 2.43 in group B. Group A experienced the maximum amount of pain [88.57%] and they did not calm during venipuncture. While the second group showed less pain [28.58%] of which about 25% of them were comfortable and only 20% of them showed severe pain. [17].

Means and interventions effective in mechanisms of pain

Abazari and his colleagues conducted a study with the aim of determining the effect of Hugo point massage with ice on the pain of venipuncture in 86 12- to 80-year-old children with thalassemia. In the intervention group, 5 minutes before venipuncture, Hugo point was massaged with ice while the control group received no intervention. The results this study showed that pain intensity was significantly lower in the intervention group than in the control group. [27] Schreiber et al. [2016] in a study evaluated a dithering cooling device called BUZZY in reducing pain in children with mental disorders in Italy. 70 children aged about 9 years old were randomly divided into two groups. In a 34-member group the BUZZY was used during venipuncture and the 36-member group received no intervention. The results showed that this device during venipuncture leads to the reduction of pain in children with mental [cognitive] disorders. Also, because of its special design, this device causes the child's distraction. [28]. There is a cooling spray that, unlike other anesthetic methods, is not chemical-based. As soon as the spray is applied in the area, gestures of pain impulses in the sensory nerves of the skin are reduced and its effect is manifested in less than one hour.

Studies evaluating the effects of different methods comparatively are as follows

The results of the study carried out by Allawi and his colleagues to evaluate distraction and EMLA cream showed that there was a significant difference between the average numeric and photographic pain intensity of distraction and EMLA cream methods with normal procedures, but there is no significant difference between distraction and EMLA cream methods. So both methods lead to reduction of the pain of venipuncture. However, given the fact that distraction method is more economical than the cream EMLA, using this method is recommended. [29]. The results of the study conducted by Nick Fried and his colleagues evaluate the use of ice and EMLA cream showed that there was no significant difference between the two groups of ice and EMLA cream. Then, because the use of non-pharmacological methods in pain relief is preferable over pharmaceutical procedures in terms of cost and availability, it can be said that in case of lack of access to pharmacological methods to relieve pain associated with venipuncture procedures, non-pharmacological method of using ice can be applied. [32]. Akdas and his colleagues [2014] in a study to compare the Valsalva Manor [VM] with EMLA cream in reducing pain during venipuncture in children concluded that the Valsalva Manor as a practical and simple method could lead to reduction of children's pain, but its effectiveness is not as much as that of EMLA cream. [33]. In Japan, Kytazava and his colleagues [2015] used the combination of EMLA cream [2.5 percent lidocaine and prilocaine 2.5%] and distraction methods, preparation and training. Of the 132 children participants, 58.3% did not cry during venipuncture procedure and 71.9% felt that this method eliminates fear in children. 90.9% were satisfied with the procedure and 75.8% thought that this method should be applied during venipuncture in children. [34].

Table 1: Pharmacological strategies

The average pain intensity in the intervention group was lower than in the control group. (7)	Intervention group: EMLA cream was applied 60-45 minutes before venipuncture in position and was dressing Control group: The usual venipuncture was performed.	Kazemi et al	2014	The average pain intensity in the intervention group was lower than in the control group. (7)	EMLA cream (EMLA)
The pain of venipuncture using the EMLA ointment is significantly less than the pain of venipuncture with Vaseline ointment. (8)		Khalili Shumia et al.	2012	The pain of venipuncture using the EMLA ointment is significantly less than the pain of venipuncture with Vaseline ointment. (8)	
The pain of venipuncture using Diclofenac Gel is significantly less than the pain of venipuncture with Vaseline ointment. (9)		Khalili Shumia et al.	2012	The pain of venipuncture using Diclofenac Gel is significantly less than the pain of venipuncture with Vaseline ointment. (9)	Diclofenac Gel
The minimum recommended treatment time is 60 minutes, but by increasing the amount of time (over 90 minutes) less pain was felt.(10)		William T	2008	The minimum recommended treatment time is 60 minutes, but by increasing the amount of time (over 90 minutes) less	EMLA) Lidocaine -%2.5 Prilocaine 2.5%(

				pain was felt.(10)	
The time it takes for the effect of anesthesia EMLA cream to appear is about 60 minutes or greater while the duration for the effect of anesthetic tetracaine gel to manifest is about 45-30 minutes. The durability of the effect of tetracaine gel after the application is 4 to 6 hours more than EMLA cream. (10)		Smith & Nephew		The time it takes for the effect of anesthesia EMLA cream to appear is about 60 minutes or greater while the duration for the effect of anesthetic tetracaine gel to manifest is about 45-30 minutes. The durability of the effect of tetracaine gel after the application is 4 to 6 hours more than EMLA cream. (10)	Tetracaine gel *
EMLA EMLA Applying it for 30 minutes has the same effect as using EMLA cream for 60 minutes and its effect is about 25% the same as that of EMLA cream. But this method has not been studied in children under two years. (10)				EMLA EMLA Applying it for 30 minutes has the same effect as using EMLA cream for 60 minutes and its effect is about 25% the same as that of EMLA cream. But this method has not been studied in children under two years. (10)	ليپوزومال ليدوكائين 4%*
Children in topical adhesive group of lidocaine and tetracaine had less pain compared to the placebo group, and 59% of children did not feel any pain. (10)		Chadds Ford		Children in topical adhesive group of lidocaine and tetracaine had less pain compared to the placebo group, and 59% of children did not feel any pain. (10)	Topical adhesive containing a thin layer of Lidocaine and tetracaine layer 70 mg / 70 mg *
Using a combination of lidocaine spray and midazolam (INM) appears to be safe and effective method to achieve short-term sedation in children in order to facilitate the care and medical procedures. (11)		Chiaretti A	2011	Using a combination of lidocaine spray and midazolam (INM) appears to be safe and effective method to achieve short-term sedation in children in order to facilitate the care and medical procedures. (11)	Intranasal lidocaine and midazolam spray (INM)
Using 0.5 mg of oral melatonin per kilogram of body weight (up to 5 mg), 30 minutes prior to blood sampling can have a significant impact in reducing pain and anxiety in children. (12)		Marseglia L	2015	Using 0.5 mg of oral melatonin per kilogram of body weight (up to 5 mg), 30 minutes prior to blood sampling can have a significant impact in reducing pain and anxiety in children. (12)	Oral melatonin
2 mL of 25% sucrose has a significant effect in pain relief in infants. (13)		Wilson S	2013	2 mL of 25% sucrose has a significant effect in pain relief in	Oral sucrose

				infants. (13)	
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Table 2: Non-Pharmacological strategies

Bubble method reduces the pain of venipuncture. And with respect to the fact that the bubble blowing method is more economical, using different techniques of distraction by nurses during venipuncture will promote life quality of children with thalassemia. (15)		Allawi et al.	2008	bubbling
Distraction through the bubble reduces the physiological responses and severity of the pain of venipuncture in children 6-3 years old. (3)		Chehrzad et al.	2010	
Various methods of distraction have successfully reduced pain in children. (16)		Dahlquist LM	2002	Distraction
Group A experienced the maximum amount of pain (88.57%) and they did not calm during venipuncture. While the second group showed less pain (28.58%) of which about 25% of them were comfortable and only 20% of them showed severe pain.(17)	Group A: Only family members accompanied the child during venipuncture.Group B: In addition to family members' accompaniment, animations and video clips were used.	Gupta HV	2014	Animation
Watching TV significantly reduces pain during venipuncture in children (18)		C V Bellieni	2006	watching TV
The pain in the intervention group using distraction techniques was less than in the control group. (19)		Windich-Biermeier A	2007	Distraction (bubble, books, music, three-dimensional glass and manual video games)
Distraction significantly reduces pain and distressful behavior in the intervention group compared to the control group. (20)		Vessey JA	1994	Distraction
Using toys as a distraction during venipuncture is effective in reducing mild to moderate pain. (21)		Rhonda Winskill	2008	Distraction (toy)
In the experimental group 3/63% of children had mild pain and no child reported severe pain and in the control group 0/50% of children had mild pain and 3/33% of children had severe pain. (22)		Shamshiri et al	2012	Pressing small and soft balls
The most effective way to relieve pain and anxiety in children during the bloodletting was distraction cards. (23)		Canbulat N	2014	Two methods of cards with distraction and kaleidoscope
Using the kaleidoscope has reduced pain in children. (24)		Karakaya A	2012	kaleidoscope
	EG group: (In the presence of dogs) CG group: (In the absence of dogs)(25)	Vagnoli L	2015	The use of animals (dogs)
Music has a beneficial effect in reducing anxiety before, during and after blood tests, and pain in the intervention group was lower than in the control group. (26)		Caprilli S	2007	Songs and music

Table 3: Interventions and tools effective in the mechanisms of pain

Pain intensity was significantly lower in the intervention group than the control group. (27)	Intervention group: 5 minutes before venipuncture Hugo point was massaged with ice. Control group: No intervention was conducted.	Abazari et al.	2014	Hugo point massage with ice
Using this device during venipuncture will lead to a reduction in pain in children with mental disorders. Also, due to its special design, this device results in child's distraction. (28)	Intervention group: BUZZY was used during venipuncture Intervention group: No intervention was conducted.	Schreiber S	2016	Dithering cooling device (BUZZY)
Upon using this spray in the area, starting and gestures of pain impulses in the sensory nerves of the skin is reduced and the onset of action in less than a minute and is very fleeting. (10)				Cooling Spray

Table 4: Comparing different methods

There is a significant difference with normal procedure, but there is no significant difference between the methods of distraction and EMLA cream. So both methods reduce the pain of venipuncture. However, considering the distraction method is more economical than the cream EMLA, using this method is recommended. (29)		Allawi et al.	2005	Distraction and EMLA cream
Application of anesthetic cream had more impact on the pain of venipuncture in children. So that, it can be recommended that the cream is applied in the desired location routinely one hour before venipuncture and music is used as a useful method for distraction of children. (30)		Pourmovah ed et al.	2008	Music and anesthesia EMLA cream
Pain intensity of venipuncture using music method and EMLA cream is significantly less than the child's pain using the normal method. Also, no significant difference was observed between the severity of pain during venipuncture using distraction (music) and EMLA cream. (31)		Shahabi et al.	2007	
There is no significant relationship between EMLA and ice groups. Then, because the use of non-pharmacological methods is preferable over pharmaceutical procedures in pain relief in terms of cost and availability, it can be said that in case of lack of access to pharmacological methods to relieve the pain of venipuncture procedures, non-pharmacological method of using ice can be applied. (32)		Nick Fried et al.	2010	Ice and EMLA cream
Valsalva Mano, as a practical and simple method, can effectively reduce pain in children, but it is not as effective as EMLA cream. (33)		Akdas O	2014	Valsalva Mano (VM) and EMLA cream
Aggression and cries reduces with clownish acts and the pain is alleviated with EMLA cream. So, it is better to reduce pain with EMLA cream and however distraction through slapstick is helpful. (35)		Meiri N	2015	Clownish acts and EMLA cream
		Biran V	2011	EMLA cream and oral sucrose(36)
There is a significant difference between the pain in the normal method with touching and bubble. However, a significant difference was found between the average pain intensity in bubble	The first group before and during venipuncture were	Razzaghi et al.	2012	Distraction and touch

technique and touching technique. So both methods of bubble play and touch are effective in reducing the pain of venipuncture in children. (37)	encouraged to bubble-making play. The second group received touching the injection area at the same time. The control group received no intervention.			
Venipuncture pain was moderate in the usual method. But in the method of using music and rhythmic breathing technique Hey-Ho, pain was mild. Moreover, comparison of the pain of venipuncture in these three methods showed that both pain of venipuncture was lower in music and rhythmic breathing technique Hey-Ho than in the usual method and that the music method had the least pain. (38)	In the first visit, venipuncture in the usual method, it means without distraction, was performed. In the second visit, music was used to create a distraction and on the third visit, Hey -Hv rhythmic breathing technique was used to create a distraction.	Vali Zadeh et al.	2004	Music and Rhythmic Breathing Technique
The pain of venipuncture is reduced by means of distraction methods, relaxation, rhythmic breathing and music among which music is more effective in reducing pain. (39)		Ismaili et al.	2008	Rhythmic Breathing and music
All used methods reduced significantly pain and anxiety in children during blood-taking. (40)		Sahiner NC	2015	Three methods of distraction (cards for distraction, listening to children's programs music and inflating balloons)
During venipuncture, the smell of vanilla and breast milk, both have calming influence on the infant. But after venipuncture, just the smell of breast milk has a calming effect. So breast milk, compared with the scent of vanilla, has more calming effect on preterm infants. (41)		Jebreili M	2015	The smell of breast milk and vanilla smell

DISCUSSION AND CONCLUSION

The results of research conducted in the field of distraction shows implementation of distraction procedure has reduces pain and anxiety of treatment procedures in children suffering from various diseases. Therefore, with a variety of methods of distraction, we can reduce the effects of destructive experience of painful and stressful procedures in children who suffer from a lot of pain during painful procedures of diagnosis, treatment and control of their disease. Given that one of the main roles of nurses is to get access to non-invasive methods for the treatment and care of patients, it is hoped that the results of these studies expand the field of nursing activities associated with pain and anxiety of children before medical procedures and increase the quality of nursing care. Nurses play an important role in the control of pain and anxiety in patients, especially children. Nurses who care for their patients' pain and anxiety, try to reduce them and establish a better relationship with their patients. In fact, by reducing pain and anxiety, nurses can increase children's satisfaction. With respect to the satisfactory results in reducing pain and anxiety in children, it can be introduced as a convenient method for relieving pain and anxiety in children that is easy-implemented and low-cost. Training non-pharmacological methods such as distraction to other social groups, such as parents and teachers is also useful. By engaging children to do these procedures at the time of facing with painful cases, they can reduce adverse physical and psychological effects in children

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CONFLICT OF INTEREST

None

FINANCIAL DISCLOSURE

None

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ARTICLE

THE CLINICAL ASSESSMENT OF BILIARY ATRESIA PATIENTS REFERRING TO PEDIATRIC WARDS OF HOSPITALS AFFILIATED TO SHIRAZ UNIVERSITY OF MEDICAL SCIENCES FROM MARCH 2007 TO MARCH 2013

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ABSTRACT

Background: Biliary atresia (BA) is the terminal stage of multiple inflammatory and fibro proliferative mechanisms which may have no certain causes. Fast diagnosis is a key in improving the outcome of the disease. So it is necessary to evaluate the main clinical signs of BA. **Methods and Materials:** It was a retrospective cross sectional study conducted between March 2007 and March 2013. Medical records of all confirmed patients in this time section were obtained and then analyzed. Main clinical signs and indications of each patient were extracted from their records in specific forms. Forms were sent to a biostatistician for further statistical analyses. **Results:** 73 cases met our inclusion criteria. Jaundice was the chief complain of 98.6% of the cases. 28.8% of the patients had a positive family history. 32.9% of patients had hepatomegaly. 35.6% had splenomegaly and 21.9% patients had both. Dark urine was observed in 58.9% of patients. Pale stool was recorded for 68.5% of patients. 50.6% of patients had both dark urine and pale stool. **Conclusion:** fast diagnosis of BA is possible with a combination of different diagnostic methods. It may be really beneficial if we educate the parents on how to tell if there is something wrong from the color of the newborn's urine and stool.

INTRODUCTION

Biliary atresia (BA) is a congenital or acquired hepatic disease which is mostly seen in neonatal phase of life.

In this rare disease, common hepatic duct is either obstructed or absent. It is also called "extra hepatic ductopenia" or "progressive obliterative cholangiopathy". [1] BA causes a persistent jaundice which won't respond to the casual treatment methods and surgical procedure is the only choice. In children, BA is the most common indication for liver transplantation. [2] BA is yet an idiopathic disease with no certain causes. Different types of BA have been observed. Most of the time BA present without any other malformations and anomalies. This type is called perinatal BA. [3] In prenatal BA, Jaundice is not present since birth and it will start to develop within the first two months of life. [4] The other types of BA are associated with other anomalies and malformations which may include asplenia, polysplenia, malrotation, situs inversus and etc. [5] Ones affected with these kinds of BA have a poorer prognosis. [6]

It is not a common problem as its occurrence rate in the United States is 1/10,000 to 1/15,000 cases in live births. [7]

Different mechanisms have been under observation and it is believed that some of these mechanisms may contribute in the onset of BA. Viral etiology is still a hypothesis and no specific viruses have been found to have a connection with BA. Yet some viruses showed the potential to cause BA [8] Genetic factors may play an important role in this disease. Some alleles may make the carrying person more susceptible to developing BA. [9] Immunologic and toxic etiologies are still under investigations as hypotheses. [10]

The prognosis of BA is very complex and variable in different patients and it largely depends on the liver transplantation and the respond of patients body to the transplanted organ. [11] without transplantation the outcomes are fairly poor. Only 55% of the patients may survive after 5 years without the surgery. [12]

First and the most important sign of the disease is jaundice which is mostly detected in the sclera. The jaundice is likely to happen from birth to 8th week. After this period the onset of jaundice is really unlikely. Acholic and pale stool is another sign of BA, but most of the time it will remain unnoticed. Bilirubin will be secreted to the urine and it will make the urine look dark and make the diaper look yellow. This is also very likely to stay unnoticed by the parents.

Fast diagnosis is very important in BA because the success rate of interventions and surgeries largely drops when the patient get older. [13] Alagille Syndrome or alpha-1-antitrypsin deficiency are two diseases that have similar signs as BA and this make fast diagnosis a challenge. Abdominal Ultra sound is the first line tool to investigate the anatomy of liver and bile duct. It is beneficial to exclude other anatomical problems associated with the similar symptoms and signs as BA. In children with BA the gall bladder is either absent or in a mal shape. The absence of common bile duct can be detected too. [14] Hepatobiliary scintigraphy is the next tool for diagnosing BA. Liver biopsy is done on every infants who are under

KEY WORDS

Biliary atresia, hepatic disease, cholestasis, bile duct, gall bladder, liver

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investigation for BA .After all these procedures, liver biopsy will confirm the BA and the urge of surgical intervention.

After that the infant will be taken to the operation room and after the pre-cutaneous Cholangiogram the surgeon will decide whether to do the KASAI procedure or not. KASAI procedure and liver transplantation are two main surgical treatments of BA.

As time plays an important role we should study the clinical features of BA in the infants so that we can achieve a faster diagnosis process. We designed this study to record and evaluate clinical signs of infants with biliary atresia in Shiraz,Iran in order to find a fast and sharp diagnosis method .

MATERIALS AND METHODS

It was a retrospective cross sectional study conducted between March 2007 and March 2013. After the legal and ethical approval of the local health authorities, all the patients that was diagnosed as BA patient in pediatrics ward of hospitals affiliated to Shiraz University of medical sciences was entered in our sample. At the end 72 confirmed BA patients were remained in the study. The patients were aged 1 week to 12 yrs. The BA was confirmed by ultrasound investigation and liver biopsy. Only the hospitalized patients were included in the study and all the outpatient cases were excluded. Patients with the lack of required information in their medical sheet were excluded too. Based on the previous studies and the consultation of a biostatistician a minimum of 70 patients were required for the study to achieve a power of 80. All the cases had a medical sheet which was recorded in the medical records library of Shiraz university of Medical sciences. We first examined their medical records and all their clinical signs and findings were transferred to another form which was designed for the study. Patients' age, birth weight, family history and chief complaint was extracted and written down in the first part of the form. Then it was checked if the patient had pale stool and dark urine. Then the anatomical abnormalities of the patients were checked. [Hepatomegaly, splenomegaly, situation of gall bladder and the condition of intra and extra hepatic bile duct].

After that the forms were sent to a biostatistician for the analyses. SPSS V 15 were used as the statistics program. Independent T-test were used and p value under 0.05 was defined as significantly meaningful .

RESULTS

At the end, after all the evaluations and exclusions, 73 cases were included in the results. Of these 73 cases, 72 was referred to hospital with the chief complaint of jaundice and 1 with cirrhosis. Patients were aged one week to 12 yrs. with the mean age of 2.50 ± 3.31 . 21 (28.1%) of patients had a family history of BA. Mean weight was 5.86 ± 3.31 kg . Thirty out of 72 (43.66%) were diagnosed at the age of 2 months and earlier. The time interval between onset of signs and symptoms and diagnosis is as follows: 1) Less than 1 month: 37 patients (51.38%), 2) 1 to 3 months: 19 patients (26.38%), 3) 3 to 6 months: 4 patients (5%), 4) 6 to 12 months: 8 patients (11.11%), and after 12 months: 4 patients (5%).

Regarding physical examination abnormalities ,24(32.9%) patients had hepatomegaly. 26(35.6%) had splenomegaly and 16 (21.9) patients had both. 19 (26%)patients had BA in intrahepatic bile duct while 7(9.5 %) patients had dilated intrahepatic bile duct , 7 out of these 8 patients had obstructed extrahepatic bile duct which may cause the intrahepatic duct to dilate . Extrahepatic bile duct was obstructed in 48 (65.7%) patients .Gall bladder was absent in 24 (32.9%) patients.

Dark urine was observed in 43 (58.9%) patients. Pale stool was recorded for 50(68.5%) patients. 37(50.6%) patients had both dark urine and pale stool.

DICUSSION AND CONCLUSION

Although diagnosis of BA isn't a hard thing to do, doing it fast is still a big challenge. Because most of the clinical signs and symptoms of BA is also present in other hepatic diseases. Scientists are really keen to screening tests for BA because early diagnosis is really important. Mushtaq *et al* designed a study to find if it is possible to create an easy and fast screening method. They used dry blood spots on the universal Guthrie screening card to evaluate the concentration of bile salts in the blood. Though they find a slight concentration difference between the affected infants and normal ones , they thought that the difference isn't sufficient enough to accept this test as a certain screening method .[15]

Our results showed that most of the families took in the infants because of jaundice . More than half of diagnoses were made at the time when newborns were older than 2 months. BA is associated with a persistent jaundice. Most Iranian parents assume the jaundice to be normal at the beginning. As they see no signs of recovery they will bring the infant to the hospital. This is not a good news. No one noticed the changes in the infants' urine color or the pale stool. This demonstrates the urge to train the families and parents after child birth .It can be really beneficial if we train the parents about normal urine and stool. Hsiao *et al* started a national wide project to create an easy and simple screening method for BA which could be done by the parents. A card was given to the parents with a child health booklet. In the card they showed the parents how to tell if the stool color is right and how to know if there is something wrong about the color. By using this method they found that the sensitivity of detecting BA before two months of age

was 72.5% in 2004, which was significantly improved to 97.1% in 2005. They concluded that using such methods may enhance early detection of the disease, and as a result the outcomes will be better. [16] Similar studies are suggested in Iran.

Table 1: Main clinical signs and symptoms of the patients diagnosed with BA.

Chief complain	Percent
Jaundice	98.60%
Cirrhosis	1.40%
Family history	
Positive	28.80%
Negative	71.20%
Dark urine	
Positive	58.90%
Negative	41.10%
<i>Pale stool</i>	
Positive	68.50%
Negative	31.50%
Hepatomegaly	
Present	32.90%
Absent	67.10%
Splenomegaly	
Present	35.60%
Absent	64.40%
<i>Gall bladder</i>	
normal	38.40%
absent	32.90%
dilated	2.70%
contracted	26%
Liver transplantation	
received	28.80%
not received	71.20%

71.20% of the patients in our study didn't have any family history of BA. In current literature there aren't enough supporting data to directly link BA with the genetics, as the twins doesn't share the phenotype and it is usually just seen in one of them. Silveira *et al* evaluated the possibility of familial inheritance of BA and concluded that there aren't any direct link between BA and genetics, but genetics may indirectly make an infant more susceptible than another.[17]

Using the ultrasound to evaluate the anatomic situation of liver and gall bladder have been a first line diagnostic tool for BA. Regarding our data splenomegaly and hepatomegaly can't be a good sign of BA, as most of the patients were negative regarding these two issues. Splenomegaly is usually detected if the presentation is late and it is a sign of portal hypertension. Nowadays, clinicians use the triangular cord sign in ultra sound evaluation to diagnose BA. This sign shows a fibrotic mass at porta hepatis. One of the weak points of our study is that we didn't have data about whether the clinicians used this sign for diagnosis or no. Takamizawa *et al* reviewed the medical data of 85 infants who were diagnosed with BA. They concluded that with emphasising on the triangular cord sign and gallbladder length and gallbladder contractility we can diagnose BA with a great certainty level. [18] By using these and combining them with laboratory tests and Hepatobiliary scintigraphy will make a fast diagnosis possible and may indirectly enhance the prognosis of this complex problem. Yet more research is needed regarding this issue.

CONFLICT OF INTEREST

None

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FINANCIAL DISCLOSURE

None

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ARTICLE

EVALUATION OF WOMEN'S ROLE IN DEVELOPMENT OF LORESTAN PROVINCE

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ABSTRACT

Women have always played important vital and creative roles in every area of life such as economic, politics, religion, culture and etc. just like men. In human's civilization, we can see important signs of women and they have now shown an undeniable glitter in the world's biggest treasures in the frame of left works from prehistoric, historic and after historic areas. These guiding roles include women's presence in every art arena and handicrafts as the most original ones that are main instances of human's civilization. The goal of this paper is to rank the women's roles in economic and social developments for Lorestan province. We have used ELECTRE model and its research method is analytic – descriptive. Early results of this research show that according to the considered indexes for ranking the cities of Lorestan, Khoramabad, Borujerd and Aligoodarz have the first to third ranks. In other words, they have most of the scores.

INTRODUCTION

These days, women have an undeniable role in societies' social and economic activities. It is really important and necessary to pay attention to women's talents in developing societies and countries. The researches and investigations that have been done on the women's participation in social affairs, reveal that social and cultural factors and different expectations of societies from men and women have always considered important obstacles for women's participation in societies (Rostami, 2004). Recent studies of socialists show that getting a constant development is not possible without women's active participation in every field including family, economic and social ones (Akbari, 2012, 38) participation is a process of making decision (Khani et al, 2009) and actually means a public interference in Urban development programs that is considered an important element in social consistency since they consider people's participation important and effective in making social funds and they knew that it ends in more people's participation and finally social consistency (UNHSP, 2009). Women's situation in every society shows the improvement of that society. And this is a fact that is going to be understood more and more by more people (Mahamoodian, 2003). Researches about working women in cities and villages have revealed the importance and different productive activities of women in the economy of developing countries. However, this issue is more important for rural women. Because being woman increases the probability of being poor (Chant, 2003). Rural women's participation in working is more than men and more than urban men or women especially in developed countries. Because the production structure and work relations are traditional (Soroosh Mehr, et al, 2010). When women live in rural societies, they can experience discrimination and poverty since they are in charge of economic activities that do not end in a reasonable income (kaur, 2005). The UN's meeting on the development and environment in Rio de Janeiro in 1992 was an important happening for the women all over the world. Since they investigated the important role of women in gaining a different type of development in a constant social, economic and environmental way and they emphasized on their role in managing the environment and more environmental developments. In 21 bill of this meeting, women have been considered as a main group whose participation is necessary in order to reach developments. According to the millennium development goals, sexual equality and strengthening women have been considered as efficient ways in combating poverty, starvation and diseases and as factors that actually create developments (Pearl, 2003) (Lucas, 2001). Actually paying attention to the women's role in development process in the first 70s was because of two importance facts of failing to meet general development ideas in improving conditions in developing countries and improving unpleasant economic, social and cultural situation of women in these countries (RouhAfza et al, 2009). Although during the recent decades the emphasizes have led to attract attentions to reviewing development processes and changing the attitudes toward the women's role in society, still there are several dimensions of this affair that are not completely clear and still women have not been able to find their special situation in the process of development even in their normal daily life. In fact, women are seen as presenters of development programs that are designed and edited by men. Therefore, women's participation can be considered as a main factor in the success of the programs and in this way women must interfere in forming these programs and feel that the programs actually belong to them (Akbari, 2012) According to the present paper, we will investigate the women's role in social and economic developments.

Background of the research

Experimental researcher inside and outside the country have dealt with the women's participation and role that shows the effect of different factors on the expectations of their participation and decisions. Sarmady and et al (1994) investigated the economic and social role of women in Ahandan village. Their research indicated that in rural families although women are more active in production than men, among different groups of people, 76 percent of women were in low economic level, 74 percent in mid-level and 56

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percent of rich women were the family work force in rice and tea farms. Pourarabi (1997) investigated the women's role in rural activities of Ramsar. The results indicate that more than 96 percent of rural women have at least one economic activity that complements the families' income. However, type and amount of their economic activities was affected by a group of geographical, social, economic and cultural factors. The results also showed that active rural women were not producers themselves in their village and family economic. As a result, although they are mostly engaged in economic activities, they can't use state validities easily and face lots of abstracts. This research indicated that the motivation of more than 87 percent of the studied women was their families' economic demands. This shows the importance of rural housewives, presence in several economic activities in order to help their family's economic situation and prevent poverty for rural families Babayi (2000) did a research and distinguished the economic and social situation of 93 percent of women in Hamedan province. The findings of this research revealed that 2/52 percent were in the mid-level and only 9 percent were in high or very high levels women of Hamedan cities such as, Nahavand, Toyserkan, Razan, Bahar, Asad Abad, and Kaboodar Ahange had higher to lower level of social – economic situation relatively. Lahsayizade and et al (2005) investigated the women's role in rural economic activities and their role in the area of Fars province. The findings of this research showed that there is a reverse relationship between education and women's economic participation. Also their participation in economic activities increases as they get older. Women's participation decreases as men's education and income increases. Finally, it was shown that the strongest factor that determines the economic participation of women is actually their attitude towards their jobs. Sedka Halim (2005) did a research as "Gender and villages that have electricity in Bangladesh." The findings of the mentioned research indicates that one of the effective factors in improving rural women's decisions is the level of technology.

One of the criteria of regional planning for specifying inequalities is determining the situations of regions according to developmental indexes (Ziari et al, 2008). There is a common belief in development policy and literature that improving gross national products and high per capita income are main development axes. (Taghvayi et al, Abdolahi, 2009) development as a global project (Sarvar, 2012) is a gradual process in improving human's situation, and includes activities for reaching material improvement and social evolution. The main goal of development is actually eliminating inequalities and the best concept of development, is growth with social justice (Gharakloo et al, 2006). The Concept of development is economic growth (Ziari, 2006) and Fast and continuous growth of the real per capital accompanied with the social improvements (Ziari and et al, 2012). In order to reach a balanced development that ends in improving the lives of all people, needs appropriate national and regional planning (Kargar et al, 2011). "Economic development" is a qualitative concept that is related to changes in production capacity, production and distribution institutions, the quality of productions and also their variety. In order to judge about development or un-development or comparing different situation of different regions. We have to use some indexes to evaluate the level of development (Salamifar, 2003). Regional development is one of the subjects that has attracted the attention of programmers especially the regional ones. Key economic, social, sanitation, industrial and other indexes in different levels are also suitable criteria in determining the location of different regions, they also need attentions in regional level and determining national – regional compatibility and consistency (Hekmatnia et al, 2006).

The concept of consistent development is understood and interpreted in different ways in different countries. These difference all reflect a variety in environmental economic, social and political conditions. The term "consistent development" was firstly used in 1980 in the report of international committee about protecting natural resources. In general, constant development has got multi-dimensional interpretations (Ratner, 2004). We usually consider difference among social and ecologic goals. In the view of Seeger, one of the key roles in constant development, is public participation, information access and justice. According to this rule, people must be able to participate in the process of making decisions which is effective in their welfare and their life. Women have an authoritative role in the process of making decisions. Actually they provide opportunities for making decisions and public thoughts. They increase critical thinking. Social justice and public performance towards profitable goals for the society reveals that constant development has three prominent characteristics that are all very interesting for women. Firstly, consistent development is mostly based on distribution than production (Kolayi, 2003). The second prominent characteristic of constant development is that it is related to future not present and therefore, we can see a sort of foresight. Its third characteristic is that it is mostly related to nourishment than development (Kolayi et al, 2006).

Research method

The research method is analytic – descriptive. Some of the necessary data were collected from the statistic center. One of the most important indexes that has been used is the education of working women, the number of housewives and economic participation rate. In this research, we have rated different cities of Lorestan province such as Aligoodarz, Borujerd, Khoramabad, Dalfan, Dorood, Koohdasht, Azna, Poldokhtar and Selseleh by economic and social indexes and ELECTRA model. The method of making decisions has different indexes that each has its specific characteristics and usage condition.



Fig.1: The situation of Lorestan province

ELECTRE model is a multi-criteria method that was firstly presented by Yu in 1992, and then was improved some years later. This method is a method for making decisions. It is multi-criteria and categorizes the option based on pre-determined interval (Malekmohammadi et al, 2008). This categorization results from the comparison of each option with profiles that determine the boundaries of social levels. (Berger, 2002). ELECTRE technic was firstly offered by Benayouand then developed by Van Delft, Nijkamp, Royand his et al. The concept of this method is better rate relations (Tavari and et al, 2008). In this method, we use the concept of “domination” implicitly (Khaliji et al, 2013) in this method, options are used in an implicit way and are compared two by two. So dominant and weak options are identified and then the target weak and beaten options are evaluated (Roy, 1991). If in a multi-criteria decision issue there are N criteria and M options, we should perform the following processes by ELECTRE method in order to choose the best option:

First step: changing decision matrix to anti-scale matrix.

There are different methods for making them without units but in ELECTRE method, we usually use the following relation (Tille et al, 2003):

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^m x_{ij}^2}}$$

Second step: forming anti-scale, weighted matrix, in which V matrix is the weight of indexes, diameter matrix whose only main element is non-zero and W is anti-scale weighted.

$$V = N_d \cdot W_n$$

Third step: forming agreed and disagreed collection of criteria: In this step, all the options are evaluated in ratio with all the criteria and agreed and disagree collections are used.

$$l_{ke} = \left\| \left\{ j \mid v_{kj} < v_{ej} \right\} \right\|$$

If the considered criterion has a positive aspect: if the considered criterion has a negative aspect

$$l_{ke} = \left\| \left\{ j \mid v_{kj} < v_{ej} \right\} \right\|$$

The forth step: calculating the agreed and disagreed matrixes. These matrices' diameter does not have any elements.

$$C_{ke} = \frac{\sum_{j=1}^m W_j}{\sum_{j=1}^m W_j}$$

And other elements of this matrix derive from the sum of agree square m * m disagree square matrix whose diameter does not have any elements and other elements of this matrix derive from anti-scaleweightedmatrix.

$$d_{ke} = \frac{\max_{j \in I_{kj}} |v_{kj} - v_{ej}|}{\max_{j \in I_{kj}} |v_{kj} - v_{ej}|}$$

Here, we should mention that data in agree matrix have main differences with the data in disagreed ones.

$$C = \sum_{k=1}^m \sum_{s=1}^m \frac{C_{ks}}{m(m-1)}$$

The fifth step: calculating effective agree matrix by the following formula.

$$f_{ke} = \begin{cases} 0 & C_{ke} \geq C^- \\ 1 & C_{ke} < C^- \end{cases}$$

The sixth step: calculating effective disagree matrix.

$$d_k = \frac{\sum_{k=1}^n \sum_{e=1}^n \frac{f_{ke}}{m(m-1)}}$$

$$g_k = \begin{cases} 0 & d_k > d^- \\ 1 & d_k \leq d^- \end{cases}$$

The seventh step: determining a general effective matrix, the final dominant matrix it is resulted from multiplication of each entry of agree dominant matrix F to disagree dominant matrix G.

$$h_{ke} = f_{ke} \cdot g_{ke}$$

The eighth step: Eliminating less satisfactory options and choosing the best option. The final dominant matrix reveals the detailed preference of the options. For instance if he equals one means that k is better than e and it is acceptable but k can be dominated by other options. We should choose the options that are mostly dominants that beaten and in this way, we can rate the options (Atayi, 2008). Infected the preferred option is the one that has the least number 1 in the column (Mirfakhredini et al, 2010).

The ninth step: eliminating low-gravity options, general matrix shows relative order of the options. That is

$h_{k1} = 1$ indicated that A_k is better than A_1 in terms of coordination and coordination criteria A_k still can be dominated by the options of coworkers (Vahdani, 2011)

Table 1: The current situation of target cities in the used indexes of Lorestan province.

Criteria	The employees Women	The Unemployed Women	The housewives	Educated Women	The employees of Women in higher institutions
Aligoodarz	34302	9645	31891	49	25
Borujerd	88080	18376	84117	482	83
Khoramabad	132508	56404	98267	765	220
Dalfan	29865	11653	28473	16	0
Dorood	34466	17338	38999	63	22
Koohdasht	42232	28518	42951	97	4
Azna	19774	6599	16050	20	5
Poldokhtar	19792	9038	16234	36	5
Selseleh	13358	12322	13878	30	0

Resource: Statistical Yearbook of Lorestan province 2011

Table 2: The normalized matrix

Criteria	The employees Women	The Unemployed Women	The housewives	The Educated Women	The employees of Women in higher institutions
Aligoodarz	1547	640	617	0.48	0/57
Borujerd	3971	1219	1682	4/7	1/89
Khoramabad	5974	3742	1902	7/46	5/02
Dalfan	1346	773	551	0/16	0
Dorood	1553	11500	755	0/61	0/5
Koohdasht	1904	1892	831	0/95	0/09
Azna	891	437	310	0/2	0/11
Poldokhtar	892	599	314	0/35	0/18
Selseleh	602	817	268	0/29	0

Resource: Writers

Table 3: The final ranking

Cities	Aligoodarz	Brojerd	KhoramAbad	Dalfan	Dorood	Koohdasht	Azna	Poldokhtar	Selseleh
A1	Aligoodarz	0	0	0	1	1	0	1	1
A2	Borujerd	1	0	0	1	1	1	1	1
A3	Khoramabad	1	1	0	1	1	1	1	1
A4	Dalfan	0	0	0	0	0	0	1	1
A5	Dorood	0	0	0	0	0	1	1	1
A6	Koohdasht	0	0	0	1	0	1	1	1
A7	Azna	0	0	0	0	0	0	0	0
A8	Poldokhtar	0	0	0	0	0	1	0	1
A9	Selseleh	0	0	0	0	0	0	0	0

Resource: Writers



Fig. 2: Ranking women's roles in social and economic developments

CONCLUSION

Participation results in strengthening and going far from the traditional paradigm of providing by engaging people who are the subject of development (Hamdi et al, 1996). One of the most important practical strategies of the women's participation in development is their capabilities. Here we should emphasize that women's participation does not only mean taking advantage of them in the advantages and results of development programs. However, they should have active participation in performing programs and in development plans. (Sai et al, 2009) In general, women's roles in local and regional planning is neglected and their daily activities are considered a normal work that doesn't have any particular structural effect. Indeed, women are seen as independent agents in the human's changes (safari shali, 2001) since 1980 the concept of "gender and development" has replaced the terms "woman in development". Gender and development do not have anything to do with women. However, they are related to social structure of gender and the role of responsibilities and expectation that society has from the men and women (Kolayi and et al 2006) Develop men is not impartial. Infect development ignores different characteristics of women and hurts them. After two decades from the start of development programs (1960 and 1970) that was announced by the UN, the world faced stunning statistics in the early 1990s. Women did 67 percent of the worlds' working hours, and earned 10 percent of the world's income. Two thirds of women were illiterate (gender and development, 1994). Occupational participation actually reveals the women's social role and fulfils the expectations of those who have those positions. Women's occupation is one of the important elements in developing social and economic life and also shows flourishing of talents and capabilities of a great proportion of the society. We should pay attention that basically fewer women are employed in Iran compared with other countries and this few number of women are in few number of jobs. Women's social and economic role is really important in societies. Besides development goals and improvements in programming, it is necessary to have balance in development gifts among women work force. And if it is not considered, it may result in an increase in social inequalities. "Justice" is a concept which has always been the human being's concern. Therefore social growth of women in education and occupation indicates their potential capabilities. Society needs appropriate and worthy work force in different fields, and the main goal of society is also developments in social and economic growth and improvements. Therefore, women should be used in important and sensitive positions of society in order to provide welfare and calmness for different people of a society. This paper has shown that in recent decades, women have not participated a lot in Lorestan province and this can be a warning for the development of this province. Since if social justice is not visible in a society, that society will definitely face numerous problems. The results of ELECTRE technic in evaluating women's roles in economic and social developments of the cities of Lorestan province, specially the west ones (Delfan, selseleh and Koohdasht) Shows that women have little social and economic participation. One of the advantages of using this technic is that it prioritizes the cities based on their participation, specifying final weight to each criterion based on their utilitarian in a way that by means of this we can differentiate the cities of Lorestan province in terms of social and economic developments. By calculating 5 indexes of working women, unemployment rate, the number of housewives, the number of literate and working women in academic institutions and centers, it was seen that these indexes were not equal in different cities of this province. According to ELECTRE model, women in Khoramabad, Borujerd and Aligoodarz were in the first to the third grades in social and economic developments. While women in Koohdasht, Dorood, Delfan, Azna, Poldokhtar, and Selseleh occupied the forth to ninth grades. Of-course here, it is necessary to mention that cities in the center of the province have the most role however, the cities in the boundaries or the cities that are far from the center have the least role in social and economic progress of Lorestan.

Therefore, we should pay special attention to the women's role in progress of the mentioned cities in the future programming and plans.

CONFLICT OF INTEREST

None

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ARTICLE

AWARENESS AND PATIENT'S RIGHTS CHARTER OBSERVANCE FROM THE PATIENTS' UNDERGOING SURGERY VIEWPOINT

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ABSTRACT

Introduction: Patient's rights Charter is the defense of human rights to show respect and sufficient care of body and soul when he or she patient. Furthermore, operating room is one of the most stressful units for patients in which patient's rights observance is significant due to sensitivity of curative actions. So this study was conducted to determine the rate of awareness and patient's right observance charter in operating room from the viewpoint of patients' undergone surgery. **Materials and methods:** This study was descriptive and cross-sectional one which was conducted 478 patients from surgery wards after surgery in two education hospitals of Jahrom University of Medical Science in 2015. Data were collected, using the researcher-designed questionnaire involving demographics, awareness rate, and the rate of patient right observance charter information. The reliability and validity of the questionnaire was checked by the researcher. The questionnaire was completed using interview. We used SPSS 16 software for data analysis. **Finding:** The total mean of awareness and patient's rights observance were respecting 17.42 ± 5.03 and 25.21 ± 1.95 from the patients' viewpoint. The score of awareness was reported in a good level in 42.2% of patients but its observance was good in 31.4% of patients. **Conclusion:** Although the rate of patients' awareness was in a good level, the rate of observance patient rights was in a medium level. So, it is necessary to have done more research and education to improve patient rights observance in operating room.

INTRODUCTION

Patients are one of the most susceptible social groups who are in danger physically, bodily, socially, economically that caused international assemblies paid special attention as the patient rights [1]. Today, patient rights is considered as a new topic in health sciences and clinical settings and is observed as a part of modern health care practice. In the other hand, patients are more aware of what health care professionals expect when they enter the health care setting [2]. So, their expectations have increased and they want to have active participation in curative decision-making [3]. World Health Organization knows the patient rights as a group of rights in which the people have to observe in the systems of health care providing. These rights include the right of suitable caring and curing with high quality, the right of having information, the right of private information, the right of intentional satisfaction, the right of free will, the right of benefiting health education, the right of complaining, and the right of loss compensation [4]. This organization published a detailed document in Amsterdam to improve patients' rights in Europe which representing a series of principles and strategies of patients' rights. These rules represent strategies to respect patients' rights and all of the countries must observe it [5]. In Iran, the health department of the ministry of health and medical education compiled and notified in 2002 [6]. Patients' rights observance improve the relation between patients and health professionals and increase their satisfaction and care quality. In the other hand, it reduces costs and the time of patients' hospitalization [7]. This necessitates that patients and health professionals to be acquainted and informed with the patient's rights. Furthermore, patient's rights mis observance causes patients' distrust and dissatisfaction toward health care professionals, increases costs and complains and decreases care quality [8].

The results of previous studies show that the rate of awareness and patients' right observance charter is different in various studies from patients' viewpoints. For example, Basiri Moghadam et al. the patients' awareness rate was reported good with 76.8% [1]. But in a study by Mossadegh this rate was reported poor [9]. In another study by Babamahmoodi et al. patients' rights charter was observed as 14.59% [10].

Based on the significance of the patients' rights and the results of various studies, actions should be taken into account to improve patient's rights and awareness in various units specially operating room. Operating room is one of the most stressful units for patients in which patient's rights observance is significant due to sensitivity of curative actions. In one hands this unit has specific features and patient is alone in this unit. In the other hand, most of the studies have been conducted in the other of health care units. So, the objective of the present study was to determine the awareness rate and patients' right observance from the viewpoint of patients undergone surgery in the operating rooms of Jahrom hospitals.

MATERIALS AND METHODS

This study was a descriptive and cross-sectional one in which awareness rate and patients' rights observance charter from the viewpoint of patients undergone surgery in operating rooms of Jahrom hospitals in 2015. The samples of the study involved 478 undergone surgery patients who were selected by stratified sampling method. Inclusion criteria involved patients undergone surgery in operating room with at least 15 years old who were able to participate in the study. Exclusion criteria involved patients' unwillingness and lack of physical and psychological ability to participate in this study. We selected some

KEY WORDS

Patient right charter; awareness; patient rights observance; operating room; patients

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patients from each surgery and used a questionnaire for data collection. This questionnaire was completed by the researcher through interview of patients after releasing from hospital. This instrument involved three parts of 15 items. The first part was about demographic information [age, sex, education, occupation, surgery type]. The second part which was designed to measure the awareness rate of patient's rights involved 6 items. The scores domain was between 0-24. The scores average was classified into four levels: high [24-21], good [20-14], medium [13-7], and poor [6-0]. The third part which was designed to measure the rate of patient right observance involved 9 items with the scores domain of 0-36. The scores of this part were classified in three levels: desirable [36-27], medium [26-14], and undesirable [13-0]. The answers were based on the 5 points Likert scale ranging from 0-4 [0: never, 1: low, 2: medium, 3: high, 4: very high]. Validity of the study was approved by 10 Faculty members of Jahrom University of Medical Sciences, Faculty of nursing and paramedics. In order to investigate the reliability of the instrument, test-retest was used and Cronbach's alpha for awareness and patient's rights observance was 0.7 and 0.83 respectively. Data were analyzed, using SPSS 16 software. For determining the rate of awareness and patient's right observance, descriptive statistics, frequency tables, averages, and standard deviation.

RESULTS

The results of the study showed that 52.5% of the patients were men and 47.5% were women. Their average age was 38.85 ± 19.68 . 34.8% of the patients had no education, 29.9% were junior high school, 21.9% were high school, and 13.4% had college degree. In terms of occupation, 42.4% were housewives, 39.8% were self-employments, 6.8% were student, 5.7% were government staffs, and 5.3% were unemployment.

The total average of awareness and patient's rights observance score from the patients' viewpoint were 17.42 ± 5.03 and 25.21 ± 1.94 respectively. The results showed that 45.2% of patients had a good awareness related to patient's rights charter and 6.4% were poor. The rate of patients' rights observance (66.8%) was in a medium level and 31.4% of the patients evaluated desirable these rights [Table 1].

Table 1: absolute and relative frequency of awareness and patient's rights observance based on the classified scores

Patient's rights awareness	Frequency (percent)
High (24-21)	30(6.4%)
Good (20-14)	120(25.6%)
Medium (13-7)	212(45.2%)
Poor (6-0)	107(22.8%)
Patient's rights observance	
Desirable (36-27)	8(1.7%)
Medium (26-14)	306(66.8%)
Undesirable (13-0)	144(31.4%)

The most awareness was related to the items of the best method of surgery and anesthesia based on the patient's condition with the weighted mean of 2.812, the prevention of various infections transmission to the patient's body while and after surgery (2.842), availability to the physician and other members of curing group during hospitalization and after release (2.838). The most items of patients' rights observance in operating room was related to respectful behavior of curing team without attention to the racial and cultural elements with the weighted mean of 3.485 and keeping patient's privacy was 3.350. Presenting physician and surgery and anesthesia nursing before surgery and patient's participation in selecting anesthesia method were observed low with the weighted means of 1.723 and 1.887 respectively [Table 2].

Table 2: Frequency and weighted mean items of awareness and patient's rights observance.

No.	Patient's rights awareness Items	Percent					Weighted mean
		Never	Low	Medium	High	Very high	
1	Receiving necessary information from curing team about disease recognition and treatment.	17%	7%	18%	30%	25%	2.393
2	Ensuring of patient's medical records confidentiality	20%	8%	12%	28%	29%	2.390
3	Performing the best method of surgery and anesthesia based on	10%	6%	15%	26%	41%	2.812

	the patient's condition						
4	Prevention of various infection transmission to the patient's body while and after surgery	10%	6%	13%	26%	42%	2.842
5	Identification of curing team members	8.1%	9%	18%	29%	33%	2.713
6	Availability to the physician and the other members of curing group during hospitalization after release	9%	3%	15%	34%	36%	2.838
No.	Patient's rights awareness						
1	Respectful behavior of curing team without attention to the racial and cultural elements	0%	0%	6%	36%	56%	3.485
2	Keeping patient's privacy	0%	1%	6%	46%	45	3.350
3	Providing a tranquil place by curing team	1%	3%	17%	36%	41%	3.136
4	Providing an opportunity to speak with the surgeon and anesthesia physician before surgery	15%	11%	20%	25%	26%	2.353
5	Patient's participation in selecting anesthesia method	31%	12%	16%	15%	24%	1.887
6	Take the necessary actions to reduce patient's pain before and after surgery	4.1%	3%	19%	49%	23%	2.840
7	Presenting physician and surgery and anesthesia nursing before surgery	35%	12%	13%	21%	16%	1.723
8	Receiving necessary information about the process of actions during surgery from physician and curing team	16%	6%	24%	33%	18%	2.302
9	Patient's medical records confidentiality by physician and curing team in operating room	1%	1%	29%	28%	38%	3.010

DISCUSSION

The results of the study showed that the awareness level of most patients about their rights was good (45.2%). Awareness level is different in various studies. For example, in a study by Sharifi et al. (2012) showed that most patients had low awareness about their rights in Kermanshah, Iran [11]. This awareness in a study by Mastaneh et al. (2013) was medium (56.4%). Another study by Ravaghi et al. (2016) in Tehran, showed that 83.4% of patients were aware of their rights [8]. In the study of Basiri Moghadam et al. (2011) which was conducted in Gonabad, Iran, most of the patients had a high level awareness about their rights [1]. However, in the study of Mossadegh Rad et al (2011) in Isfahan, this rate was poor [9]. Furthermore, in a study by Sharif et al. (2012) in Kermanshah, showed that the high level of patients' education and duration of hospitalization increases the rate of patients' awareness about their rights [11].

Due to specific features of operating room related to the other units and the low information of patients about this unit, they try to gain necessary information about their surgeries before entering operating room. As stated in the previous studies, due to ministry of health's emphasis on the patients' rights and its specific significance in clinical governance, patients are more aware of their rights compared to the past. The results of this study also showed that from the most patients, viewpoint, the rate of patients' rights observance was in the medium level. In a study by sharifi et al. patient's right observance in 72.4% of the Kermanshah hospital was in the medium level [11]. In the study of Basiri Moghadam et al. this rate was in desirable level [1]. Patients had the most awareness about "performing the best method of surgery and anesthesia based on the patient's condition", "prevention of various infections transmission to the patient's body while and after surgery", and "availability to the physician and the other members of curing group during hospitalization an after release". In the study of Bokaei et al. (2011), the rate of patients' awareness related to availability to curing group during hospitalization and release was high which was compatible with the results of this study. However, most patients had low awareness about their selection right of curing method [13]. This difference may be due to the fact that all of the participants of this study were the patients undergone surgery and because of the specific features of surgery their sensitivities were high and their expectations about selection right of curing method were high. So, they had higher awareness. The most right which was observed from the patients' viewpoint were "respectful behavior of curing team without attention to the racial and cultural" and "keeping patient's privacy". In the study by Bokaei et al., the most observed right was related to the respectful behavior of curing teams toward patients which was compatible with the result of this study [13]. Norian et al. [14] Nayeri [15], and Aghajani [16] reported the physical privacy of the most patients in a high level. This is justifiable according to Iran's culture and religion. The least observed right in the operating room was related to "presenting physician and surgery nursing to the patient. Furthermore, in Hoseinean's study, the least observed right was related to the "identification of curing team and setting" which is compatible with the result of this study [17]. In the present study, "the patient's participation in choosing anesthesia method" was one of the items which was observed low. This right was observed low in Roudi's et al. study, too. This issue maybe as the result of patriarchy features of curing teams which they think due to having more information about medical issues they have the right to decide instead of patients [18].

CONCLUSION

Based on the results, patients' awareness was in a good level. However, its observance rate in choosing anesthesia method by the patients and identification of the members of curing team was not in a desirable level. So, for improving the rate of patient's rights observance in operating room, it is recommended that more researches to be conducted in operating room especially for the identification of the obstacles of this right and suitable strategies to facilitate its observance.

CONFLICT OF INTEREST

The authors declare no competing interests in relation to the work.

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ARTICLE

COMPARISON OF CONSCIOUS AND UNCONSCIOUS MEMORIES AND SENSORY PROCESSING IN PEOPLES WITH SCHIZOPHRENIA AND MULTIPLE SCLEROSIS AND ALZHEIMER'S DISEASE

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ABSTRACT

The purpose of this study was comparison of the conscious and unconscious memories and sensory processing in patients with schizophrenia, multiple sclerosis (MS) and Alzheimer's disease. Our research method was causal-comparative. Statistical population were patients with schizophrenia in Mirzakochak mental hospital and patients with multiple sclerosis and Alzheimer's disease that are kept by formal caregivers in welfare centers in Gilan or by informal caregivers in families in Rasht city of Gilan province in Iran. 45 persons with MS/ Alzheimer's disease and schizophrenia (in each group 15 persons) were randomly selected by accessible sampling method in 1393. Then, subjects were asked to response to Wechsler Memory Scale to assess Conscious memory and Stroop test for assessing of Unconscious memory and sensory profile questionnaires to measure of Sensory processing and then raw data were analyzed by multiple analyses of variance with using of spss16 software. P value less than 0/05, namely $p < 0/05$ was considered as significant. The result showed that there was significant difference between conscious memories/ unconscious memories and sensory. Conscious memory in schizophrenia was significantly better than the other two groups and multiple sclerosis was in the second grade. Unconscious memory in schizophrenia group was significantly better than the other two groups. In sensory processing the Alzheimer group was significantly better than the other two groups and the schizophrenia was lower than the other two groups. Conscious of Alzheimer in time of fourth card (mean=74/93, CI 95% =64/87 - 84/98, $p=0/005 < 0/01$) / unconscious of Alzheimer in time of 2th card (mean=54/78, CI 95% = 47/18-62/38, $p=0/001 < 0/01$) / sensory processing of Alzheimer (mean=48/80, CI 95% = 45/10-52/49, $p=0/001 < 0/01$) / had the maximum mean in three groups.

INTRODUCTION

KEY WORDS

alzheimer; multiple sclerosis;
conscious & unconscious
memory; schizophrenia;
sensory processing

The diagnosis of schizophrenia has expanded in DSM-5 [1]. Criterion A now includes five items:

1. Delusions.
2. Hallucinations.
3. Disorganized speech (e.g., frequent derailment or incoherence).
4. Grossly disorganized or catatonic behavior.
5. Negative symptoms (i.e., diminished emotional expression or volition).

At least two of the five symptoms must be present for at least one month. One of the two symptoms must be delusions, hallucinations, or disorganized speech.

Criterion B for schizophrenia gets more attention in DSM-5: "Level of functioning... is markedly below the level achieved prior to the onset". This is *not* a criterion for schizoaffective disorder. (This is apparently unchanged from DSM-4.)

American Multiple Sclerosis Association [2], see that Multiple sclerosis is an immune mediated process where an abnormal response puts the immune system against the central nervous system including the brain, spinal cord and optic nerves.

Alzheimer's disease or senile dementia is a progressive and debilitating chronic brain disorder that is associated with profound effects on memory, intelligence and ability to care for themselves and a defect in speech, motor activity, recognition of landscapes and familiar people or dysfunction in planning, innovation, organizing and abstract reasoning. Diagnosing a person with Alzheimer's disease or the likelihood of developing Alzheimer's disease in an elderly person is fearful for her or his relatives and carers [3]. Usually "memory disorder" is the first symptom that arises. Memory refers to recollection of something from the past and it is usually done consciously. As recollection is the conscious process of retrieval, the cognitive psychologists call it explicit memory. Implicit memory appears when the performance on a task is facilitated in the absence of conscious recalling and this facilitation is measured by the preferential effect. In the preferential effect process, the nodes that are launched through activity dissemination are activated imperfectly and thus are readily sensitive to the next activities [4]. Explicit memory is conscious and voluntary recollection of facts and events that is measured by using simple recall and recognition examinations. In contrast, implicit memory is the involuntary and unconscious form of memory, and refers to the knowledge that is not at the level of consciousness and through a variety of tests including stem of words and part-words completion tests is assessed [5]. Perhaps sensory processing is the most essential component of psychological that forms the base of how people perceive and react to environmental stimuli. New evidence shows that people process sensory information in different ways. This means that some people are more sensitive than others to have sensory information [6]. A number of investigators have suggested that unlike the normal elderly population, patients with Alzheimer's disease have a severe semantic-memory deficit. However, the semantic-memory tasks used in previous studies have been confounded by the heavy demands they placed on effortful processing. In the present study [7], 20 demented (mean age 71 yrs) and 20 normal (mean age 69.8 yrs)

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elderly Ss were given a battery of episodic-memory tasks and 3 tasks that examined how intact and accessible their semantic memory was under conditions that did not require effortful processing. Although the demented Ss were greatly inferior to the normal Ss on the episodic-memory tests, they performed equally well on the semantic-memory test: The naming latency of both groups was equally facilitated by a semantic prime, the recall accuracy of both normal and demented elderly for a string of letters was similarly affected by the degree to which the string approximated English orthography, and recall accuracy for a string of words was affected equally in the two groups by the degree to which the word string obeyed syntactic and semantic rules.

In a study that was done by [8], the Early empirical studies in the field of memory loss in the early stages of dementia of the Alzheimer and evaluation these studies in relation to the new theory of memory in humans, it was discovered that: Whilst memory deficits are found to be widespread, some aspects are more resilient to impairment than others. For example, the processes associated with articulators' rehearsal in working memory are unimpaired despite a reduction in performance on most tests of primary memory. The "implicit" aspects of secondary memory appear to remain unimpaired, in contrast to a marked decline in "explicit" or "episodic" memory. In addition, there is evidence that the rate of forgetting from secondary memory is normal. Some aspects of episodic and semantic memory are found to be impaired as a consequence of a decline in the efficient organization and processing of verbal material at encoding or retrieval. It is concluded that the deficits share particular features found in organic amnesia, but with additional deficits which relate to impairments in other domains of functioning. [9] write in an essay under the title of « Auditory sensory memory impairment in Alzheimer's disease: an event-related potential study»: AUDITORY event-related potentials (ERP) were recorded from 10 healthy older subjects and 9 patients with Alzheimer's disease (AD) to investigate whether auditory sensory memory is impaired in AD. Standard (85%) and deviant (15%) tones were presented in random order with inter stimulus intervals (ISI) of 1 s or 3 s in separate blocks and conclude that/ the memory trace decays faster in the AD patients than in age-matched healthy controls. In studies that have been conducted on the clinical aspects of dementia/some features are registered and reported/ such as aphasia without viscosity speech/near memory disturbances and then distant memory/ Structural disorders/ also weakened the power of abstract thought, Calculate and Language difficulty in naming and finding appropriate words/with loss of functional words are reported. Also has been recorded some cases of vocabulary insufficiency/ and random use of words that already have "been used. Evaluation of kind of speech disorders in patients with Alzheimer's disease shows that repetition and adventitious use of integrity tools are the general characteristics of speech in these patients [10]. In a study that conducted by [11] with the aim of to examine the contribution of controlled (or conscious) and automatic (or unconscious) memory processes to the performance of a stem-completion recall task by persons with Alzheimer's disease and comparing them with a control group (control)/ the obtained results indicate the severity of impairment in the community dwelling demented patients'. Further, the estimates of the automatic processing were also found to be reduced, although there was considerable overlap in the performance of the two groups on this parameter. It was found that the residual capacity of Alzheimer's patients to recall previously learned information was supported to a substantial degree by their automatic memory processes. This finding can be very important for planning in the area of effective learning and development and growth of rehabilitation strategies. In a study about conscious and unconscious memory [12] Conscious and unconscious uses of memory and priming were studied in 30 patients with multiple sclerosis (MS) and 15 normal control (NC) subjects. MS patients were classified into two subgroups according to their cognitive status; 15 of them were cognitively deteriorated (the MS-D group) and 15 cognitively preserved (the MS-P group). A process dissociation procedure was used to separate conscious and unconscious memory performance in a word stem completion task. The results showed that the MS-D group had deficient conscious memory performance, but had intact unconscious memory as well as priming. The MS-P group showed normal conscious and unconscious uses of memory and priming. Thus, in MS-related cognitive decline, conscious memory seems to be vulnerable, whereas unconscious memory remains intact. The results provide neuropsychological support for the distinction between conscious and unconscious memory processes. Moreover, the results show the importance of studying cognitively homogenous MS groups as opposed to heterogeneous ones, in order to find the underlying mechanisms of memory deficits in MS. Interestingly, the neural systems needed for the unconscious use of memory do not seem to deteriorate even in MS patients with deficient overall cognitive capacity. This finding encourages the development of future rehabilitation programs, suggesting that unconscious remembering might help MS patients with deficient conscious memory to cope with their daily activities. Initial descriptions of sensory sensitivity [6] about attention deficit in patients with schizophrenia/including some personal reports/ that describe the noises loudness/ color brightness/ distraction and disorganization in patient. Sensory gate insufficiency/ that is measured by pre-trauma and latent inhibition such as techniques/also denotes the inability to filter out irrelevant information in this disorder. But Brown & et.al [6] in their studies didn't find any meaningful differences between patients with schizophrenia/patients with bipolar disorders and normal people/ in view point of sensory sensitivity. But the avoidance of feelings in people with schizophrenia and bipolar disorder was higher than normal. The schizophrenic patients frequently fail to respond and ascribe meaning to stimuli. Their performance in reaction time tasks is an example of slowed response in schizophrenia. Return responses (the urge to go back to previous responses) can also be another example of low sensory registration in patients with schizophrenia. In connection with sense searching Brown & et.al [6] concluded that schizophrenia and bipolar disorder groups were significantly obtained lower scores in sense search. According to the results/since the extreme sensitivity and inhibition to sensory stimuli and also impairment in social skill which is the result of sensory processing disorder/is a very important aspect of schizophrenia and partly to major depressive disorder, therefore, identifying the style of sensory processing in patients with these disorders/ can help to precise identify of impairment. Rotenberg [13] in

a study on patients with schizophrenia showed that/ cognitive impairment and inability to make appropriate use of past information/are connected with perceptual input or information processing and formation of signs that need to the left hemisphere activity.it is consider that/ patients with schizophrenia may have imperfect and impaired performance of the brain cortex/ and show heterogeneous defects in some of spatial and verbal short –time memory tests. Many researchers know the dysfunctions exist in attention and short-time memory processing as most crucial characteristic of schizophrenic disorder. Studies also showed that/patients with schizophrenia/ recall lower figures in immediate recollection and repetition (when more than two minutes) and act weaker than normal people in tracing tasks [13]. [14]/ write that Several studies have shown that the style of repressive character , negative emotions , inability to talk about feeling/ over assimilation and hysteric characteristics with a weaker immune system and emotions expression and thoughts depended on excitement/ are related to immune system performance improvement. Neuropsychological pattern that typically has been seen in patients with multiple sclerosis (MS) / includes memory impairment, failure to maintain attention, visual-spatial perception abnormalities, and low information processing and executive deficits [15]. In a study by [16]/ under the title of«Sensory symptoms of multiple sclerosis: a hidden reservoir of morbidity/the following results reports: Sensory symptoms were more common in MS patients than in controls, and differed in severity and quality. There was however a strong correlation between the total number of sensory symptoms reported and the presence of disability in the MS patients. Conclusions: Sensory symptoms are common in MS patients. Pain syndromes, transient neurologic events, Lhermitte's phenomenon, fatigue, respiratory symptoms and vertigo were present significantly more frequently in patients with MS than in a control population and contributed to subjective morbidity. Future clinical trials assessing therapy in MS might include sensory symptoms as secondary endpoints to capture this `hidden reservoir' of disease morbidity.

The purpose of this study was to assess, conscious, unconscious memory and sensory processing in patients with schizophrenia, multiple sclerosis, and those with Alzheimer's and comparing them with one another.

Research hypotheses

- Conscious memory in patients with schizophrenia and multiple sclerosis (ms) is different.
- Conscious memory in patients with schizophrenia and Alzheimer's is different.
- Conscious memory in patients with multiple sclerosis (MS) and Alzheimer's is different.
- Unconscious memory in patients with schizophrenia and multiple sclerosis (ms) is different.
- Unconscious memory in patients with schizophrenia and Alzheimer's is different.
- Unconscious Memory in Patients with Multiple Sclerosis (MS) and Alzheimer's is different.
- Sensory processing in patients with schizophrenia and multiple sclerosis (ms) is different.
- Sensory processing in patients with schizophrenia and Alzheimer's is different.
- Sensory processing in patients with multiple sclerosis (MS) and Alzheimer's is different.

MATERIALS AND METHODS

In this study, three groups of patients with schizophrenia and multiple sclerosis and Alzheimer's disease per group of 15 people (N1 = N2 = N3 = 15) were selected. Our research method was causal-comparative. Statistical population were patients with schizophrenia in Mirzakochak mental hospital and patients with multiple sclerosis and Alzheimer's disease that are kept by formal caregivers in welfare centers or by informal caregivers in families in Rasht city of Guilan province in Iran.45 persons with MS, Alzheimer's disease and schizophrenia (in each group 15 persons) were randomly selected by accessible sampling method in 2014. then, subjects were asked to response to Wechsler Memory Scale to assess Conscious memory and Stroop test for assess of Unconscious memory and sensory profile questionnaires to measure of Sensory processing . Wechsler scale reliability coefficient for the subscales are in the range of 0/74 to 0/93 and its validity in a variety of clinical populations is 0/98 [17]. Reliability for first and second Stroop test cards has reported 0/88 and for third and fourth cards has reported 0/80 [4]. Coefficient of internal consistency of subscales of sensory processing test were reported between 0/60 to 0/78 and cronbach's Alpha coefficient of this test for total scale is 0/87 and for subscales of low registration, sense searching, sensory sensitivity and sense avoiding are as 0/72, 0/65, 0/75 and 0/71[6]. Then raw data were analyzed by multiple analyses of variance with using of spss16 software. Conscious and unconscious memory and sensory processing are considered for three groups as the dependent variables and the diseases as attribute independent variables.

RESULTS

As can be seen in [Table 1], in the survey of solution's effect on healthy mice, weight of liver and spleen in each test group was examined and in the first and third group, 9 mice and in the second group, 8 mice were survived at the end of test time.

Table 1: Descriptive information about the conscious memory

Depended variable	Subject groups	Frequency	mean	Std. Deviation	%95 confidence interval	
					Lower bound	Upper bound
Conscious memory	Schizophrenia	15	32/73	12/70	28/25	37/21
	Multiple sclerosis	15	28/60	5/90	24/12	33/07
	Alzheimer's disease	15	26/40	5/03	21/92	30/87
Time in third card	Schizophrenia	15	20/13	3/46	11/28	29/01
	Multiple sclerosis	15	24/28	19/98	15/41	33/14
	Alzheimer's disease	15	14/38	21/38	5/51	23/24
Time in forth card	Schizophrenia	15	52/52	10/98	42/46	62/57
	Multiple sclerosis	15	55/05	22/11	45	65/10
	Alzheimer's disease	15	74/93	22/51	64/87	84/98

In survey of effects on healthy mice group with plant extract solvent gavage, results of [Table 2] was seen as below and seen that these mice group, were gavaged for only seven days with plant extract solvent to survey, effect of toxicity of solvent. This group has 27.7 average weight which at the end of seventh day reduce to 25.9. This group was with 9 alive mice at the end of seventh day and the below table conclude weight of spleen and liver of this group at the end of this test. As you can see at chart 1, with respect to no special toxicity was observed at examination test of toxicity in different groups, high dose with 100 mg/ml was selected for patient treatment.

Table 2: Average of time in the unconscious tests cards

Depended variable	Subject groups	Frequency	mean	Std. Deviation	%95 confidence interval	
					Lower bound	Upper bound
Time in first card	Schizophrenia	15	18/73	3/54	7/27	30/19
	Multiple sclerosis	15	20/41	17/81	8/95	31/86
	Alzheimer's disease	15	22	33/48	10/54	33/46
Time in second card	Schizophrenia	15	29/85	11/97	22/25	37/45
	Multiple sclerosis	15	38/22	21/51	30/61	45/81
	Alzheimer's disease	15	54/78	5/66	47/18	62/38

Table 3: Descriptive information about the components of sensory processing

variables	Disease groups	frequency	mean	Std. Deviation	%95 confidence interval	
					Lower bound	Upper bound
Total	schizophrenia	15	37	1/83	33/30	40/69

sensory processing	Multiple sclerosis	15	37/40	1/83	33/70	41/09
	Alzheimer	15	48/80	1/83	45/10	52/49

Table 4: Results of the multivariate analysis of variance in conscious and unconscious memory

source	Depended variable	Sum squares of three groups	Degrees of freedom	Squares mean	F	sig	Partial Eta Squared
Groups	Conscious memory	310/178	2and42	155/089	2/10	0/135	0/091
	time of third cart	742/173	2 and42	371/087	1/282	0/288	0/058
	time of forth cart	4518/654	2 and42	2259/327	6/071	0/005*	0/224
groups	Time of first cart	80/216	2 and42	40/108	0/083	0/921	0/004
	Time of second cart	4827/311	2 and42	2413/655	11/346	0/000*	0/351

Information of [Table 4]. in the fourth row, about time of the fourth card, according to a significance level of $p=0/005<0/01$, so the difference is significant.

•In the sixth row about time of the second card, given the significant level $p=0/001<0/01$, so the difference is significant.

Table 5: Results of the multivariate analysis of sensory processing

source	Depended variable	Sum squares	Degrees of freedom(d.f)	Squares mean	F	sig	Partial Eta Squared
groups	Sensory processing	1346/8	2 and 42	673/4	13/379	0/000*	0/389

The result of [Table 5].

Given that significant level equal to $p=0/001<0/01$.so there is a significant difference between the groups in sensory processing.

DISCUSSION

The results showed that there were significant differences between conscious memories, unconscious memories and sensory processing. A preliminary conclusion is that the conscious memories in patients with schizophrenia are less damaged. According to the presentation, researches conducted by other researchers suggest that conscious memories are damaged in three examined groups of patients. But present research has shown that the amounts of damages in Alzheimer's patients are more than the other tow groups (schizophrenia and multiple sclerosis).The amount of damage in the schizophrenic group is lower than the other two groups (MS and Alzheimer's).This may be due to the destruction of more parts of the brains of patients with Alzheimer's disease that is caused by the disease. This conclusion is consistent with findings by researchers such as [7], [8] and [13] cited in the literature of this study.

The average times are different in this study in the first and second card (unconscious) in three groups of patients with schizophrenia and patients with multiple sclerosis and Alzheimer's patients. An obvious conclusion is that the time required meeting the test cards. Patient with multiple sclerosis is better than the patient with Alzheimer's disease. Generally, in terms of unconscious memory patients with schizophrenia are significantly better than the other two groups. Patients with multiple sclerosis in terms of

the time mean were better than the group with Alzheimer's disease. The concluding is consistent with findings of [11] , which has cited in literature.

Average sensory processing is different in three groups of patients with schizophrenia, multiple sclerosis and patients with Alzheimer. An obvious conclusion is that the memory of sensory processing in patients with multiple sclerosis and Alzheimer's are better than the group with schizophrenia. This issue is consistent with the inhibition reaction by patients with schizophrenia that cited by [6] in literature. Totally patients with Alzheimer's disease had significantly better performance in sensory processing. Patients with schizophrenia had lower performance than the other two groups.

One of the major limitations in sample size are illiterate or low literacy people which make it difficult to gather information and need to give sufficient information and required training to individuals to fill the questionnaires which are time consuming. In the present study variables such as gender, marital status, education, and the severity and duration of illness are not included.

CONCLUSION

Given that sensory processing in patients with Alzheimer was better than the other tow groups, therefore, it is better to use of sensory processing and its enhancement to treatment and rehabilitation of these people, it means that must be used of sensory processing to compensate other memories. Because sensory processing isn't in a desirable condition in patients with schizophrenia and multiple sclerosis (MS), so it is necessary that the people who are at high risk of developing the disease or the initial stages of the disease, must be acted to improve their sensory processing.

With regard to this fact that the conscious memory in patients with schizophrenia is less damaged in comparison with the other tow groups of patients with multiple sclerosis and Alzheimer disease. Therefore it is better that in rehabilitation of this group conscious memory be used in addition of use of unconscious memory.

Since the conscious memory in Alzheimer's patients is more damaged than in the other tow groups, namely individuals with schizophrenia and multiple sclerosis, So it is necessary to detect those who have a high risk of developing the disease, such as the elderly resolutions and those who are in the early stages of the disease, and to be improved their unconscious memory.

Since the unconscious memory in patients with schizophrenia is better than the other two groups namely people with multiple sclerosis and with Alzheimer disease therefore it is better in rehabilitation of these patients the unconscious memory to be used and reinforced in them for compensation of other memories.

Generally most of the results of researches that have described in the research literature indicated that unconscious memories in three groups of patients remained almost intact. Therefore, strengthening of this memory must be accepted as a principle for the rehabilitation of patients with schizophrenia and individuals with acquired multiple sclerosis and individuals with Alzheimer's disease.

CONFLICT OF INTEREST

None

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ARTICLE

THE IMPACT OF ORGANIZATIONAL INCENTIVES ON EMPLOYEES' PERFORMANCE DIMENSIONS

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ABSTRACT

Organizations use motivational strategies, such as incentives and rewards, to improve individuals' profitability by increasing motivation and productivity, reducing turnover and absenteeism, and retaining skilled and talented employees. The objective of this research was to investigate the impact of organizational incentives on judges' quantitative and qualitative performance dimensions. The statistical population of this research were the judges of Khuzestan Provenance Courts (Iran) through the years 2008 up to 2014. Since the complete information about the population members' performance and organizational incentives was available, we studied the whole population. Data were collected from Judiciary Salary and Payroll System (for extrinsic motivator), Promotion and Transmission Committee of Judges (for intrinsic motivator) and Judicial Case Management System (for judge's performance). Data analyzed by analysis of variance (2-way ANOVA) and parameter estimate tables by 95% confidence level and separate statistical test used for every dimension of performance. The results showed that the organizational incentives have significant influence on judges' performance dimensions, although their effect on each dimension of performance was different.

INTRODUCTION

Motivation is a fundamental component of most models of human performance [4]. Also, it is one of the most important subjects of industrial and organizational psychology [4]. Also, it is one of the most important problems facing many organizations today [4]. Motivational forces can be described for practical purposes as extrinsic or intrinsic [4], guiding the direction, intensity, and persistence of individual behaviors [4]. The relationship between incentives and public sector performance emphasizes on the human dimension of public sector organizations, namely the civil service. Science individual change is necessary for organizational change; incentives have vital role in managerial decisions. Organizations' success depends on effective use of individual skills by aligning the employees' goals with the organizational goals. Incentives represent various ways to put this idea into practice. [9] define motivation as individual attitudes to a persistent effort in order to achieve the organizational goals. Incentives may create competition and accountability. Incentives should focus on objectives to improve public service performance that influence attraction, motivation and loyalty of competent workforce [15].

Theoretically, incentives are closely related to development theory and human resources management theory. The concept of incentives is influenced by various academic disciplines such as sociology and economics, and changes individual behavior by introducing a motivating factor for it. Although the concepts of incentives and motivation are very close together, but they are different. The former is the cause and the latter the effect.

The World Health Report (2000) defines incentives as the rewards (in positive form) and punishments (in negative form) that providers face as a consequence of their organizations, institutions and the specific interventions they provide. In These definitions, the main focus is on individuals as public service providers. Also, the importance of the institutional context as well as the individual specific tasks is revealed. Incentives, in the form of rewards or punishment, can be resulted from all of these levels and according to the nature of these incentives, the individual adapts their behavior. Therefore, Incentives can influence accountability. Accountability and performance are closely related and often overlap at workplaces, since accountability itself may enhance performance. Accountability can improve by improving public access to information or establishing transparent rules for human resources management. So, accountability may motivate individual to work more efficiently [13].

The main difference between incentive and reward is that an incentive triggers a particular action, but a reward is assigned after a desired behavior to increase its reputation probability. So when an incentive is offered for meeting a specific goal, the individual works harder to meet the goal and subsequently gain the reward. Incentives and rewards are very useful mechanisms for developing positive work attitude and individual motivation [13].

Review of literature

Employee performance management

The employees' performance management has a number of aspects. One of these aspects is how well employees are equipped to perform a particular task and achieve the task related objectives. This can be established through training and development of the necessary skills needed. Another aspect is how the

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management process of performance is carried out [8]. Apart from training and the actual execution of duty, there is appraisal - an evaluation process at the end of a predetermined period - in order to determine how best an employee has met the set targets given the opportunities that were available. Another aspect of staff performance is the reward system where employees are rewarded according to how well they have achieved their performance objectives [8]. Then, management needs to verify the appraisal results and doing corrective proceedings to eliminate the weaknesses of low-performance level employees. One of the aims of this process is to get the best out of employee abilities. [4] pointed out that appraisal should not only be used as a way of establishing how much one has achieved the objectives, but also as a way of getting information on what needs to be done in order to help the employee achieve the best they can in their performance. According to [9], employees' performance should be a responsibility of not only the manager but of every other person sharing the same interest in the objectives of the organization. The manager advocates an employment culture that nurtures performance management techniques among all the employees, not among managers alone. staff performance is to get the best out of their abilities.

Performance dimensions

Performance dimensions are investigated by many researchers. Each research considered different dimensions, according to proficiency and conditions of studied organizations. [7], Richardson and Gordon (1980) considered quantitative and qualitative dimensions. [11] defined four dimensions for performance as process, people, culture and system. In order to determinate the maturity and effectiveness of performance management systems, [18] developed the Improvement System Assessment Tool (ISAT), which contains four scoring dimensions: Araujo and Martins approach that determines the development process of performance management system; deployment that assesses the standards development and implementation; study that assesses data collection, usage and communication; and refinement that assesses the performance management system improvement. Morin, Savoie and Beaudin developed a model around four perspectives: economic efficiency, the human resources value, validation against external groups and continuity of the organization [7].

There are various perspectives for studying performance, adopted by researchers. Generally, three different perspectives can be distinguished among these researches:

(1) Individual differences perspective which searches for individual characteristics, such as personality and general mental ability, as sources for variation in performance. It's main focus of this perspective is on performance differences between individuals and trying to identify the underlying factors, and tries to answer to this question: Which individuals perform best? Its main idea is that differences in performance between individuals can be explained by individual differences in their abilities, like motivation and personality. Campbell described the performance essential components as a function of three determinants (1) declarative knowledge, that includes knowledge about principles, facts and goals (2) procedural knowledge and skills, that include physical and cognitive, interpersonal, and self-management skills, and (3) motivation, that contains choice to perform, level and persistence of effort. In addition, [13] stated that cognitive ability variables influence task knowledge, task habits, and task skills.

(2) Situational perspective which concentrates on situational aspects as impediments and facilitators for performance, focuses on the individuals' environment factors in which stimulates and support or hinder performance. The main question of this perspective is: In which situations do individuals perform best? This perspective includes approaches which concentrate on workplace factors and specific motivational approaches, or approaches which focus on reward systems and perceptions of equity and fairness as important factors that influence individual performance [1,9]. Most of leadership researches can be subsumed under this perspective. So, the environmental constraints are the major situational predictors of employee performance and are classified in two categories: those who focus on situational factors enhance and facilitate performance, and those who attend to situational factors which impede performance.

(3) Performance regulation perspective which describes the process of performance. This perspective is different from previous perspectives. It doesn't focus on individual or situational performance predictors. Instead, this perspective focuses on the performance process as an action process concept. Its core questions are: 'How does the performance process seem?' and "What is happening during individual performance?" One of the most important objectives of researches in this area is to identify what distinguishes individuals at different performance levels (Ericsson &Smith, 1991). These researches focus on process characteristics of the task accomplishment process, in order to find differences between moderate and high performers on a specific task.

These perspectives are not mutually exclusive and they can complete each other when they are put into practice. For example, many researches showed that motivation is an essential performance factor. Motivational constructs related to performance can be partly subsumed under the individual differences perspectives as need for achievement, partly under the situational perspectives as extrinsic rewards, and partly under the performance regulation perspective as goal setting.

The discussed perspectives represent different performance approaches. However, researchers often use a combination of two or more approaches to explain performance. Despite of researchers' efforts to find

and describe a perfect performance model, a comprehensive model which integrates all the various performance perspectives is still missing. The role of individual and situational variables in the performance process is unclear. So, developing a model which combines the individual differences and situational perspectives with the performance regulation perspective should specify how cognitive ability and motivational factors are in interaction with situational variables.

Motivation and incentives

In [16], motivation defined as moving or persuading to act for satisfying a need. In [2] motivation defined as a set of process concerned with a kind of force that directs individual behavior towards achieving some specific goals. Many researchers have expressed motivation is goal directed behavior [12]. Therefore, the role of managers is to guide employees towards achieving organizational objectives. So, it is very important for them to understand those psychological processes and undertakings that causes the stimulation, direction to desired behavior, determination and persistence of voluntary actions [13]. There are two types of motivation at the workplace: intrinsic motivation and extrinsic motivation [3]. This implies that job-related variables that influence individual motivation have extrinsic and intrinsic motivational value that drives employees to perform. Intrinsic and extrinsic motivations are not mutually exclusive and managers can individuals can motivate an individual intrinsically and extrinsically simultaneously.

Intrinsic motivation implies that motivation comes from within the individual, in other words, this type of motivation is self-generated. It comes from pleasure provided by the work itself. It values rewards gained through the task completion process, in spite of any external rewards [10]. When an individual motivates intrinsically, he/she will strive to satisfy the three psychological needs, like needs for, competence, relatedness, and autonomy. Such employees like to make decisions independently, recognition for good work, opportunities for advancement, a channel to express creativity, incline to do challenging and meaningful tasks which makes them feel a sense of accomplishment upon successful completion [6]. Extrinsic motivation comes from the pleasure of a reward or the pursuit of some external rewards to the task completion. External rewards come from outside an individual in exchange for task completion and not derived from the work itself. Extrinsic motivation consists of different types which are tangible monetary or non-monetary incentives such as gift certificates, vacation trips, pay rise, stock options, company banquets, wall plaques, movie tickets etc. Extrinsic motivation is caused by positive and negative incentives. These are more effective when people are in need [9]. While extrinsic rewards are effective tool for short-term gains [1]. Many researches show that employees who do not expect to receive extrinsic rewards have better performance than those who expect rewards [12]. Extrinsic rewards can be useful, especially when designed carefully.

Workplace motivation strategies such as incentives, rewards and recognition are commonly adopted by organizations to improve individual profitability by increasing productivity and motivation, reducing turnover and absenteeism, and retaining skilled and talented employees. Incentives can be classified in three categories: (1) Monetary incentives, which refer to financial rewards, such as bonuses, stock options, insurances, paid leave etc. (2) Tangible non-monetary incentives that involve the indirect payments such as garments, gift cards, watches, etc. and (3) Intangible non-monetary incentives that include the use social rewards and task-related rewards [17].

Incentive programs can increase the level of employees' engagement. Incentive programs can be a combination of the organizations' attraction and recalling strategies. It is pointed out that long-term incentive programs can influence the individual performance more than short-term incentive programs. Extrinsic rewards may not influence individual motivation more than intrinsic rewards; researches show that employees who are rewarded for exceeding targets are interested in devoting more time and effort to a task which leads to satisfaction. Incentives have high influence on employees' motivation and increase their loyalty [5].

An incentive is a tool used to change the human behavior. Promotion of individual performance is the main objective of this change. The various definitions of incentives tend to emphasize different complementary aspects of the concept depending on the theoretical approach and its empirical implications.

[Fig.1] shows the conceptual framework if this research.

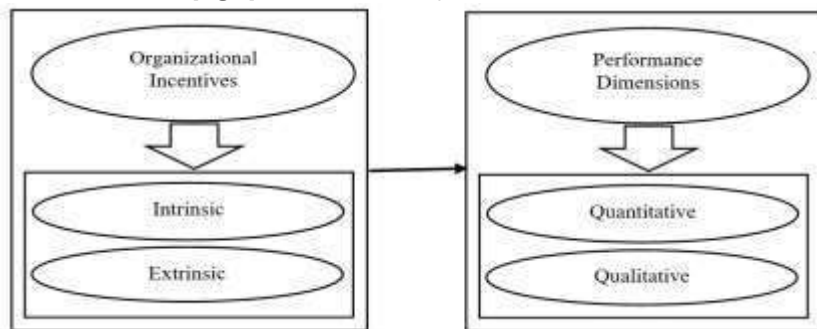


Fig. 1: Research conceptual model (Author, 2015)

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MATERIALS AND METHODS

Research hypothesis

The main hypothesis of this paper is defined as: Organizational incentives have significant impact on judges' performance dimensions. The sub-Hypothesis are defined as below:

- H1: Intrinsic organizational incentives have significant impact on judges' performance dimensions.
- H2: Extrinsic organizational incentives have significant impact on judges' performance dimensions.

Statistical population

The case study we present refers to the Khuzestan Provenance Courts (Iran) through the years of 2008 up to 2014. The number of judges in this study was variable from 146 in year 2008 to 171 in year 2014. All of them were male, and had B.A or M.A degree in law. Their age was 37 to 52 years old. Also, their work experience was 8 to 18 years and 36.8% to 73.4% were non-native, based on each year of our investigation.

Dependent and independent variables

In this research, the dependent variables are organizational incentives, which contains intrinsic and extrinsic incentives. The intrinsic incentive indicator is Judges' grade, that is used for their promotion and transmission to other provenances. This factor is a function of age, education, race and the number of cases processed by the judge. Since promotion and transmission does not increase judges' income, the only reason for their effort to increase their grade, is intrinsic motivation. For extrinsic incentive, according to many researchers' focus on financial rewards and monetary incentives as the most important extrinsic motivator, we considered the judges' overtime payment as extrinsic motivation indicator. The dependent variables are employees' performance dimensions, which contain quantitative and qualitative dimensions. Quantitative performance dimension is defined as the number of legal cases processed by the court during the year. Qualitative performance dimension is defined as the accuracy of the judgment, which is measured by the share of decisions confirmed by a higher authority (Provenance Appeal Court).

Data and method

The information of organizational incentives was collected from Judiciary Salary and Payroll System (for extrinsic motivator) and Promotion and Transmission Committee of Judges (for intrinsic motivator). The information of judges' performance was extracted from Judicial Case Management System. Since the complete information about the population members' performance and organizational incentives was available, we studied the whole population. Analysis of variance (2-way ANOVA) and parameter estimate table by 95% confidence level used for data analysis and a separate statistical test used for every dimension of performance. All data analysis was done by SPSS version 22.

RESULTS

This section presents the results of data analysis and findings. At first, the analysis of variance (ANOVA) used to examine the significance of research data model. Quantitative and qualitative dimensions tested separately. Since significance value of the model was less than 0.05 ($p < 0.05$) in all years of the study for both qualitative and quantitative dimensions, it is concluded that the model is significant [Table 1] and [Table 2]. For choosing the appropriate data analysis method, the normality of data tested by Kolmogorov-Smirnov test. This test was not significant ($p > 0.05$), so we used a parametric method, 2-Way ANOVA for data analysis [Table 3] and [Table 4].

Table 1: Analysis of variance for quantitative dimension of performance

year	Sum of Squares	Df	Mean Square	F	R Squared	.Sig
2008	4418.888	6	736.481	2668.184	0.991	0.000
2009	3410.588	6	568.431	2204.181	0.989	0.000
2010	3225.699	6	537.617	1843.730	0.987	0.000
2011	4740.373	6	790.062	930.631	0.974	0.000
2012	3456.359	6	576.060	2881.409	0.991	0.000
2013	3861.473	6	643.579	4806.442	0.995	0.000
2014	6435.021	6	1072.503	1500.610	0.982	0.000

Table 2: Analysis of variance for qualitative dimension of performance

year	Sum of Squares	Df	Mean Square	F	R Squared	.Sig
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2008	1944.621	6	324.103	10748.755	0.998	0.000
2009	2048.027	6	341.338	4693.964	0.995	0.000
2010	2603.929	6	433.988	3892.583	0.994	0.000
2011	2874.442	6	479.074	3679.934	0.993	0.000
2012	3249.917	6	541.653	1733.939	0.986	0.000
2013	2998.556	6	499.759	2278.570	0.989	0.000
2014	3490.736	6	581.789	521.424	0.950	0.000

Table 3: Kolmogorov-Smirnov test for quantitative dimension of performance

year	Statistic	Df	.Sig
2008	0.766	146	0.512
2009	0.729	155	0.665
2010	0.412	155	0.635
2011	0.113	156	0.816
2012	0.735	158	0.565
2013	0.856	165	0.435
2014	0.818	171	0.443

Table 4: Kolmogorov-Smirnov test for qualitative dimension of performance

year	Statistic	Df	.Sig
2008	0.845	146	0.405
2009	0.357	155	0.111
2010	0.503	155	0.870
2011	0.722	156	0.416
2012	0.930	158	0.735
2013	0.910	165	0.829
2014	0.769	171	0.509

H1: Intrinsic organizational incentives have significant impact on judges' performance dimensions. For measuring the influence of organizational intrinsic motivator on performance we used 2-Way ANOVA test for each dimension separately, based on the years of investigation. The significance value for each dimension was less than 0.05 ($p < 0.05$), so the organizational intrinsic motivator has significant influence on performance dimensions. For determining that the influence is the positive or negative, we referred to the Parameter Estimate table. The B factor for quantitative dimension was positive in all years of investigation, so it can be resulted by 95 percent confident that the organizational intrinsic motivator has significant and positive influence on quantitative dimension of performance. Also, the B factor for qualitative dimension was positive in all years of investigation, so it can be resulted by 95 percent confident that the organizational intrinsic motivator has significant and positive influence on qualitative dimension of performance. [Tables 5 through 8] show the results.

Table 5: Way ANOVA test to examine the influence of organizational intrinsic motivator on quantitative dimension of performance

year	Sum of Squares	Df	Mean Square	F	.Sig
2008	3539.187	1	3539.187	658.602	0.000
2009	3337.060	1	3337.060	1545.228	0.000
2010	3833.157	1	3833.157	743.092	0.000
2011	3981.634	1	3981.634	4557.859	0.000
2012	3907.227	1	3907.227	2609.308	0.000
2013	4191.185	1	4191.185	1881.700	0.000
2014	4398.395	1	4398.395	723.888	0.000

Table 6: Parameter-estimate table to examine the influence of organizational intrinsic motivator on quantitative dimension of performance

year	B	Std. Error	t	.Sig
2008	0.018	0.001	25.663	0.000
2009	0.015	0.000	39.309	0.000
2010	0.017	0.001	27.260	0.000
2011	0.017	0.000	67.512	0.000
2012	0.015	0.000	51.081	0.000
2013	0.015	0.000	43.379	0.000
2014	0.011	0.000	26.905	0.000

Table 7: 2-way ANOVA test to examine the influence of organizational intrinsic motivator on qualitative dimension of performance

year	Sum of Squares	Df	Mean Square	F	.Sig
2008	1404.700	1	1404.700	371.756	0.000
2009	1659.619	1	1659.619	636.124	0.000
2010	2051.138	1	2051.138	551.253	0.000
2011	2520.057	1	2520.057	1038.274	0.000
2012	2878.809	1	2878.809	1073.676	0.000
2013	2796.079	1	2796.079	1921.979	0.000
2014	2751.686	1	2751.686	504.357	0.000

Table 8: Parameter-estimate table to examine the influence of organizational intrinsic motivator on qualitative dimension of performance

year	B	Std. Error	t	.Sig
2008	0.011	0.001	19.281	0.000
2009	0.010	0.000	25.221	0.000
2010	0.013	0.001	23.479	0.000
2011	0.014	0.000	32.222	0.000
2012	0.013	0.000	32.767	0.000
2013	0.012	0.000	43.840	0.000
2014	0.009	0.000	22.458	0.000

H2: Extrinsic organizational incentives have significant impact on judges' performance dimensions. To measure the influence of organizational extrinsic motivator on performance we used 2-Way ANOVA test for each dimension separately, based on the years of investigation. The significance value for each dimension was less than 0.05 ($p < 0.05$), so the organizational extrinsic motivator has significant influence on performance dimensions. For determining that the influence is the positive or negative, we referred to the Parameter Estimate table. The B factor for quantitative dimension was positive in all years of investigation, so it can be resulted by 95 percent confident that the organizational intrinsic motivator has significant and positive influence on quantitative dimension of performance. On the other hand, the B factor for qualitative dimension was negative in all years of investigation, so it can be resulted by 95 percent confident that the organizational intrinsic motivator has significant and negative influence on qualitative dimension of performance. [Tables 9 through 12] show the results.

Table 9: 2-way ANOVA test for examine the influence of organizational extrinsic motivator on quantitative dimension of performance

year	Sum of Squares	Df	Mean Square	F	.Sig
2008	44.237	1	44.237	27.041	0.000
2009	37.936	1	37.936	43.586	0.000
2010	16.204	1	16.204	22.276	0.000
2011	76.815	1	76.815	134.156	0.000
2012	143.512	1	143.512	217.115	0.000
2013	108.049	1	108.049	137.672	0.000
2014	374.962	1	374.962	158.904	0.000

Table 10: Parameter-estimate table to examine the influence of organizational extrinsic motivator on quantitative dimension of performance

year	B	Std. Error	t	.Sig
2008	4.969E-11	9.555E-12	5.200	0.000
2009	6.216E-10	9.416E-11	6.602	0.000
2010	5.097E-10	1.080E-10	4.720	0.000
2011	1.850E-10	1.597E-11	11.583	0.000
2012	2.373E-10	1.611E-11	14.735	0.000
2013	2.301E-10	1.961E-11	11.733	0.000
2014	4.215E-10	3.344E-11	12.606	0.000

Table 11: 2-way ANOVA test to examine the influence of organizational extrinsic motivator on qualitative dimension of performance

year	Sum of Squares	Df	Mean Square	F	.Sig
2008	30.819	1	30.819	10.679	0.001
2009	45.147	1	45.147	18.846	0.000
2010	58.633	1	58.633	43.534	0.000
2011	85.236	1	85.236	26.245	0.000

2012	4.426	1	4.426	2.697	0.000
2013	12.927	1	12.927	2.041	0.001
2014	213.593	1	213.593	37.130	0.000

Table 12 :Parameter-estimate table to examine the influence of organizational extrinsic motivator on qualitative dimension of performance

year	B	Std. Error	t	.Sig
2008	-4.147E-11	1.269E-11	-3.268	0.001
2009	-6.781E-10	1.562E-10	-4.341	0.000
2010	-9.695E-10	1.469E-10	-6.598	0.000
2011	-1.949E-10	3.804E-11	-5.123	0.000
2012	-4.168E-11	4.992E-11	-.835	0.004
2013	-7.958E-11	5.571E-11	-1.428	0.001
2014	-3.181E-10	5.221E-11	-6.093	0.000

DISCUSSION

The aim of this research was to investigate the impact of organizational incentives on judges' performance dimensions. Research findings showed that organizational incentives have significant influence on performance dimensions. The organizational intrinsic motivator has significant and positive influence on both dimensions of performance. It means that in order to gain the higher grade for promotion and transferring to desired city, judges are worked harder and processed more cases in shorter time. Also, processing more cases has improved their intrinsic knowledge and quality of their work. On the other hand, the organizational extrinsic motivator has significant and negative influence on qualitative dimension of performance, but has significant and positive influence on quantitative dimension of performance. It means that the emphasize on overtime payments (as extrinsic motivator) is increased judges' efforts to process more cases, but their accuracy and quality of processing the cases decreased.

These results are in agreement with the result of [7] on Brazilian software development companies. They found that although financial recompense is an important component for motivating employees, but there are other factors that prompt employees to be motivated and influence their performance. In fact, several studies have reported that financial forms are not always the ones to be most recommended. In addition, findings of this research is in agreement with the result of [5]. They studied 600 researches and found that by implementing incentives carefully and controlling employees' performance step by step through the incentive programs, incentives can significantly increase individual performance. They also suggested that through using incentives 26% of qualitative performance was increased and quantitative performance was grown 21%, which reveals the importance of organizational incentives.

CONCLUSION

The aim of this study was to find out the impact of organizational incentives on different dimensions of judges' performance. We considered quantitative and qualitative dimensions for individual performance. Since organizational incentives have significant impact on employee's performance, they ought to be emphasized in performance management. Depending on the type of work, they can influence the dimensions of organizational performance differently. In addition, incentives and organizational incentive programs can play a crucial role in motivating employees and promoting the levels of their performance.

A number of recommendations can be made from the findings of this study.

Firstly, management should define appropriate dimensions for performance, according to the type of organization main activities. Then, performance appraisal would provide more clear and more accurate results for decision making. Secondly, as the results showed, emphasize on extrinsic motivators can affect intrinsic motivation negatively. While many researches showed that non-monetary incentives take precedence over monetary incentives, managers should focus on designing more intrinsically challenging task, fulfilled and contribute to long-term positive effect on employees' job performance.

CONFLICT OF INTEREST

There is no conflict of interest.

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FINANCIAL DISCLOSURE

None.

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ARTICLE

ENHANCED HEAVY OIL RECOVERY BY USING THERMAL AND NON-THERMAL METHODS

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ABSTRACT

Many believe that the era of conventional oil will soon come to an end and heavy and nonconventional oil will be replaced by easy producing oils. Compared with conventional oil, heavy oil has reduced mobility; it is termed as heavy oil because it has higher specific gravity and density along with viscosity when compared with the conventional oil. The viscosity is between 100 CP or greater and API gravity less than 20°. API gravity is a specific gravity scale developed by the American petroleum institute to measure the relative density of various petroleum liquids, expressed in degrees. The lower the API number, the heavier the oil and the higher its specific gravity. In this paper introduced thermal and non-thermal methods for heavy oil recovery and investigated some parameters effect on oil recovery, such as: effect of reservoir temperature on oil recovery, effect of temperature of injected fluid on oil recovery, effect of injection pressure on oil recovery, effect of reservoir temperature on gas oil ratio (GOR) and effect of reservoir temperature on water production

INTRODUCTION

Origin of heavy oil according to many authors is the result of biodegradation. Larter et al., (2006) believes that first the oil was expelled from its source rock as light or medium oil, and subsequently migrated to a trap, then it is converted into heavy oil through different processes such as water washing, bacterial degradation (aerobic), and evaporation, provided that the trap is elevated into oxidizing zone. This biodegradation can occur at the depth in a subsurface reservoir. Head et.al, (2003) mentioned the depths of the biodegradation oil up to about 4 Km with most biodegraded reservoirs up to 2.5 Km below the sediment surface.

Goodarzi et al., (2009) define heavy oil in terms of viscosity as the class of oils ranging from 50 cP to 5000 cP. The high viscosity restricts the easy flow of oil at the reservoir temperature and pressure. [Fig. 1] is a graph relating viscosity and API ratings and it can be observed that the heavy oil region lies in the high viscosity range.

Ancheyta and Speight (2007) define heavy oil as a viscous type of petroleum that contains a higher level of sulfur as compared to conventional petroleum that occurs in similar locations. Meyer et al., (2007) explained that the oil becomes heavy as a result of eradication of light fractions through natural processes after evolution from the natural source materials. A high proportion of asphaltic molecules and with substitution in the carbon network of heteroatoms such as nitrogen, sulfur, and oxygen also play an important role in making the oil heavy. Therefore, heavy oil, regardless of source, always contains the heavy fractions of asphaltenes, heavy metal, sulphur, and nitrogen.

The importance of resins and asphaltenes in accumulation, recovery, processing, and utilization of petroleum was highlighted by Raicar and Proctor (1984). They found that most asphaltenes are generated from the kerogen evolution due to the increase in temperature and pressure with the increase in depth. Their opinion is in the light of the fact that asphaltenes are recognized as a soluble chemically altered fragments of kerogen that migrated out of the source rock during oil catagenesis.

Origin of heavy oil according to many authors is the result of biodegradation. Larter et al., (2006) believes that first the oil was expelled from its source rock as light or medium oil, and subsequently migrated to a trap, then it is converted into heavy oil through different processes such as water washing, bacterial degradation (aerobic), and evaporation, provided that the trap is elevated into oxidizing zone. This biodegradation can occur at the depth in a subsurface reservoir. Head et.al, (2003) mentioned the depths of the biodegradation oil up to about 4 Km with most biodegraded reservoirs up to 2.5 Km below the sediment surface.

From the above we can conclude that the heavy oil migrated from the deep source rock or deep reservoirs originally as conventional oil. At these depths, water caused weathering and bacteria fed on the oil causing biological degradation by removing hydrogen and thus increasing its density.

KEY WORDS

Conventional Oil ,
Nonconventional Oil ,
Non-Thermal Methods ,
Thermal Methods ,
Heavy Oil

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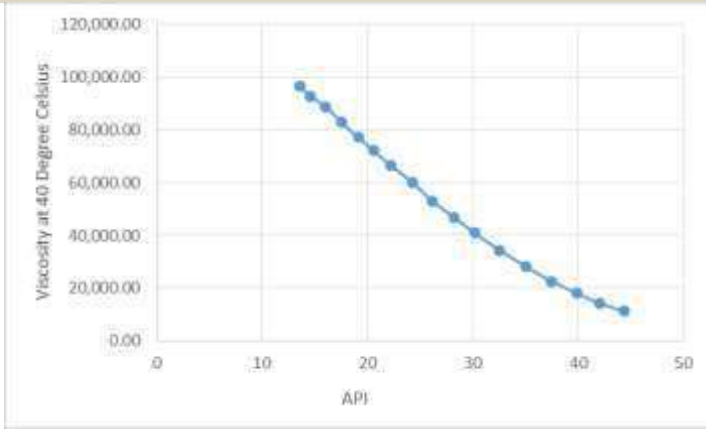


Fig . 1: General Relationship of Viscosity to API Gravity

The recoverable reserves of heavy oil and natural bitumen are equal to the remaining reserves of conventional oil . [Fig. 2]

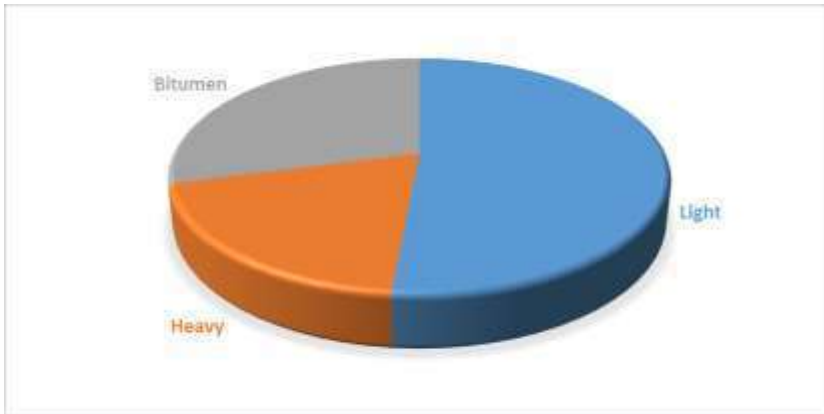


Fig. 2: Distribution of Light , Heavy and Bitumen Resources

Herron in his article “Heavy Oil: A Solution to Dwindling Domestic Oil Supplies” wrote that the total estimate of worldwide deposits of heavy hydrocarbons is around 5½ trillion barrels and western hemisphere contains four-fifths of these deposits. [Fig. 3 , 4 , 5]

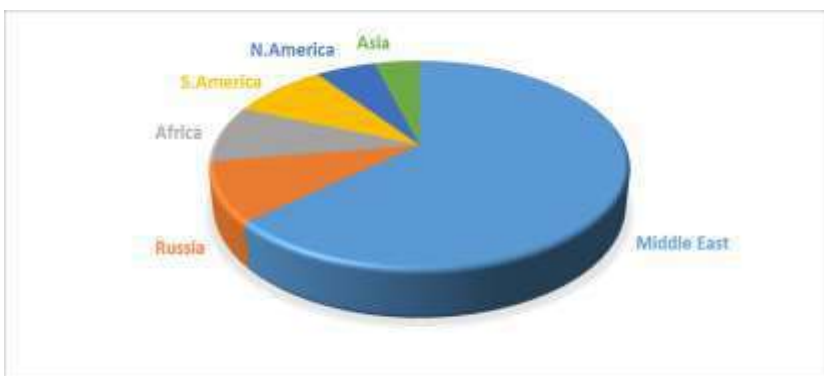


Fig. 3: Conventional reserves by region

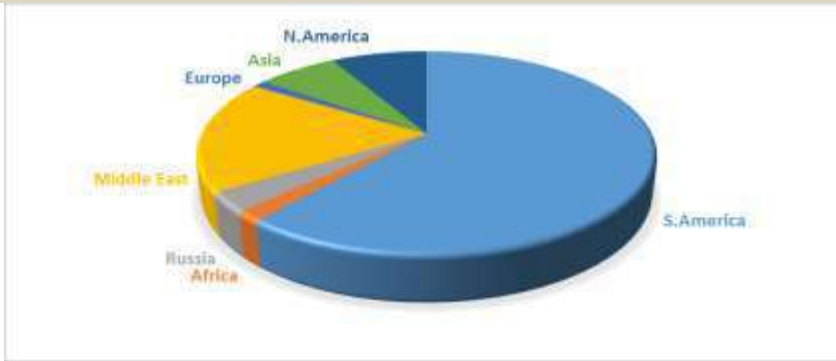


Fig. 4: Heavy oil reserves by region

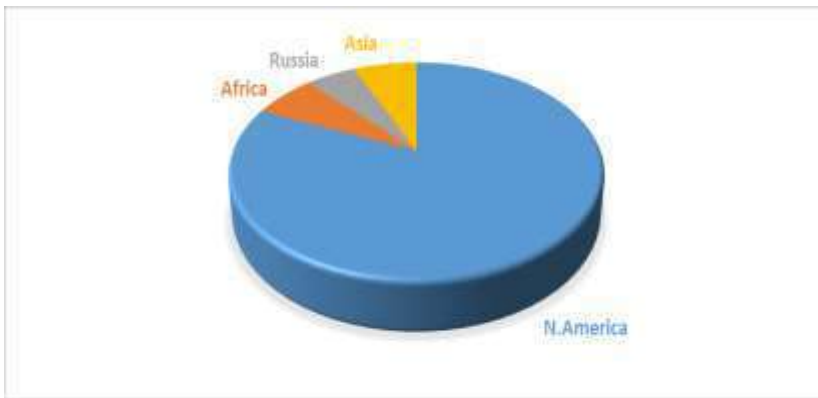
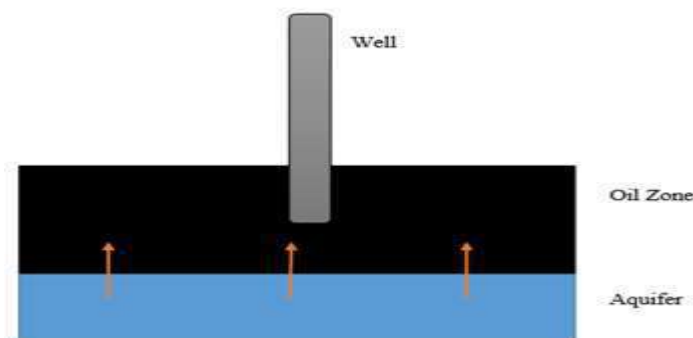


Fig. 5: Bitumen reserves by region

NON- THERMAL PRIMARY RECOVERY METHODS

As discussed earlier, many heavy oil reservoirs contains oil that does not flow easily under reservoir conditions which means successful recovery of this resource is based upon developing a mechanism that displaces the heavy oil in the reservoir. All reservoirs have different lithology and some of them are thin or small and overlying gas or underlying water may cause contraction in them which makes them poor candidate for the thermal methods of oil recovery. That means after the application of primary recovery any additional method should be non-thermal.

Primary recovery techniques rely entirely on natural forces within the reservoir that's why it is not the usual approach of recovery. For example the pressure of natural gas dissolved in oil or present above the oil or the natural pressures surrounding the reservoir rocks can help in the flow of oil. [Fig. 6] shows different methods and the basic techniques of primary recovery.



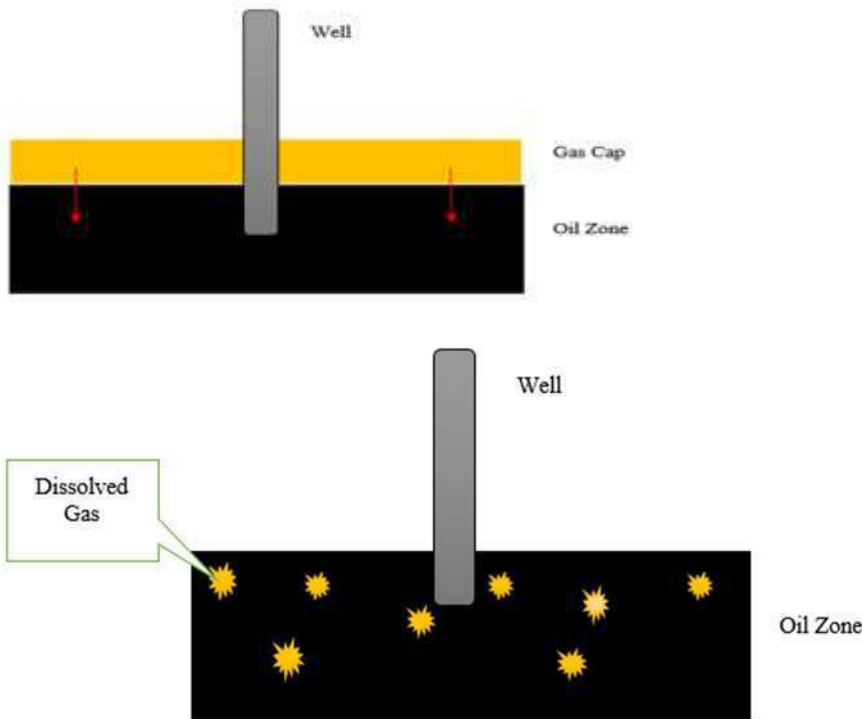


Fig. 6: Three basic natural drives

Water Drive

Water drive is the most efficient naturally driven propulsive force drive, it drives the oil into a well by pressurizing recoverable oil with the help of forces of water . In water drive field it should be taken care that the removal rate should be adjusted, so that water moves up evenly and there is always an available space for it by the removal of hydrocarbons.

This is the most efficient process in driving the oil into a well; it works by pressurizing the light recoverable oil with the help of forces of water in a water drive field. In an anticlinal structure, first the lowest wells around and then the oil-water plane moves upward as they produce until it reaches the top of the anticline. An appreciable decline in bottom-hole pressure is necessary when the well is abandoned as it displaces the oil. This pressure decline provides the pressure gradient to cause water influx. The pressure differential depends upon the permeability, which means less pressure is required for greater permeability to cause the water influx. The recovery from the properly operated drive pools can be as high as 80%. The force behind water drives may be either the expansion of reservoir water or hydrostatic pressure or a combination of both.

Gas Cap Drive

The gas if it lies over the top of the trap with oil beneath it can be utilized to drive the oil into wells at the bottom of the oil bearing zone . The gas (usually methane and other hydrocarbons) is compressed to achieve this condition. This process is known as the gas cap drive. If the oil is produced only from below if the gas cap than it is possible to achieve high gas-oil ration in the reservoir.

In this kind of recovery an undue portion of oil is left behind because the oil deposits are not systematically developed, which causes the bypassing of gas. The gas mixture (methane and other hydrocarbons) may be separated by compressing the gas. Gasoline is an example of the gases that are separated by compression of gases. However, at high pressures retrograde condensates are formed, because in deeper fields the density of oil decreases and the density of gas increases until they form a single phase. The retrograde condensate pools bring condensation in Liquid hydrocarbons because the pressure declines instead of inclination. When this condensate is removed from the reservoir fluid, the pressure is maintained within the gas cap by injecting back the residual gas into the reservoir.

Solution Gas Drive or Dissolved Gas Drive

In Solution gas drive, the propulsive force comes from the gas dissolved in the oil , this force is the result of pressure release at the point of penetration in the well. It means that release of gas expansion from the 'oil in place' fluids, as the reservoir pressure declines, supplies the major reservoir energy for the primary depletion.

Thomas 2008 explained that the Solution gas drive is the mechanism whereby lowering of the reservoir pressure through production in an under-saturated reservoir causes the oil to reach the bubble point where gas starts to evolve from solution.

The definition from Thomas (2008) is valid when the evolved gas begins to flow only when the critical gas saturation has been reached. Once that condition is achieved, then it will cause an increase in the rate of pressure drop due to the production of the gas phase. All of the evolved gas below the bubble point pressure is kept in the form of small bubbles in the porous media and does not form a continuous free gas phase. Retention of the evolved gas phase in a dispersed form with the oil would lead to maintaining the reservoir energy.

NON- THERMAL SECONDARY RECOVERY METHODS

A lot of oil can be left behind after primary recovery, since the normal reservoir pressure has declined and as a result there is no natural force that can push the oil into the well that's why secondary methods come into play. Secondary oil recovery techniques are applied on depleted or low pressure reservoirs. Some of the techniques are discussed below.

Water Flooding

In water flooding the energy required to drive the oil from the reservoir rock is provided by means of water injection from the surface [Fig. 7]. Water injection boosts the low pressure in the reservoir keeping the production rate and the pressure the same over the long term, hence producing the oil replacing by the water. Water flooding was considered to be a form of enhanced oil recovery but it is essentially an artificial water drive .

The theory of water flooding is quite old in industry and according to Smith (1992) this theory was pioneered by Buckley and Leverett. In their theory, displacement starts with only connate water and oil as incompressible phases. A region divided by the shock front in which only movable oil which is being displaced, from the one with only movable water. Only oil is produced prior to breakthrough and only water after.

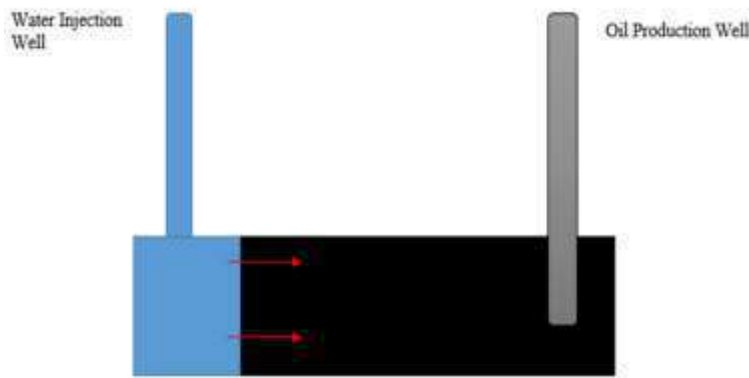


Fig. 7: Water flooding displacing oil

In a completely developed oil field, the wells may be drilled anywhere from 200 to 2,000 feet (60 to 600 meters) from one another, depending on the nature of the reservoir. If water is pumped into alternate wells in such a field consider [Fig. 8], the pressure in the reservoir as a whole can be maintained or even increased. Water flooding may increase the recovery efficiency to as much as 60% or more of the original oil in place. Kumar (2006) reported incremental recovery of approximately 2 to 20% of the original oil in place.

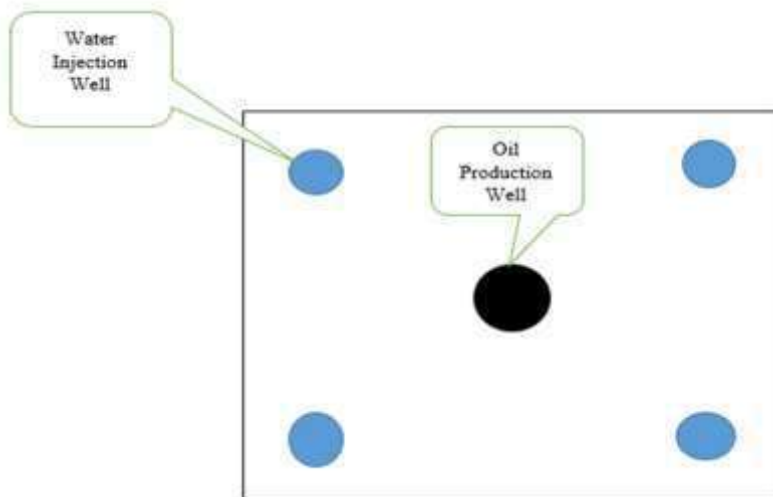


Fig. 8: Concept of water flooding

Cold heavy oil production with sand (CHOPS)

In this method sand is produced aggressively along with the heavy oil without applying heat. The oil production is improved substantially through the regions of increased permeability wormholes. The basis of this process is the oil production and recovery when sand production occurs naturally. The production of the unconsolidated un-cemented reservoir sand results in significantly higher oil production.

Sawatzky et al., (2002) postulated that oil production and sand production are bound together intimately in the process. What these authors means can be described in a three step process :

- The mobile heavy oil flows toward the production well, sharp pressure gradients are generated in the reservoir.
- This results in failure of the unconsolidated sand matrix.
- The failed sand is dragged to the well by the high viscosity oil.

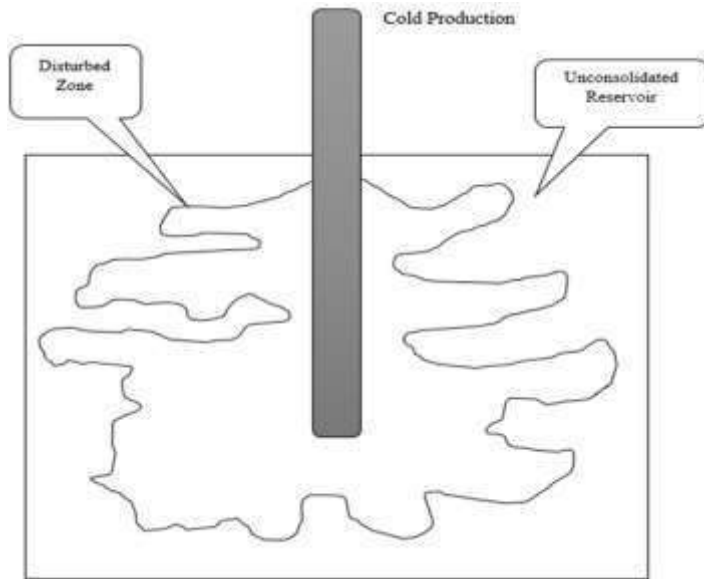


Fig. 9: Schematic of sand production with wormholing

By studying the whole process it can be concluded that the cold production can be summed up succinctly as a process in which the well is transported to the oil rather than the oil transported to the well.

Gas injection

The process also known as reinjection or re-pressurization increases the pressure in the reservoir by gas injection and thus induces the flow of crude oil. The injected gas molecules dissolved in the oil reduce its viscosity and make it mobile which increases the well output. After the crude oil is pumped out, the natural gas is once again recovered. Carbon dioxide is used as the gas for re-pressurization. Inert gases, and natural gas can also be used to pressurize the well, but air is not suitable for that because it causes deterioration of the oil.

NON- THERMAL TERTIARY RECOVERY METHODS

Tertiary recovery of oil begins when it is felt that the production from secondary oil recovery is not enough. Tertiary recovery process like most of the recovery processes reduces the viscosity of oil to increase in production .

But Krumrine and Falcone (1987) believe that there is a renewed interest in chemical enhanced oil recovery because of diminished reserves and advances in surfactant and polymer technology. They also believe that by greater understanding of the chemical reactions involved it is possible to get good results in the field. They suggest that the combination of chemicals should be applied as premixed slugs or in sequence.

The choice of the method and the expected recovery depend on many considerations, economic as well as technological. According to Thomas (2008) only a few recovery methods have been commercially successful, such as steam injection based processes in heavy oils and miscible carbon dioxide, provided that the reservoir offers favorable conditions for implementation of such methods.

Alkaline flooding

Alkaline flooding also known as caustic flooding appears to be the most attractive among the various non thermal processes. Alkaline flooding (caustic flooding) involves alkaline chemicals, such as sodium

hydroxide, sodium carbonate, or sodium orthosilicate, are injected during water flooding or during polymer flooding operations. These Alkaline reagents are quite cheap and abundant. The alkaline reagents react with the surface active materials present in the crude oil and form the in-situ formation of the surfactant soap species. The adsorption of these generated surfactants at the oil/water/sand interfaces reduces the interfacial tension and raises the PH of the injected flood water; as a result the residual oil trapped in the fine pores of the reservoir sand is mobilized.

Carbon dioxide flooding

Carbon dioxide is injected into an oil reservoir in order to increase output when extracting oil. This process can be understood by considering [Fig. 10] which depicts an existing well that has been produced before and has been designated suitable for carbon dioxide flooding; the first action is to restore the pressure within the reservoir to one suitable for production. This is done by injecting water and shutting off the production well. The water serves to increase the sweep efficiency and to minimize the amount of carbon dioxide required for the flood. Then the next step is the injection of carbon dioxide into the same injection well used to restore the pressure; when the carbon dioxide comes in contact with the oil, it creates a miscible zone that can be moved more easily to the production well. As reservoir fluids are produced through production wells, the carbon dioxide reverts to a gaseous state, which provides the “gas lift” similar to the original natural reservoir pressure.

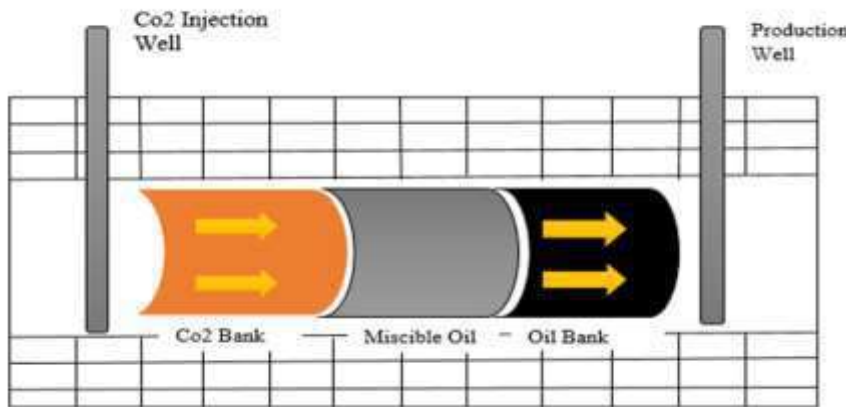


Fig.10: Carbon dioxide flooding

Cyclic carbon dioxide stimulation

This method bears a resemblance to the cyclic steam process . First carbon dioxide is injected into the reservoir, than the well is shut in for a certain amount of time (providing for a soak period), and the well is opened after a certain period, allowing the oil to produce. This is a single well process. Just like the carbon dioxide injection process, the dissolving of the carbon dioxide in the oil reduces the viscosity and causes it to swell, allowing the oil to flow more easily towards the well. Carbon dioxide is injected by high pressure for heavy oil reservoirs. There are two types of carbon dioxide-enhanced oil recovery processes which are miscible and immiscible.

Miscible carbon dioxide enhanced oil recovery process

The miscible carbon dioxide-enhanced oil recovery is a multiple contact process, involving the injected carbon dioxide and the reservoir oil. In this process carbon dioxide vaporizes the lighter oil fraction during the injection phases and then it condenses into the reservoir oil phase. This leads to two reservoir fluids that become miscible and as a result we get more mobile fluid with low viscosity and low interfacial tension. The primary objective of miscible carbon dioxide enhanced oil recovery is to remobilize and dramatically reduce the after-water flooding residual oil saturation in the reservoir’s pore space.

Immiscible carbon dioxide enhanced oil recovery process

When insufficient reservoir pressure is available or the reservoir’s oil composition is less favorable (heavier), the injected carbon dioxide will not become miscible with the reservoir’s oil. Then, another oil displacement mechanism, immiscible carbon dioxide flooding, occurs. The immiscible carbon dioxide flooding process has considerable potential for the recovery of moderately viscous oils, which are unsuited for the application of thermal recovery techniques.

THERMAL RECOVERY METHODS

Generally there are two thermal methods of recovering heavy oil:

- The process in which heat is injected into the reservoir.
- The process in which heat is generated within the reservoir itself.

Steam based process were used before the advancements in the field that introduced new processes such as in situ combustion or fire flooding. Thermal recovery process reduces the viscosity by means of heat and also provides the force to increase the flow rates of the oil to the production well that's why thermal processes are also classified as thermal drives. In the thermal stimulation techniques, only the reservoir near the production well is heated. Stimulation techniques can also be combined with thermal drives, and in this case the driving forces are both natural and imposed.

As shown in [Fig. 11], the fluid is injected continuously through injection wells to displace oil and obtain production from other wells. The same pressure which maintains the injection of the fluid in the well also increases the driving forces in the reservoir, which increases the flow of crude oil. Driving forces present in the reservoir, such as gravity, solution gas, and natural water drive, affects the improved recovery rates once the flow resistance is reduced and overcome by the driving force. Thermal processes use heat in well bores to increase the production rates for heavy crude oils. The drive process can also be applied to recover the residual oil in energy depleted reservoirs that hold conventional oil

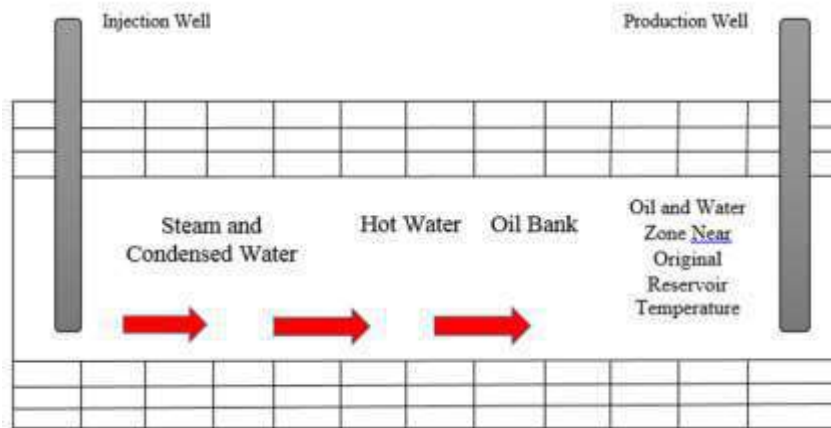


Fig. 11: Oil recovery by thermal methods

Hot fluid injection

In hot fluid injection methods the preheated fluids are injected into the relatively cold reservoir as shown in [Fig. 12]. Injected fluids are usually heated at the surface; although these days well bore heaters which are also known as the down-hole heaters are seeing a wider use. The fluids range from water (both liquid and vapor) and air to others, such as natural gas, carbon dioxide, exhaust gases, and even solvents.

In every hot fluid injection there are heat losses in the well bore from the injection wellbore to the over burden formations as a result of poor insulation of the injected wells and low injected rates. When the heat approaches the formation there is a temperature difference between the well head and the formation as a result of heat loss. In case of condensable fluids such as steam, the heat losses cause the condensation of steam, which then turns into hot water, and oil comes in contact with the hot water rather than steam. To overcome this issue surface lines are insulated.

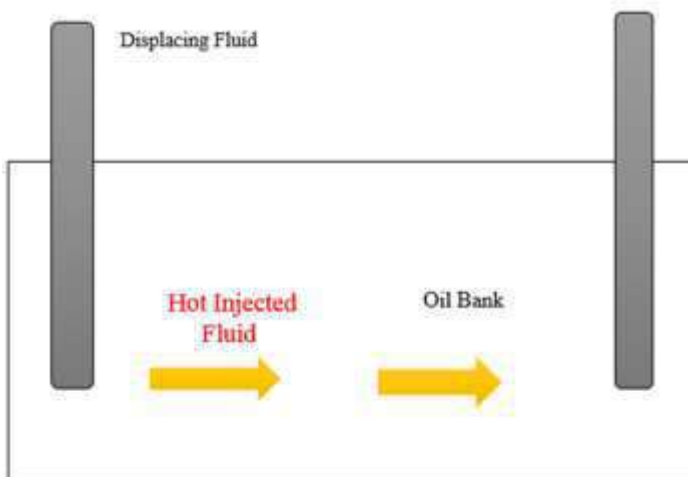


Fig. 12: Hot fluid injection

Hot water drive

Hot Water drive involves the flow of only two phases, water and oil, in which oil is displaced by water. In this process the leading edge of the water comes to the initial reservoir temperature as it loses heat very quickly and increases the mobility of the fluids in the heated zone. This results in better displacement efficiency from the heated zone and would improve the ultimate recovery. Basically the concept is that the thermal expansion of oil facilitates the displacement of oil, because of the pervasive presence of water in all petroleum reservoirs, the displacement by water must occur to some extent in all thermal recovery process. Typically, in hot-water flooding, the water is filtered, treated to control corrosion and scale, heated, and if necessary, treated to minimize the swelling of clays in the reservoir.

Steam based methods

The concept behind the steam-based processes is to reduce the viscosity so that the heavy oil can flow to the production well. In most instances the injection pressure must exceed the formation pressure in order to force the steam into the reservoir and into contact with the oil. When sufficient heating is achieved, the wells are closed and left for a certain period, which is referred to as the soak period. There is no chemical change in the constituents of oil, but there will be favorable changes in the composition, which will result the recovery of the lighter fractions, and the heavier materials will remain in the reservoir.

As the steam condenses, the steam distilled components also condense and form a solvent front that will assist in displacing heavy oil as a mixture of solvent and oil towards the production well. These effects will help to improve the displacement efficiency. Whether or not steam distillation occurs and the role it plays in oil recovery depends on the character of the heavy oil as well as the down-hole conditions. For example, most of the times when dealing with heavy oil, the steam distilled material is composed of aromatic and naphthenic constituents, which are excellent solvents for oil. But when the constituents are predominantly paraffin character result in the deposition of asphaltic material ahead of the steam front, and this deposition will cause the blockade in the reservoir flow channels, which will restrict the oil flow to the production well. Luckily paraffin character is not often found in heavy oil reservoirs.

Steam-assisted gravity drainage (SAGD)

This method involves drilling of two parallel horizontal wells (shown in figure 13), one above the other, along the reservoir itself. Hot steam is introduced from the top well which reduces the viscosity of the heavy oil (like all other thermal methods). The reduction in viscosity of the heavy oil separates it from the sand and it is drained into the lower well by means of gravity. The key to this method is the two parallel and horizontal wells, and this has only become possible due to the directional drilling technology.

The heat of the steam reduces the viscosity of the heavy oil and separates it from the sand. It is drained into the lower well by means of gravity. Even though the injection and the production wells can be close (5-7m), the mechanism causes the steam saturated zone, known as the steam chamber, to rise on the top of the reservoir, expand gradually sideways, and eventually allow the drainage. The distance between the pair of horizontal wells vertically separated by each other is 15-20 feet. These wells are drilled at the bottom of a thick unconsolidated sand stone reservoir. The injected steam reduces the oil viscosity to values as low as 1 -10 cP, depending upon the temperatures and the initial conditions and develops a steam chamber that grows vertically and laterally. The steam and gases rise, the lower well receives oil and condensates due to the density difference. The products are methane, carbon dioxide, and some traces of hydrogen sulfide. The non condensable gases act as a partial insulation blanket by filling up the void space, which helps to reduce the vertical heat losses. Injection pressures are much lower than the fracture gradient, which reduces the chances of breaking into thief zone.



Fig. 13: SAGD process (Source : Canadian Center for Energy Information)

The SAGD process, like all gravity driven processes, is extremely stable because the process zone progresses by means of gravity segregation, and there are no pressure driven instabilities such as conning, fracturing,

or channeling. It is vital to maintain a volume balance; it means that each unit volume injected is replaced by each unit volume withdrawn or reduced. If bottom water influx develops, this indicates that the pressure in the water is higher than the pressure in the steam chamber, so this pressure should be balanced. It is obvious that the pressure in the water zone cannot be reduced, so the pressure in the steam chamber and production well must be increased. This increase in pressure is achieved by increasing the operating pressure of the steam chamber through the injection rate of steam or by reducing the production rate from the lower well.

In-situ combustion

In Situ combustion was the center of attention in 1950's when many papers were published on this particular method and until the 1960's most of the projects of thermal oil recovery were connected with this process. In-Situ combustion applies on the reservoirs that contain low gravity oil, which is heated with the help of air injection and the burning part of the crude oil. The oil is then driven out of the reservoir with the help of steam, hot water or gas drive, as it becomes less viscous. Either dry or moist air can be injected. The fire propagates from the air injection well to the producing well, moving oil and the combustion gases to the front. The coke left behind the displaced oil works as a fuel. The temperature reaches hundreds of degrees which is enough to crack heavy oil into low boiling products, below is the summary of different reactants and their products formed as a result of cracking of asphaltenes . The displacement of oil is the result of the combination of hot water, steam and gas drive, vaporization, and light hydrocarbons.

Alexander et al., (1962) define the parameters which determine the design of the in situ combustion process (in addition to the operating cost) which are as follows:

- The fuel concentration per unit reservoir volume burned.
- The composition of the fuel.
- The amount of air required to burn the fuel.
- The volume of reservoir swept by the combustion zone.
- The required air injection rates and pressures.
- The oil production rate.

Simulation

Introducing the reservoir :

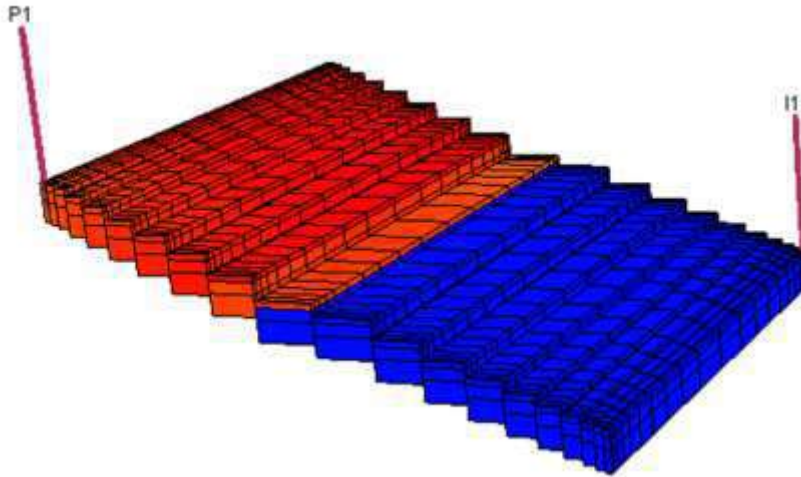


Fig. 14: 3D view of the reservoir

In this simulation investigated some parameters such as :

- Effect of reservoir temperature on oil recovery .
- Effect of temperature of injected fluid (water flooding) on oil recovery .
- Effect of injection (water flooding) pressure on oil recovery .
- Effect of reservoir temperature on gas oil ratio (GOR) .

- Effect of reservoir temperature on water production .

RESULTS

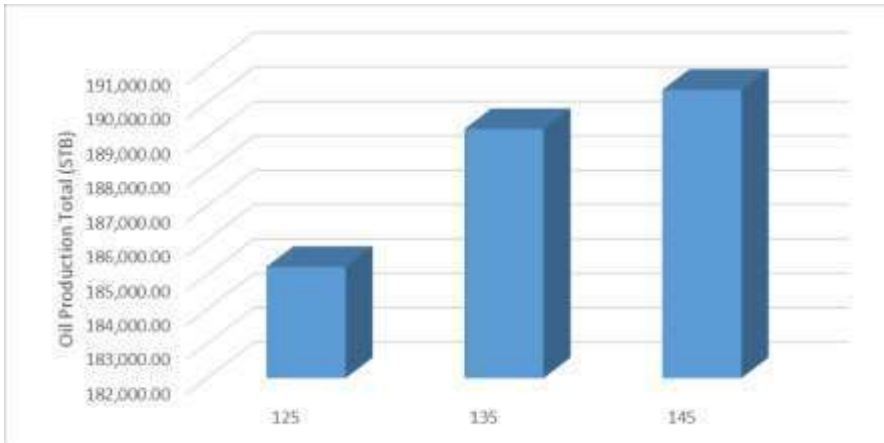


Fig. 15: Effect of reservoir temperature (°F) on oil recovery (stb)

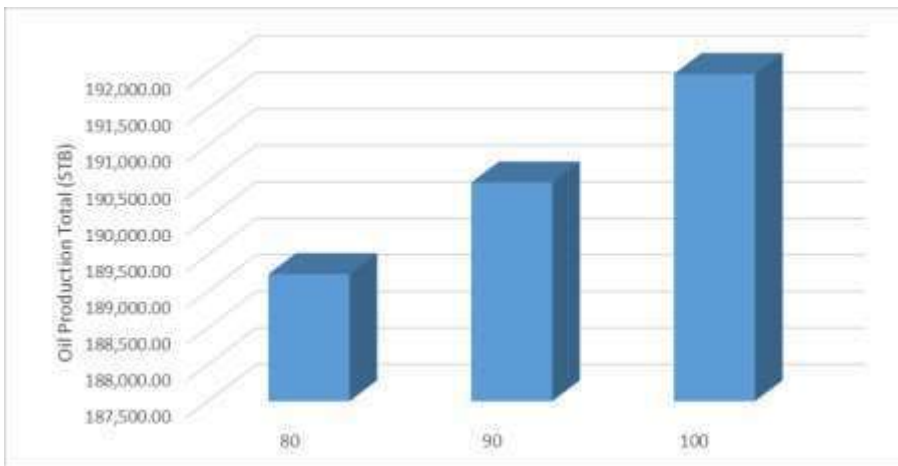


Fig. 16: Effect of temperature of injected fluid (°F) (water flooding) on oil recovery (STB)

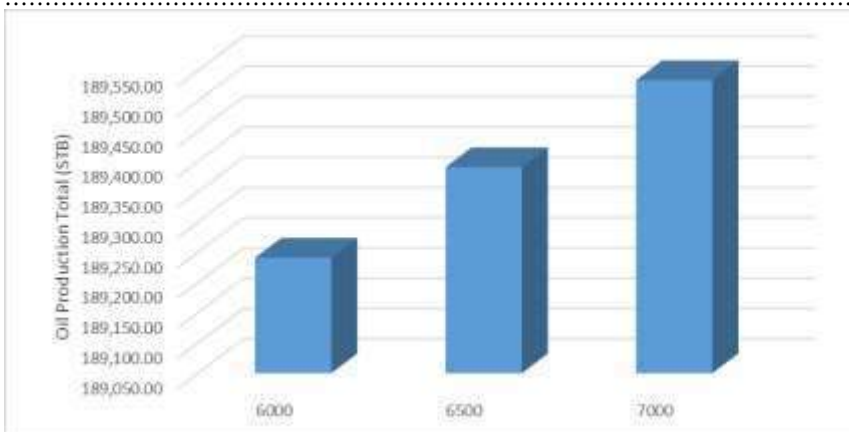


Fig. 17: Effect of injection pressure (Psia) on oil recovery (STB)

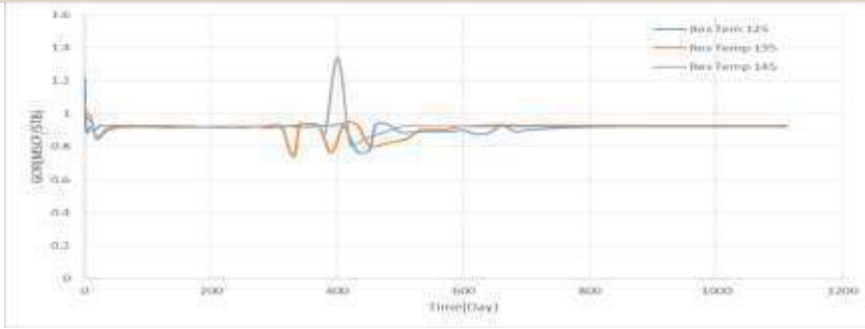


Fig. 18: Effect of reservoir temperature (°F) on gas oil ratio (GOR)

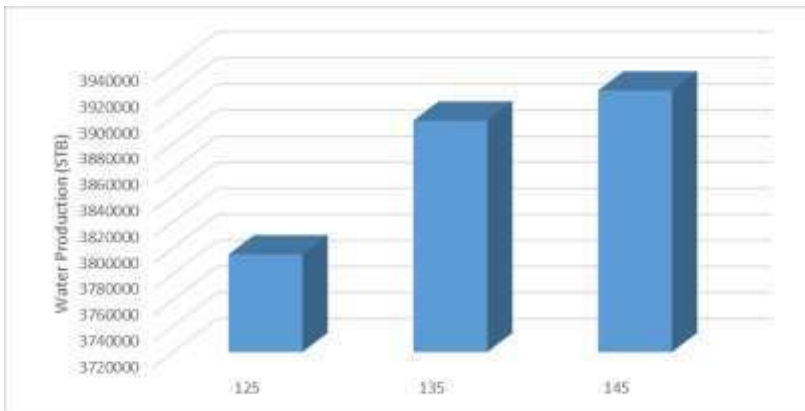


Fig: 19. Effect of reservoir temperature (°F) on water production (STB)

CONCLUSION

Based on the results of this investigation, the following conclusions could be drawn for this simulation :

- By increasing the reservoir temperature the amount of oil recovery increased .
- By increasing the injected fluid temperature the amount of oil recovery increased .
- By increasing the injection pressure the amount of oil recovery increased .
- The reservoir temperature is not so affected on gas oil ratio (GOR) .
- And finally by increasing the reservoir temperature the amount of water producing increased .

FINANCIAL DISCLOSURE

No financial in relation to the work .

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To my parents

CONFLICT OF INTEREST

No competing interests in relation to the work

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ARTICLE

THE RELATIONSHIP BETWEEN ESP STUDENTS' SELF-REGULATION AND MOTIVATION: A REVIEW OF LITERATURE

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ABSTRACT

There has always been debate on how to encourage students in learning what they are trying to learn. There has also been hard work to create students who solely take the responsibility of their own learning. It has been said that for a student to be self-regulated, which means a person who takes the responsibility of his learning and also thinks about the strategies to make in different situations, learners need to acquire 4 components, namely: standards of desirable behavior, motivation to meet the standards, monitoring Of situations and thoughts that precede breaking standards, and will power being the internal strength to control urges. Motivation being a very important factor in the creation self-regulated students is the main focus of this study.

INTRODUCTION

Infection A major goal of any education system is said to create lifelong, autonomous students who can acquire, retain knowledge and also learn new knowledge autonomously (American Association of Colleges and Universities, 2002, 2007 [1]. In order to study the autonomy of the students and mentioning that the responsibility of their learning is solely theirs, and their teachers are just facilitators, it is worth paying attention to the area of self-regulation. Self-regulation theory is a system of conscious personal management that involves the processing one's own thoughts, behaviors and feelings to reach his goals (Wikipedia, 2016). Self-regulation entails the ability to manage and monitor the people's cognitive processes a long with the ability to consciously controlling the feelings, emotions, behaviors and motivations [3]. Unfortunately, the students don't show an understanding of the fact that their own efforts play an important role in their attainment. A study done on 132 veterinary students to understand their ideas about the important factors in their learning revealed that most of the participants believed that the only important factors are their courses workload and the curriculum but not their own efforts [4]. The participants of the study revealed to believe that the learning just comes to them and this is the responsibility if their school and the faculty to bring learning to them. The study shed light on the fact that the students under research lack intention, independence and self-direction. Another study on younger undergraduate students showed that they also has little or no responsibility for their learning and what they blame as a hindrance to learning is the irrelevant and too complicated teaching materials [6] [5]. The interesting thing about some other student involved with other studies was that none of them were interested in learning for its own sake and lacked integrative motivation. They tended to show that learning does not at all needs effort [7]. Given their ideas and beliefs on the sources of attainment, it should be understood that our students are in a serious lack of specific kind of knowledge. They are not well aware of the learning strategies, cognitive tasks, and how their mind process input. In developing self-regulation and self-regulated learning our students seem to have little or no knowledge about the below classifications [8,9,10,11]

- Strategic knowledge, which includes the knowledge of several different learning strategies, problem solving strategies, plan, monitor and evaluate their learning and thinking.
- Knowledge about cognitive tasks, which involves the decision making about which strategy is useful and should be applied in which situation while learning and thinking.
- Self-knowledge, which studies and shows and understanding of one's strengths and weaknesses a long with the knowledge of which strategies work under which condition.

Study

As mentioned above, self-regulation is a system of conscious self-management which controls what we say, think and do. This states that students should acquire the ability to control their own feelings and behaviors and come to the understanding that they are the only responsible person for their learning. [22] said that self-regulation, "... refers to self-generated thoughts, feelings, and actions that [" are planned and cyclically adapted to the attainment of personal goals" Baumeister et al. (2007) described four components to self-regulation, namely standards of desirable behavior, motivation to meet the standards, monitoring Of situations and thoughts that precede breaking standards, and will power being the internal strength to control urges. In order to create self-regulated learners motivation plays an important role. This is more important when we are dealing with ESP (English for Specific Purposes). Many studies tried to reveal the relationship between motivation and self-regulation. It is believed that although the knowledge of cognitive and metacognitive strategies plays an important role in classroom setting, but it is not enough to increase the students' achievement. Students should be motivated too in order to use the strategies

KEY WORDS

Learning, Self-regulation,
Metacognition,
Motivation

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and take control of their thinking ability and effort (Paris, Lipson, & Wixson, 1983). This study shows the importance of motivation in that although everything in the classroom goes well, the students need a driving force to help them to be willing to apply the strategies they acquired before while learning. Motivation, according to [11] has got three components, namely: expectancy, which is the students' beliefs about their abilities to perform a task, value, which includes students' goals and beliefs about the importance and interest of the task, and affection which includes students' emotional reactions to the task. This study showed a positive relationship between motivation and self-regulation.

In addition to what Zimmerman suggested above, in another study by Katsara (2008), the researcher investigated the aspects of motivation in ESP courses in Greece. The study revealed that the Greek students' orientation toward learning is identified by performance rather than any learning goals. The study showed that the Greek students suffer a de-motivation of learning a foreign language at schools. Therefore, the researcher suggested that a need analysis of them be carried out and then give them language learning treatments. Additionally this study summarizes the reasons why the Greek students learn English. The investigation was done on 92 students, most of whom (84.87%) stated that they learn English, for they think English is useful for their job in the future. Therefore, it could be concluded that the Greek are instrumentally motivated towards foreign language learning. According to the study, there is a lost part in the area of education: sociological aspects of classroom. It was mentioned that in the Greek classes students suffer a lack of rich relationship with their teachers. As [16]:750 (as cited in Katsara, 2008) believes, it is a community which values not the end goal. Therefore, the teacher should be as helpful as possible to motivate the students by developing a rapport with students.

Creating self-regulated learners and self-regulated learning is the main focus on today's educational psychology. In order to label a learner this way, one should have a clear understanding of what self-regulated learning is. [17] believed that self-regulation is directed by metacognition which is defined as thinking about thinking, strategic action which includes planning the learning process, one's monitoring of his learning, and thinking of a standard to do an evaluation of personal progress. According to [18], self-regulated learners are aware of the fact that their practice of learning and doing challenging tasks and walking deep into the taught materials will lead to academic achievement. The self-regulated learners seem to be more successful, for they take control of their own learning and also monitor their learning, and they seem to have integrative motivation because they are participating actively in the classrooms. [19] believe that metacognition enable the students to deploy strategies they acquired in a situation in a similar but not the same situation which in turn means meaningful learning. This ability is valuable for the ESP students in that they not only know how to cope with a problem, but also how to behave in a similar situation. According to [20] metacognition is composed of two parts: knowledge about cognition and monitoring of cognition. There is a link made between metacognition, self-regulation and motivation. Garrison (2004), defined motivation as the property and the driving force that moves a person, to or not to do things. [21] defines the academic motivation as enjoying the learning at school with a taste of and orientation towards mastery and also involvement in doing the novel tasks. As mentioned before in the present study, one important component of self-regulation is motivation. Motivation and critical thinking can be considered the core elements of metacognition. Husman (2008) considers self-regulation as a more general concept and metacognition just an aspect of it, and specifically speaking, metacognition is the conscious control over our cognitive processes and reflecting on our experiences. [12], says that metacognition is the awareness and knowing how one's thinking works. Schraw (1998) defines metacognition as the thinking about how a person performs a skill. There are other ideas about metacognition. For instance [23] shed light on the idea that metacognition includes the ability to give feedback on our own learning and it is considered a necessary component of meaningful learning. Contrary to what has been said above about metacognition, careful distinction should be made between that and self-regulation in that the latter includes the ability to manage and monitor the thinking processes and also control of our emotion and, motivation, behavior and also the environment close to learning. In this concern, behavior includes self-discipline, hard-work, the ability to manage the time, and the ability to finding out about the time one needs help and how getting help from the teacher or peers [3]. Environment deals with the use of teaching aids, CALL activities and management of the tasks. Additional factor are temperature, place and background sounds.

A recall to the above mentioned ideas and reviews shows that motivation and self-regulation are interrelated in nature. Considering ESP courses one should account for several different orientations such as: development of communicative competence and performance, enriching the knowledge of several different subject matters and the ability to get certified both professionally and academically. In ESP classes there are three parties involved, namely: the teacher, the learner and the materials. Sifakis N.C. (2002) proposed a learning contract necessary to be made between the three above-mentioned parties. Sifakis's explicit learning contract can be summarized as follows:

1. A close coordination and cooperation between ESP teacher and student and also paying attention to the level of motivation among both.
2. To complete the learning cycle, it is essential that the learners be left with a sense of satisfaction and the understanding that they have learnt something valuable. This gives them the necessary motivation to keep learning.
3. There should be a link between known and unknown and their learning goals should be taken into account. If the link is made between the prior knowledge and the new information, students develop a feeling of

4. The ESP student should develop the understanding that the responsibility of learning is his and nobody else's responsibility. He should be aware of the learning objectives and also of the methodological aspects of learning. It is crystal clear that the active involvement of the whole learning process develops motivation and commitment.

CONCLUSION

This study as the name suggests aims at investigating a relationship between ESP students' self-regulation and motivation. Self-regulation is defined as the ability to take control and reflect on the process of learning. Recalls from the above investigations show that some scholars relate that to metacognition, and metacognition of cognition, metacognition being defined as the process of thinking about thinking. Conclusion can be made that self-regulated students are far more successful in their learning, for they take the complete responsibility of their own learning process. It also was shown that some students take their school and the situation for their learning. They are also not interested in learning at all. They actually lack motivation especially integrative sense of it. The study showed that in order to create self-regulated learners ESP courses should give them a sense of value. The courses should also be based on the needs of the students so that they tend to study them better, therefore to learn more meaningfully. ESP teachers should enhance their courses with sugar of motivation and hard-work to involve the students in what they are going to learn in the classroom. This study showed that there is relationship between self-regulation and motivation of the ESP students. Suggestions for further studies are that the investigations be made in a region-based and country-based manner so that a more comprehensive result is made available to the policy makers and ESP teachers and material designers so that the courses are more successful in motivating students and to create self-regulated learners.

CONFLICT OF INTEREST

There is no conflict of interest.

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None

FINANCIAL DISCLOSURE

None

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ARTICLE

INVESTIGATING THE BEHAVIORS OF THE MANAGERS, FIRM PERFORMANCE AND THE STAFF ATTITUDES CASE STUDY: HALVA-OGHAB CO.

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ABSTRACT

This study investigates the relationship between the leadership behaviors of the executives, firm performance and the attitudes of the staffs. The samples of the survey were selected from those who had high job experience and high level of education. The size of this population was 189 individuals. It is worth mentioning here that because our population was limited and accessible, all population (sampling based on the statistics) were used to respond to the questionnaire. In this study, a questionnaire containing questions that include the examination of the relationship between leadership practices, company performance and attitude of employees of Halva-Oghab Co, was made based on the Likert scale. LISREL software was used to analyze the test results hypothesis. The results of the study indicated that there is a significant relationship between the task-oriented leadership behaviors of the managers, firm performance and the staff attitudes of Halva-Oghab Co. However, the results indicated the relationship-focused leadership has a significant effect on the enterprise performance.

INTRODUCTION

In today's competitive world, multiple factors which contribute to the company's performance should be considered. One of the biggest problems is attending to the human resources as the driving force of the enterprise. Therefore, the managers attempt to increase the productivity of the employees by various methods. In Halva Oghab- Tehran Co., the managers need to develop the talents and abilities of their employees to have a high yield. According to the competitive environment. Given the competitive environment in the market and the need to use all the power in manufacturing firms, Halva Oghab- Tehran Co. concerned to keep competitive advantage and productivity of their employees to reduce costs further and increase their performance. Therefore, the Company managers have to measure the impact of leadership style on reducing the concerns of companies to diminish the costs and to increase productivity. Human resources in the company may lose their motivation and productivity for various reasons. One of the most important factors is the behavior style of the managers and company supervisors as the top leaders who has the direct impact on the employee attitudes. However, previous studies also have shown that general attitudes of employees have a direct bearing on the performance of the Institute [1]. However, such attitudes are not related to the leadership behaviors of top executive managers. The leadership behavior in the companies is one of the most decisive factors in shaping the attitudes of employees concerning the business, objectives and the performance of the enterprise. Numerous studies examined the relationship between executive leadership and the outcomes of the firm (Carpenter et al., 2004). Lack of purposeful leadership style at Halva OGHAB- TEHRAN Co. can be considered as a point of improvement in the company. So if appropriate leadership styles were chosen and manager's conduct based on them, the performance and the practice of the employers can be improved. Some studies indicate that the chief executive officer (CEO) is among the agents who can upgrade the performance of the company, and they are critically important individuals (Peterson et al., 2003). Recent research also established consensus on the issue that the top managers have the critical role in the company's performance (Ling et al., 2008).

The managers have different ways of managing their businesses. Each of them attempts to make the best use of available resources and optimize the efficiency and effectiveness of the company as possible with the lowest cost in the shortest time. The manager as a leader may have different styles of behavior. Another method of improving business performance is Relationship-focused leadership style which affects on the company performance. Relationship-focused leadership style directly influences the job satisfaction and employee attitude of Halva OGHAB- TEHRAN Co. and their performance promotion can be a wide step in improving the productivity of the company.

Relationship-focused leadership, which is based on communication, is affected by the relationship with the employees, showing benevolence to them as well as having an arrogant behavior with them. This leadership style will have a significant impact on employee attitudes. The task-oriented leadership style is one of the styles which focus on the tasks, and it includes the precise statement of the aim, creativity, and risk-taking, and it also includes monitoring operations. This leadership style is to improve the performance and proper functioning.

The aim of this study was to investigate the relationship between leadership practices of the top managers, and the firm performance and the link between these are the employee's attitudes (this is the possible mediator that has not been directly assessed). We are going to help to understand this issue. Accordingly,

KEY WORDS

Organization,
management,
performance, attitude

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we have a conceptual model that explores the significant relationships between the variables. According to this model, the overall attitudes of the staff have a direct connection with the company's performance.

The results of the study indicate the significant relationships, and they are according to the conceptual model. The results can be a model of Relationship-focused leadership for the managers of Halva OGHAB-TEHRAN COCo. and the results can change the attitudes of employees to provide the basis for better performance.

LITERATURE REVIEW

Organizational behavior

Organizational behavior based on several series of applied behavioral sciences and behavioral sciences, which include psychology, sociology, social anthropology and political science, psychology and other micro and macro level.

1. **Psychology:** the science that seeks to measure, explain, account for the reasons of behavioral change in human beings. This science refers to the study of individual behavior. So this science is at the micro level in which the individual behavior is investigated. Psychologists studied topics such as thought, perception, personality, learning, teaching, effective leadership, needs and motivational forces, job satisfaction, decision-making processes, performance evaluation, assessing people's attitudes, practices, staff selection, career planning and job stresses.
2. **Sociology:** Sociologists consider the social system in which one plays roles. The sociologist is involved in the provision of organizational behavior through the study of group behavior in organizations, and their vital fields of interests include group dynamics, team planning, culture, structure and organization theory, bureaucracy (Bureaucracy), communications, tolerant person, power, and conflict.
3. **Social Psychology:** Social Psychology is one of the subsidiaries of the psychology in which two psychology and sociology are combined with each other. In this field, the leveraging on each other is influenced. One of the issues addressed in this field is the phenomena of changing (i.e., how can the obstacles be eliminated). Social psychologists assess changing attitudes, communication patterns and consider the ways in which the activities of the group can meet individual needs, and they focus group decision-making process.
4. **Anthropology:** the study of science about human beings and their activities that can be taught. Anthropology specialists have been able to understand the culture, organizational environments and the differences between national cultures.
5. **Political science:** the study of individual behavior and group in a political context. Scientists in the field consider the structural conflict or power allocation and the way people use their power to benefit themselves.

Leadership behaviors

After more than 50 years, the most common way of studying the leadership is relying on the distinctive traits of leadership. It was believed that the traits and the inherent and individual characteristics such as intelligence, having good speech, having sound knowledge, and the appropriate appearance is the main indicators of the real leader. However, these individual studies did not reach clear results to explain the leadership, so theories of leadership focused on the behavior of the leader (Hersey and Blanchard, 2006). For many people, the leadership has the endowed inherent attributes. The leadership is nothing but the integrated acquired and complicated skills. Leaders are not born, but they are grown. With sustained effort, leadership skills can be gained. (Hajir,1986).

Attitude of staffs

The Equivalent word in English for the word "Negaresh", is attitude, behavior style, perception and thinking method based on prior assumptions (Masood et al., 2002). Many definitions have been given in management and psychology about attitudes, and some of them are mentioned below: Attitude refers to the readiness to respond to a person, object, thought or situation [10]. Attitude refers to the set of beliefs, emotions and behavioral intentions toward an object, person or event. In other words, is defined as a relatively stable tendency to a person, thing or event that appears in emotion and behavior. [3]. Attitude refers to the estimated assessments about the object or person or event takes place, and these evaluations are favorable or unfavorable. Attitudes reflect the way one feels about oneself, one thing or one person. For example, when we say "I love my job" you express your attitude about work. [11]. Attitude is also described as the state of mind which indicates a tendency through the organized experience, and completely tailored individual responses to all situations with which he is associated, [8].

Study of the related literature

There is evidence that overall employee attitudes at the organizational level have the direct relationship with organizational performance (Asklicher et al., 2004) and have the inverse relationship with the turnover of staff [12]. Many factors may influence the attitudes of staff including support and supervision, effects of collaboration and personal characteristics of the employees. We will mention with the provision of the reasons in which the chief executive in this category is the main agent in instilling the positive attitudes among employees (such as perceived organizational support and organizational commitment). In the meantime, staff attitudes are regarded as a link between senior executive's leadership behaviors and practices of the institutions.

One of the possible substrates for communicating between behaviors of chief executive and the organization performance is affected by the communicative role of the overall staff attitudes based on the theory of "shared values." According to [12] if the employees of an organization have common values, they are more likely to cooperate and collaborate and this would, in turn, lead to improved organizational performance. The chief executive officer can appeal to the reward and punishment mechanism to motivate employees to work more to achieve organizational goals. Moreover, the charismatic behavior of the chief executive can inject incentive to employees to work more than they are expected (Yuki, 1989, p. 272). The incidence of such behavior on the part of senior management helps the employees to achieve the mission of the group or organization and to reflect beyond their personal interests [13], Shamir et al., 1993, Shamir et al., 1993).

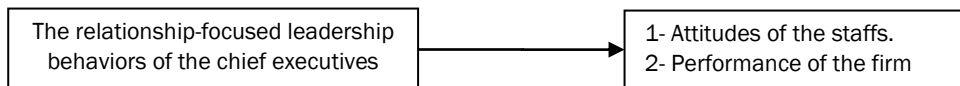
Most studies have found a direct relationship between a charismatic behavior [2] or transformational leaders [9] with their job satisfaction, organizational commitment, trust and confidence their efforts a, self-assessment effort and the rated performance of supervisors at individual level. Evidence of the relationship between leadership behaviors of Executive Director and staff attitudes are more limited. [5], in their recent meta-analysis study, reported that the requirements dimension (relationship-oriented behavior) and the core structure dimension (task-oriented behavior) of leadership behavior at the regulatory level have a relatively strong relationship with job satisfaction, employee performance, and the collective performance. Therefore, our expectation is that the task -oriented behavior of Chief Executive be directly related to the performance of the Institute, the relationship-focused behavior of top managers and the positive attitudes of the employers.

Research hypotheses

H1.The relationship-focused leadership behaviors of the chief executives impact on the attitudes of the staffs.

H2.The relationship-focused leadership behaviors of the chief executives impact on the performance of the firm

The conceptual model of the investigation:



MATERIALS AND METHODS

Methodology

This study is an applied one regarding its objective, and it is descriptive -survey regarding data collection method. To collect data, the researcher used the library studies and the field studies among consumers of luxury products in North Khorasan province. To investigate the relationship between leadership practices, company performance, and attitude, the following domains were specified:

Subject domain: the general debate on the relationship between leadership practices, business performance, and attitude of the personnel involved. **Time domain:** the information and data of this study are related to the first six months of 2015. **Place domain:** the domain of this study is Halva-Oghab Co. in Tehran.

The population and sample

To address the relationship between the leadership behaviors of the executives, firm performance and the attitudes of the staffs, the study population includes all staffs, experts, executives and managers of Halva-Oghab Co. in Tehran. The samples of the survey were selected from those who had high job experience and high level of education. The size of this population was 189 individuals. It is worth mentioning here that because our population was limited and accessible, all population (sampling based on the statistics)were used to respond to the questionnaire.

Data collection method

In this study, a standard questionnaire containing questions that include the examination of the relationship between leadership practices, company performance and attitude of employees of Halva-Oghab Co, was made based on the Likert scale (strongly disagree, disagree, neither agree nor disagree, agree and strongly agree). LISREL software was used to analyze the test results hypothesis.

The methods for data analysis

Descriptive statistics refers to an applied set of concepts and methods employed in the company, to sum up and prepare tables, graphs and descriptions of the collected data and descriptive statistics. In general, descriptive statistics provides the summary, and image of the observed data using standard figures and diagrams. Descriptive statistics of variables regarding frequency, variable values, and the density are examined.

In the inferential statistics, the researcher deals with sampling method, selecting the small group as a representative of the large population and he predicts the characteristics of the population based on the data derived from the sample. LISREL Software is employed at inferential statistics level regarding the required information and the distribution of the population. To investigate the correlation of the variables, the researcher used the Pearson or Spearman test. Structural equation modeling is a comprehensive statistical approach to test hypotheses about the relationship between the observed and latent variables.

Analysis

H1

The task-oriented leadership behaviors impact on the staff attitudes

Table 1: Fit indices (the second hypothesis of the test)

row	Index models	Amount of acceptable	Observed value	result
1	χ^2/df	$\chi^2/df < 3$	2/63	Good fitness model
2	CFI	$CFI > 0/9$	0/921	Good fitness model
3	GFI	$0/1 < GFI < 0/5$	0/408	Good fitness model
4	RMSEA	$RMSEA < 0/08$	0/015	Good fitness model

Because all indicators of the goodness in the fitting model except GFI are in the desired range, so it can be concluded that the model is well- fitted. So, we can comment on the second hypothesis. As shown in [Table 1], the path coefficients between the variables of task-oriented leadership behaviors and staff attitudes is $56/0 = \beta$ and this path coefficient, at 95 percent (or 99 percent) is significant ($001/0 = P$ -value). So we can accept the second hypothesis.

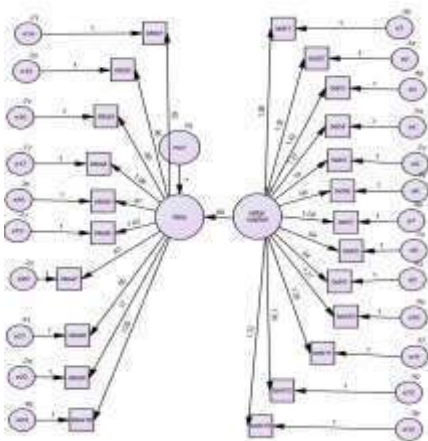


Fig. 1: The path coefficients between the variables of the relationship-focused leadership behaviors and the staff attitudes.

H2

The relationship-focused leadership behaviors impact on the firm performance.

Table 2: Fit indices (the fourth hypothesis of the test)

row	Index models	Amount of acceptable	Observed value	result
1	χ^2/df	$\chi^2/df < 3$	2/69	Good fitness model
2	CFI	$CFI > 0/9$	0/975	Good fitness model
3	GFI	$0/1 < GFI < 0/5$	0/171	Good fitness model
4	RMSEA	$RMSEA < 0/08$	0/023	Good fitness model

Because all indicators of the goodness in the fitting model except GFI are in the desired range, so it can be concluded that the model is well- fitted. So, we can comment on the fourth hypothesis. As shown in [Fig. 2], the path coefficients between the variables of the relationship-focused leadership behaviors and the firm performance is $0.62 = \beta$ and this path coefficient, at 95 percent (or 99 percent) is significant ($001/0 = P$ -value). So we can accept the fourth hypothesis.

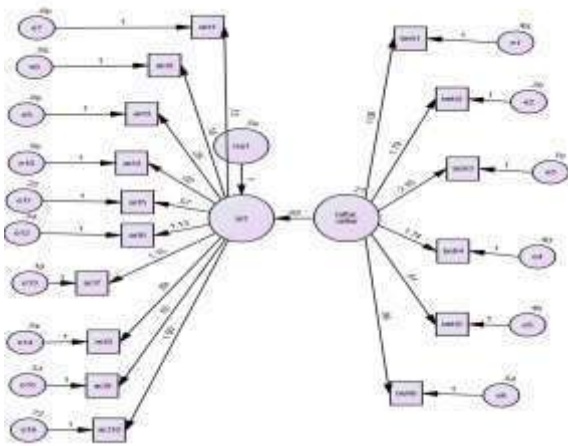


Fig. 2: The path coefficients between the variables of the relationship-focused leadership behaviors and the firm performance.

DISCUSSION AND CONCLUSION

The review of the literature and the research hypotheses have been considered. Then the explanation about population, sampling and data collection by a standard questionnaire have been given. The questionnaire includes the questions about the relationships between the leadership behaviors of the managers, firm performance and the staff attitudes of Halva-Oghab Co. LISREL software was used to analyze the data. The results of the study indicated that there is a significant relationship between the task-oriented leadership behaviors of the managers, firm performance and the staff attitudes of Halva-Oghab Co. However, the results indicated the relationship-focused leadership has a significant effect on the enterprise performance. This study implies that the behaviors of the managers can change the staff attitudes, and these behaviors can lead to the modification of the organization (the change in the quality of the products, quality of the work, the motivation for working,) and these behaviors can finally lead to the improvement of the firm performance.

CONFLICT OF INTEREST
There is no conflict of interest.

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None

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ARTICLE

PERFORMANCE MEASUREMENT OF KARAJ MUNICIPALITY WITH USING KANJI BUSINESS EXCELLENCE MEASUREMENT SYSTEM

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ABSTRACT

For the performance measurement system, to be effective, this system should be based on success factors. Organizations that higher levels of business excellence have earned, based on the number of customers have shown very high growth, resulting in improved their overall profitability and shareholder value. The aim of this study was to evaluate the performance of the municipality of Karaj using business excellence kanji (KBEMS) and with stakeholders inside and outside the organization's approach. The system has two parts: The Excellence Kanji Model (KBEM) and scorecard kanji (KBS). This research has two populations, which consists of stakeholders internal and external stakeholders. The data collected in this study was a questionnaire that each part of the questionnaire was prepared. Cronbach's alpha reliability was calculated through the collection of performance information about each benchmark was performed and rates can be achieved performance excellence model Kanji scorecard. Specific research has been done in this area. The results indicate that the performance of Karaj Municipality with external stakeholders is average and Unacceptable performance in terms of internal stakeholders and are generally the performance is average.

INTRODUCTION

Business Excellence is "an instrument for simultaneous measurement of customer satisfaction, staff and stakeholders in an organization in order to achieve a comprehensive assessment of organizational performance" [5]. Creating a measurement system in which criteria are used as a management and motivation tool and motivation is important. Thus, to meet this role, performance measurement system must be expanded in which each person and his participation to be determined in a general system. Therefore, performance measurement requires systematic assessment of organization of factors related to its success. Performance measurement has been considered throughout the years, especially within last twenty years, and various performance measurement models have been proposed that each of them examine performance of an organization from specific aspect. A variation of these models has made it difficult to choose appropriate model according to the needs of managers, because each model can be proper depending on specific conditions of each organization, including internal and external activities for different strategies.

Definitions

Organizational excellence

Organizational excellence means growing and promoting in an organization in all dimensions, satisfaction of all stakeholders, creating a balance between the needs and expectations of all stakeholders and ensuring long-term success of the organization. Excellence model is a management structure that paves the way to improvement relying on principles and fundamental concepts and paying attention to the main criteria of comprehensive quality management and self-assessment system [6]. Excellence model is in fact a tool to measure the value of establishment of systems and self-assessment identifying and determining the course of activity of managers.

Performance

Performance is the way of doing duties and results.
It is a folk and singular trait is the result of the work and degree of work.

Evaluation

Evaluation is finding the value and the price of everything, and examining and estimating its value. Evaluating is activity that has educational, economic, social and cultural nature. Therefore, using evaluation, a comparison must be done among implicit objectives and stated or specified objectives on one hand, and unpredicted results on other hand. Then, the impact of these results on environmental, social, and cultural environment should be examined [1].

KEY WORDS

Performance, business, organization

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Performance assessment

Comprehensive measurement of performance process using terms such as efficiency, effectiveness, significance, empowerment, accountability within the framework of the principles and concepts for the realization of the goals and tasks of the organization, structure, plan and long-term development of the organization is called as organization performance assessment [1]. Performance assessment at organizational dimension is usually synonymous with effectiveness of activities. Effectiveness means value of achieving the goals and programs with feature of efficiency of activities [2] (2004). At the dimension of way of using resources, performance assessment is stated in terms of efficiency indicators. If we consider efficiency as ratio of input to output in the simplest definition, performance assessment system in fact measures the efficiency of management decisions on optimal use of resources and facilities [3]. Performance assessment is a process measuring, valuing, and making judgment on performance during specified period [1]. Performance assessment is measuring performance through comparing the existing situation with optimal situation based on pre-specified indices having their own features [3]. In general, performance assessment system is the process of measuring and comparing the degree and way of achieving optimal situation with specified criteria and attitude in the specified and determined range and area, with specified indices at specified period in order to review, revise and improve continuously [3].

Pyramid model of Kanji

Kanji's Business Excellence measurement system structure depends highly on critical success factors, including a limited number of factors that if they results are successful, the success of organization will be guaranteed [7]. As Kanji believes "there are areas of the organization that if the organization wants to achieve success, they must work well [6]. Kanji has considered critical success factors in his pyramid model and summit of pyramid is organizational excellence, as he believes.

Kanji's Business Excellence Measurement System (KBEMS)

According to its general principles and central concepts, 2 structure have been introduced for this model (Kanji, 1998).

1. Kanji's Business Excellence Model (KBEM) [5]
2. Kanji's Business Scorecard (KBS) [6]

The role of Kanji's Business Excellence Model (KBEM) is to measure organizational performance in terms of internal stakeholders, while Kanji's Business Scorecard (KBS) measure it from external stakeholder's perspective. Finally, by integrating internal and external scores, excellence Index of organization performance is calculated finally provides overall organization outcome.

Measuring by Kanji's Business Excellence Measurement system includes two parts of (A) and (B) which are respectively used to assess internal and external stakeholders. Excellence Performance (A) related to (KBEM) and Performance Excellence (B) related to (KBS). Leadership is the most important component in part (A). It means that leaders are the most important factor improving quality and business excellence and their behavior and attitude leads to other part improvement (A). Leaders' attempt should consider four principles, including satisfying customers, management based on reality, management relying on staff, and continuous improvement.

Part (B) includes Kanji's Business Scorecard that is consistent with components discussed in various external stakeholders' evaluation such as customers, suppliers, government and so on. In this part, organizational values are starting point for process excellence, organizational learning, and satisfying stakeholders. Effective management of critical success factors leads to defining performance excellence index in part (B). Parts (A) and (B) should be used simultaneously to provide a single and complementary perspective of organizational performance.

To compare Business Excellence models of KBEM and EFQM

Foundation Quality Management Model is currently used in many countries, and Balanced Scorecard model also takes into consideration the financial dimension of performance and it becomes prevalent. However, Kanji's Business Excellence Measurement Model has advantage over these methods since it has two parts that one is Kanji's Business Excellence Model seeking to performance excellence within organization and one part of Kanji's Scorecard Model aims to performance out of organization, therefore, it can be said that it is combination of two mentioned models, with different structures.

Business Excellence Model was developed to achieve superior performance in the continuous development of organization. As a result, the foundation of this model should be adjusted based on critical success factors. This means that in areas where results are satisfactory, successful competitive performance will be guaranteed for the organization. What is clear that literature used in business excellence model of Kanji is consistent with key elements of total quality management (TQM).

There are many similarities between business excellence models. In all of them, leadership has been introduced as the most important and key factor affecting organization and all of them emphasizes on human resources management, process management, and continuous learning and training. Kanji's model advantage over Malcolm Baldrige' model is that it considers customer satisfaction and paying special attention on continuous improvement culture. Kanji's model includes principles such as "prevention" and "teamwork" that have not been dealt with sufficiently in the European foundation for quality management. Another difference of this model with the European Foundation of Quality Management model is that it has not separated results from enablers and it is due to different structure of this model following kanji's pyramid model. Table below compares two models.

According to logic that Kanji's Business Excellence Measurement system follows, the final score of internal performance excellence measured by KBEM and external performance measured by KBS are obtained and final score of Kanji's system is placed in 1000 scores scale, multiplied in 10. By obtaining final score of Kanji's Business Excellence Measurement System, the organization performance score is determined. Kanji's model is a structural model, therefore, score of each criterion is reflected in indicators of assessment used to measure it, but also it should be calculated in degree of effort made for different paths to achieve it. As a result, if need to compare scores network exists in these two model, we should be careful that each of European Foundation of Quality Criteria must be adapted and matched with more than one dimension of Kanji's model dimensions [4].

MATERIALS AND METHODS

The research is applied in terms of goal and it is descriptive (a case study) in terms of data collection. The study was conducted in "Organization of Karaj municipality". The population of study consists of a set of individuals or units that have at least one common trait. In any research, the population is selected as researcher want to study trait of its units (Khaki, 2004). As Kanji's business excellence system studies two internal and external organization views, this study has two populations.

The population of internal stakeholders

This population actually consists of specialists, managers, and staff of Karaj Municipality organization (headquarters).

The population of external stakeholders

This population of external stakeholders consists of Fire Organization, Beautification Organization, Sport and Cultural Organization, and IT and Communication Organization. In the present study, simple random sampling was used and questionnaire was also used as one of the most common tools in survey studies.

The questionnaire used in this study is same standard questionnaire measuring business excellence that Kanji has referred to it in his measurement book (Kanji, 2002). It worth to note that as Karaj municipality Organization is an organization that its output is services not product, so focus of questions is on services. The questionnaires used in this study are as follows:

1. Questionnaire (1) relating to questions of performance assessment from internal organization perspective
2. Questionnaire (2) relating to questions of performance assessment from external organization perspective

Questionnaires were developed based on five-point Likert including responses of excellent, good, moderate, weak or very weak, respectively, and their scores are 1 to 5. Each of participants selected options based on his awareness of each question.

Data analysis

After collecting information of questionnaires from this organization, responses were given to Excel Software and its accuracy was examined. Then, information was given to SPSS Software and normality of data was tested and they were analyzed.

To measure kanji's business excellence measurement system

Kanji's business excellence measurement consists of two parts (A) and (B) used respectively to assess the performance of internal and external stakeholders. Part (A) exactly matches with Kanji's business excellence model (KBEM) (Kanji, 1998). Leadership is the major component (A), in the sense that most

important factor to improve quality and business excellence. To measure the performance, organization's objectives must be determined for the specified period firstly. On the one hand, as performance evaluation from the perspective of internal stakeholders is considered by this model (Kanji, 1998). Organization performance is measured through questionnaires and by interviewing stakeholders. To do this, five-point Likert questionnaire was used. The questionnaire used for this section was written by Kanji.

At the end, scores that respondents give for organization performance are collected and their mean is calculated for each criterion of KBEM. In addition, obtained score in this part for each criterion is mean of scores that respondents have given for related questions. Kanji's Business Excellence Model finally gives the internal organization score with 100 scores scale. Kanji's Business Scorecard was used to analyze the different stakeholders, so different score is obtained for Part (B) using Formula 1.

It should be noted that as this study investigated only 4 groups of stakeholders outside the organization, so in the formula 1, $n = 4$. Finally, in this study, external organization score will be number with 100 scores. As stressed before, critical success factors (with performance generators) constitute basis and foundation of Kanji's model in two parts. Among these differences, it is only possible that differences to be seen only at the level of details and degree of focus to reflect the priorities, needs and skills of different stakeholders. It is essential to note that parts (A) and (B) should be applied simultaneously so that a single and complementary perspective of organizational performance to be provided. Each of criteria making up the system can be examined in detail [8].

Finally, final index of organizational business excellence is achieved that is particular to simple mean of final scores of Part A and B of Kanji's Business Excellence Measurement System calculated according to the formula 2.

Performance Excellence Index: PEI
Performance Excellence of Part A: PEA
Performance Excellence of Part B: PEB

To measure reliability of data

To measure normality of data, Kolmogorov - Smirnov was used. In the case of normal distribution of data for each question of hypothesis, that question is rejected, and it can be concluded that responses have not been given randomly by chance. Hypotheses of H_0 and H_1 are defined as follows:

H_0 : observations distribution follows normal distribution
 H_1 : observations distribution does not follow normal distribution

In the data analysis of each criterion, Kolmogorov - Smirnov as was used. All results are summarized in [Table 2 and 3]. The base to reject null hypothesis is that obtained number to be less than 0.025 as P-Value given by SPSS software. Therefore, when the number is higher than 0.025 for data of a criterion, it becomes clear that the null hypothesis is accepted and the data follow a normal distribution. As is can be seen from Tables 2 and 3, statistical statistic obtained for all criteria of section (KBEM) and (KBS) is more than the number 0.025. Therefore, assuming normal data for all criteria of this section is accepted.

To test all hypotheses, one sample T test was used and as goal is to compare score of each criterion with number 70, test is one domain.

RESULTS

To measure the performance of organization using Kanji's Business Excellence Measurement System, firstly, organization performance score from the perspective of external and internal stakeholders to be obtained. Then, mean of obtained scores will be score of organization performance Kanji's Business Excellence Measurement System. To measure, organization performance based on criterion in two internal and external parts, questionnaires were set based on Likert spectrum. Options of each response included: excellent, good, moderate, weak, and very weak that scores 1 to 5 were assigned for them, respectively. Each criterion (KBEMS) has 100 scores. Therefore, these responses were multiplied in 20 after finding their mean so that obtained score to be based on 100. It should be explained that the minimum score is 5 and minimum score is 100 (KBEMS) number is 100. Therefore, number 5 was multiplied in 20 so that scores to be equivalent. As a result, scores were obtained for each criterion of organization performance in the internal and external parts and final score of organization performance was obtained using mean of scores. Results can be seen in [Table 4]. Scores are multiplied in 10 as indicated in Formula 3. As it can be seen from [Table 6], Karaj municipality performance has 545.3 scores, indicating that organization needs to be examined in terms performance. [Fig. 3] performance shows scores of internal and external organization performance scores along with final score at 1000-score scale.

Performance measurement from internal organization stakeholders' perspective-KBEM

Internal organizational performance scores can be seen in [Table 5]. In addition, [Fig. 4] shows graph of these scores. Regarding scores of criteria of focus on customer, process improvement, staff performance and culture of continuous improvement must be said that as each of these criteria consist of two sub-criteria, so their scores will be equal to mean of each of these scores.

Measuring performance from the external organizational stakeholders’ perspective -KBS

For external organization part, information of questionnaire was collected using Likert spectrum and as it was mentioned before, these score were calculated that are as follows. To do this, fire department, beautification, sport and cultural, and ICT organizations were used as sample and final score for each organization was added and divided to 4 (formula 4). Additionally, score of each organization is obtained by mean of four criteria of organizational values, process excellence, organizational learning, and satisfying external stakeholders. Scores can be seen in Table 6 and graph of external organization performance scores can be seen in [Fig. 5].

To test organization final performance hypothesis-KBEMS
 Finally, main hypothesis was tested and it is stated as follows:

H0= Karaj Municipality has no acceptable performance H0: $\mu \leq 700$
 H1= Karaj Municipality has acceptable performance H1: $\mu > 700$

Here, we examine it at the 1000-score scale. As a result, T test was conducted at 97.5% confidence level and its results are shown in [Table 7].

P-Value is 0.046 that is higher than 0.025, but score value is 545.3 that is lower than 700, Indicating performance that criteria should be examined and moderate performance

Equations

$$P = \frac{PEA + PEB}{2} \tag{1}$$

$$PEI = (PEA + PEB) / 2 \tag{2}$$

$$PE = [(PEA + PEB) / 2] * 10 \tag{3}$$

$$PEB = (PEB1 + PEB2 + PEB3 + PEB4) / 4 \tag{4}$$

Tables and Figures

Table 1: Comparing scores of EFQM and KBEM

Score	KBEM	EFQM
60	Leadership (60%)	leadership
10	Customer satisfaction (10%)	
10	Management based on reality (10%)	
10	Staff-based management (10%)	
10	Continuous improvement (10%)	
100		
30	Leadership (30%)	Policy and strategy
20	Management based on reality (20%)	
20	Customer satisfaction (20%)	
20	Staff-based management (20%)	
10	Continuous improvement (10%)	
100		
40	Staff-based management (40%)	staff
50	Staff create quality (50%)	
10	Continuous improvement (10%)	
100		
50	Teamwork (50%)	Participations and resources
50	Measurement (50%)	
100		
50	All works are process (50%)	process
40	Management based on reality (40%)	
10	Continuous improvement (10%)	
100		
50	Customer satisfaction (50%)	Customer results
25	External customers' satisfaction (25%)	
25	Internal customers' satisfaction (25%)	

100		
50	Prevention (50%) Staff-based management (30%) Continuous improvement circle (20%)	Staff results
30		
20		
100		
25	External customers' satisfaction (25%) Internal customers' satisfaction (25%) Customer satisfaction (20%) Leadership (10%) Continuous improvement (20%)	Results of society
25		
20		
10		
20		
100		
30	Management based on reality (30%) Continuous improvement (40%) Continuous improvement circle (30%)	Key results of performance
40		
30		
100		
Total	900	1000

Table 2: Sample Kolmogorov-Smirnov Test of KBEM section

One-Sample Kolmogorov-Smirnov Test			
Criteria	N	Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
leadership	58	0.668	0.763
Customers satisfaction	58	0.966	0.309
External customers satisfaction	58	1.354	0.51
Internal customers satisfaction	58	1.235	0.95
Management based on reality	58	0.794	0.553
All works are process	58	0.650	0.792
Measurement	58	0.884	0.414
staff-based management	58	0.829	0.497
Teamwork	58	0.903	0.389
People create quality	58	0.857	0.455
Continuous improvement	58	0.941	0.339
continuous improvement circle	58	0.754	0.621
Prevention	58	1.185	0.121

Table 3: Sample Kolmogorov-Smirnov Test of KBS section

One-Sample Kolmogorov-Smirnov Test			
Criterion	N	Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
Organizational values	88	0.839	0.482
Stakeholders satisfaction	88	0.926	0.358
Process excellence	88	0.902	0.390
Organizational learning	88	0.737	0.649

Table 4: Final score of Karaj Municipality performance

PEA	PEB	Final score of organization
53.40	55.66	545.3

Table 5: Performance scores from internal stakeholders' perspective

Criterion	Score	KBEM part
Leadership	59.69	
Customers satisfaction	55.28	
Focus on customer	53.39	
Management based on reality	49.42	
Continuous improvement	49.54	
Staff-based management	54.82	
Staff performance	57.18	
Continuous improvement	48.73	

Continuous improvement culture	52.58
Performance excellence score of first part -PEA	53.40

Table 6: performance scores from external stakeholders' perspective-KBS

Organization	Score	KBS part
Fire Department (PEB1)	47.67	
Beautification (PEB2)	54.57	
Sport culture (PEB3)	65.69	
Communication and Information Technology(PEB4)	54.73	
Performance excellence score of second part - PEB	55.66	

Table 7: T test for Kanji's Business Excellence score

One Sample Statistics						
	N	Mean	Std. Deviation	Std. Error Mean		
PE	2	545.3	15.98061	11.30000		
One-Sample Test						
Test Value = 700						
	t	df	Sig. (2-tailed)	Mean Difference	97.5% Confidence Interval of the Difference	
					Lower	Upper
PE	-13.690	1	.046	-154.7	-442.3042	132.9042

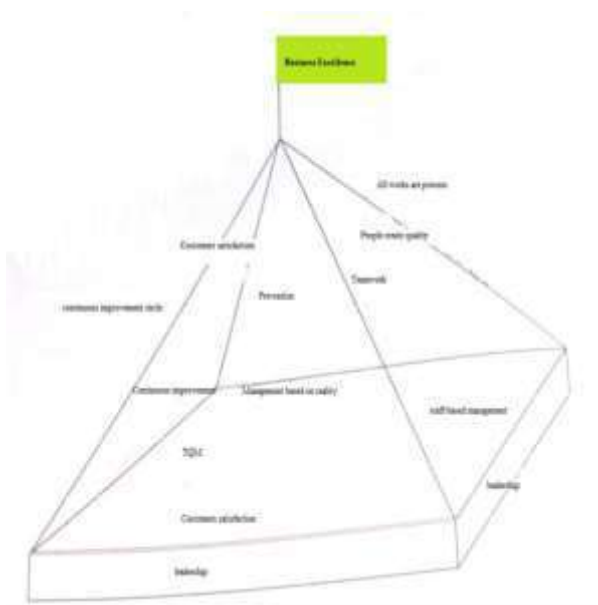


Fig. 1: Pyramid model of Kanji consisting of critical factors of success.

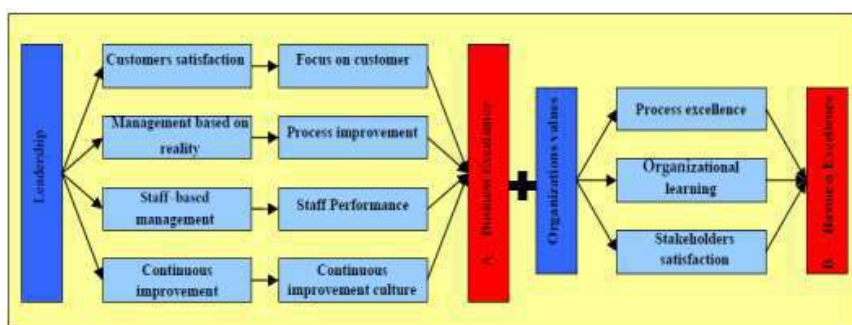


Fig. 2: Kanji's Business Excellence Measurement System.

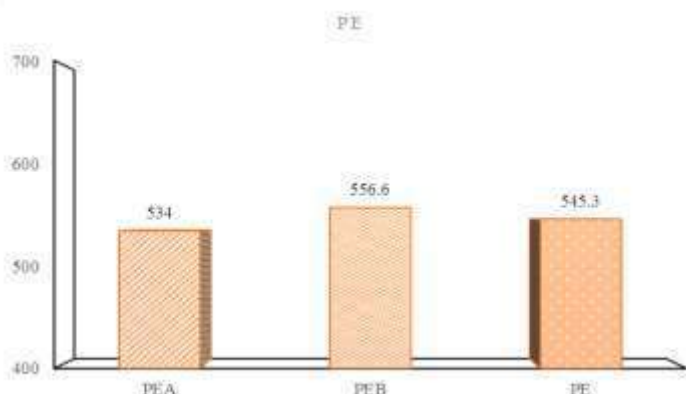


Fig. 3: Graph comparing the performance scores of Karaj Municipality Organization.

DISCUSSION AND CONCLUSION

According to the definition of Kanji's system, Karaj municipality will have acceptable and appropriate performance in each criterion that its score is above 70. According to the results of Karaj municipality, only in organizational values acceptable results were not achieved and regarding Sports and Cultural Organization its score was 70.23. In addition, regarding weak points of performance, Karaj municipality in the criteria of organizational value, external stakeholders' satisfaction, and process excellence only from Sport and Culture Organization view and criterion of organizational values from Beautification Organization view had moderate performance and in other criteria, it has inappropriate performance. According to the strengths and weaknesses of Karaj municipality, recommendations are divided into two parts. First group is to maintain strengths of performance and the second group is recommendations to find the root of weak performance and improving strengths versus weaknesses. What is clear is that weaknesses have impact on organization performance leading that managers and staff to be questioned. Various reasons cause weaknesses of the organization performance, but is considered in the organizational policy and strategic management is that root of reasons must be determined and solutions to be provided for them. Some of them are: To improve excellent leadership, it is proposed that leaders and senior managers of Karaj municipality develop long-term strategies and determine performance vision for their employees. Additionally, to consider internal and external customers views, both complaints and suggestions, will make them more satisfied. In order to improve performance, comparing performance of staff with competitors and encouraging people to communicate and interact with each other are some of suggestions to improve performance in the case of focus on customer. One of the principles considered in quality management systems is organizational processes. All affairs that are done in the organization are process, so it is suggested that the key processes to be identified and assessed for awareness of managers and their comparison with other similar organizations. It is also recommended that the objectives, policies, tasks and executive plans to be developed realistically. It is recommended that managers give necessary training for staff in order to improve their knowledge and their productivity. It should be attempted that feedback is received from staff performance and implementation of the objectives and required resources to be provided for staff.

In addition, staff training in order to empower them and provide good working environment as well as encouraging and motivating them will lead to increased efficiency and performance score. To implement continuous improvement of culture, those methods should be used seeking to find the roots of problems. It also recommended that managers and senior managers of Karaj municipality use continuous improvement and feedback to improve. To do this, using quality management systems and organizational excellence are useful.

Identifying opportunities for improvement, execution of cycle of continuous improvement of processes, developing and implementation of practices to prevent the recurrence of errors, performing corrective actions and identifying the root of the problems are such cases that can be recommended to improve the performance of this criterion. Organizational values should be consistent with organizational objectives and used to satisfy the needs of organizational stakeholders. The results show that the stakeholders complain senior managers of Karaj municipality. Therefore, to solve this problem, it is recommended that senior managers pay attention to problems, do their best to resolve them, and consider the expectations of external stakeholders and meet them. It is also suggested that they give correct and sufficient information

for stakeholders and establish proper work relations with them, and use their views and ideas in developing the plans. Process excellence is an issue that is used in many large organizations and factories. To improve performance and move towards excellence, it is recommended that Karaj municipality officials pay higher attention in serving clients and use organizational excellence indices to determine their own performance. Organizational learning and the concept of learning organization are now one of the organizations' development factors towards excellence. Low organizational excellence score investigated by four stakeholders indicate that staff of this organization has no greater tendency to learn activities from each other and this is a warning for senior managers of this organization.

Suggestions for Future Research

According to the research and literature in research, following recommendations are provided for future studies:

Performance assessment of other municipalities in the country using business excellence of kanji
 Karaj municipality performance assessment using other performance measurement tools
 Examining the effect of each component of Kanji's excellence performance measurement system on organization performance

To measure the performance of other organizations, companies and factories using Kanji's business excellence measurement system

Theoretical and practical comparison of EFQM and KBEM models

Theoretical and practical comparison of BSC and KBS models

CONFLICT OF INTEREST

There is no conflict of interest.

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ARTICLE

THE HYDROCHEMICAL EVALUATION OF CASPIAN SEA COASTAL AQUIFER BY STATISTICAL METHODS (CASE STUDY; GHAEMSHAR-JOYBAR'S AQUIFER; NE OF IRAN)

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ABSTRACT

Ghaemshahr-Joybar plain is located in northeastern Iran, Mazandaran province on the shore of the Caspian Sea. The study area lies from 35'-44' to 36'-47' North latitudes and 52'-35' to 53'-23' East longitudes. The sample is determined after experiment of 22 points for different physicochemical. Groundwater quality by various physical and chemical parameters was tested. In this study, statistical methods with central indices such as mean, median, and mode are used. For distribution such as standard deviation and the relationship between variables, Pearson correlation coefficient, Skewness, Kurtosis and used. Kolmogorov and Smirnov method used to test the normal distribution of data. In these tests, values less than 0.05 as significant and considered acceptable. Given this assumption, all selected factors have approximate value (P -value < 0.05) more than test error (α), so there is no reason to reject the assumption of normality of the data. Statistical analysis shows that, this can complement conventional methods used in chemical assessment of groundwater. Based on the results analysis, ground water of dominant facies are composed of calcium and sodium bicarbonate and mixture of waters with calcium, magnesium, chloride, with sodium chloride. As a result, chemical reactions swap or reverse ion exchange in the study area of sodium result from salt-water intrusion and the amount of weathering of clay minerals, calcium, and magnesium from limestone and dolomite deposits. This study showed that statistical methods could be effective in analysis methods commonly used hydro-chemical.

INTRODUCTION

KEY WORDS

Ghaemshahr- Joybar,
heavy tailed, Skewness,
Kurtosis, Kolmogorov –
Smirnov

There are many variables associated with water quality, which are a function of wide fluctuations in time and space. Understanding these fluctuations and identifying whether the changes are natural or as the result of human activities can be a great challenge. The chemical composition of groundwater has many control factors including hydro climate, composition, and amount of rainfall, geological conditions, chemical composition of formations, topography, vegetation, and many other factors. One of the most important and complex issues in hydrogeological studies is the quality and suitability of the groundwater and protecting it, because most hydrology activities are done to supply water for various uses. In hydro chemical studies, using statistical methods such as correlation matrix, Skewness, kurtosis, and descriptive statistics can be an effective aid to common methods in the interpretation of data on water resources. Consider the analysis of the test data carefully for any assumption in any research is of great importance and as the main and most important part of each study. With the help of descriptive statistics such as central tendencies, for example mean, median, mode, variance dispersion such as standard deviation, and the like are data analysis. Descriptive statistics on the relationship between variables such as Pearson correlation, Skewness and Kurtosis are used. In this study, statistical methods and common hydro-geochemistry used to describe the situation. In this regard, there is a lot of research in Iran and the world. Among them, the studies by Burgohain et al. (2009) showed that statistical observations of the main ions and other parameters have almost uncoordinated distribution and their normal curve is asymmetrical. Comparing the contents of water according to the instructions provided for drinking for heavy elements is at warning level, which needs regular sampling to determine the concentrations of elements in the study area. Temporal and spatial measurements of chemical or physical processes usually cannot clearly reveal the main governing processes. Multi-variable analyses try to classify, interpret, or reveal the main processes governing by reducing data [18]. Due to the combined effect of multiple hydrologic, biogeochemical factors, it is very hard to determine the relationship between groundwater quality parameters and biogeochemical processes through graphical methods [11]. That another research [19], studied the quality changes in Suidish groundwater (Southern Sudan) in the period of 20 years for 77 stations using non-parametric method of Mann-Kendall, and the results showed a decreasing trend in the concentration of sulfate ion and no trend was observed in other alkaline ions. In southern Izmir (Turkey), Elci and Polat (2010) studied and assessed groundwater samples of 57 stations for qualitative variables through Kolmogorov-Smirnov method and t tests. The results obtained show a proper and coordinated process between the responses obtained from statistical parameters and common methods in hydro-geochemistry and qualitative variables. Another study is assessing hydro-geochemistry control agents of groundwater in Arak plain [9]. In this study, by establishing the correlation matrix, calculating the values of Skewness and kurtosis of hydro-geochemical parameters has assessed while comparing with conventional methods. Using statistical multivariate methods to help common hydro-geochemical methods, Moghimi et al. (2015) showed that proper and usable responses obtained. Faryabi et al (2009) compared hydro-geochemical methods with multivariate statistical methods and found that this method used in geology and water chemistry and their relationship with each other. One of the purposes of this article is in line with the use of statistical methods and their comparison with conventional methods used in hydro-geochemistry.

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Another goal is, whether we can rely on the results of statistical methods and based on a comprehensive analysis of hydro- climate, hydrology, geochemistry hydro-geochemical and geological be used.

Study and geological scopes

The studied area is until the Caspian Sea from the north and in the south, it is until of the Alborz mountain range. The study area lies from 35°-44' to 36°- 47' North latitudes and 52°-35' to 53°-23' East longitudes in Mazandaran. The total area of the basin is approximately 3348.1 square kilometers, of which 935.5 square kilometers is plains that makes up the study area and the rest is the Northern Alborz mountain range [Fig. 1]. Climatic conditions of the study area are affected by mountain and moist maritime climate with semi-humid climate.

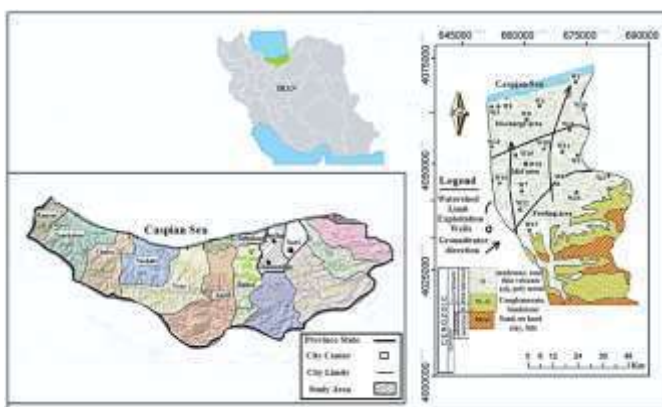


Fig. 2: Map of geographical location, geology, location of wells and the general direction of groundwater in Ghaemshahr- Joybar.

Caspian Sea coastal plains overlooking the sea gradually formed due to a drop in the sea. This loss along the coast is different. Along with the retreat of the sea, fresh water from the mountains has tried to wash and push back the salt water, but it has not completed and in here and there in alluvium, areas of salt water have remained [7]. Geology and hydrogeology studies conducted in the Caspian Sea coastal aquifers have proved some saltwater zone due to the Caspian Sea retreat. Geological formations have the most and major impact on water resources (quality and quantity) of Ghaemshahr- Joybar catchment. The heights of this area are mostly calcareous, marl, dolomite, and sandstone sediments (Mesozoic and Cenozoic). In the plain area from south to north in the foothills are the alluvial deposits that have high permeability and in the middle towards the coast in the plain, with reduced grain size, sediment such as sand, non-hard clay, silt, and thin layer of volcanic ash (new Caspian deposits with Quaternary age) prevail. Below these sediments is Absheron Formation made of clay, marl, non-hard sand, conglomerate, and a thin layer of volcanic ash with upper Pliocene-Quaternary age [Fig.1] [12].

According to geophysical studies, Ghaemshahr-Joybar coastal plain aquifer is like a bowl that has low thickness in the northern and southern ends and has the maximum thickness in the middle [17]. As a result, according to the geological situation and the direction of groundwater flow, water time of stay in the middle increases and this increases the chemical reactions in the middle section. In the study area, changes follow a certain order water table and affect the Earth's surface morphology and feeding of the aquifer (south area). Elevation of groundwater level curves varies between -25 to 60 meters and decrease from south to north. The general direction of groundwater flow in the area is from south to north and northeast [Fig. 1]. The focus in this research is to use descriptive statistical methods in the analysis of hydro chemical data of Ghaemshahr-Joybar and to compare them with conventional methods. The research objectives are assessment of the factors affecting hydro-geochemical status of Ghaemshahr-Joybar Plain aquifer using statistical methods and comparing the results of statistical methods with conventional hydro-geochemistry methods (Piper-Gibbs graph).

MATERIALS AND METHODS

Data and methodology

In order to investigate the quality of groundwater streams of Ghaemshahr-Joybar Plain through statistical procedures and common hydro-geochemical methods, the data of 22 exploitation wells used in the two sampling periods of 2003-2015 [Fig.1] [Table 1][1]. For chemical analysis is used APHA standards method [2]. Aqqa software is used in the determination of water type; SPSS-16 is used in the calculation and analysis of statistical methods to assess the chemical status of groundwater resources.

Table 1: Statistical Profile of Chemical analysis of selected sources in Ghaemshahr area (The values of elements and TDS in terms of mg / l and EC in terms of $\mu\text{S} / \text{cm}$ for 2003 and 2015) (R; Range, Min; Minimum, Max; Maximum, Me; Mean, Med; Median, Mo; Mode, SD; Standard Deviation, S; Skewness, K; Kurtosis, V; Variance,)

P	EC	TDS	P H	Ca	Mg	Na	K	HCO ₃	Cl	SO 4	TDI	SI c	SI d	SIha l	SI g	Alk	CA 1	CA 2	TH
2003																			
R	3278	2082	0.7	178	85.8	470	8	811.8	569.8	581	2111	1.3	1.8	0.05	14	640	1.65	0.4	1280
Min	792	522.5	7.5	74.8	31.6	22.7	2.2	250.1	35.01	73.9	571	0.41	6.51	-0.20	-16.2	212.2	-1.65	-0.4	572
Max	3885	2486.4	8.21	241.5	111.3	470.	10.	1037	577.5	624.7	2560	1.68	7.98	-0.14	-1.9	818.2	-0.06	0.0	1730
Me	2129.	1357	7.8	136.5	60.7	204	5.2	568.6	229	244	1450	1.2	7.41	-0.16	-6.2	453	-0.43	-0.1	988
Med	1855	1212	7.8	137.8	50.2	157	4.2	539.5	150.8	158	1292	1.2	7.3	-0.16	-4.0	427	-0.4	-0.1	927
Mo	1855	1212	7.8	88.5	42.7	143	3.9	381.2	46	160	560.7	1.3	6.3	-0.16	-16	208	-0.4	-0.2	879
SD	928	573.7	0.2	44.1	23.2	152	2.1	218.5	179.5	159	596.6	0.37	0.51	0.02	3.93	173.3	0.32	0.10	327.2
S	0.58	0.61	0.44	0.89	1.19	0.70	0.73	0.57	0.80	1.21	0.55	-0.5	-0.4	-0.16	-1.1	0.52	-2.0	-0.8	1.1
K	-0.49	-0.52	-0.3	0.79	0.41	-0.98	0.15	-0.25	-0.77	0.74	-0.53	-0.8	-0.5	-0.98	0.48	-0.36	6.15	-0.2	0.92
CV	0.435	0.422	0.02	0.32	0.38	0.74	0.4	0.38	0.78	0.65	0.41	0.3	0.07	-0.13	-0.6	0.38	-0.7	0.62	0.33
V	7.4E5	3.0E5	0.04	1.7E3	491.2	2. E4	4.0	4.1E4	2.8E4	3E4	3.08E5	0.12	0.22	0.00	13.4	2. E4	0.10	0.01	9. E4
2015																			
R	6480	4148.1	1.1	297	121	940.5	2.57	818.6	1612.6	501.6	5757.4	1.43	1.88	0.07	10.4	638.1	0.70	0.64	2059
Min	868	554.4	7.52	74.8	29	22.7	3.43	255	31.2	47.5	686.4	0.07	5.74	-0.18	-11.5	193.3	-0.45	-0.12	552
Max	7014	4712.4	8.3	355	142.8	919.8	5.73	1024.8	1568.8	524	6152	1.50	7.62	-0.11	-1.1	793.7	0.25	0.51	2493
Me	1936	1244.1	7.85	145.1	58.9	154.8	4.2	554.5	254.7	128	1648	0.66	6.44	-0.15	-3.0	438	-0.0	-0.0	1021
Med	1480.8	946.5	7.79	136.7	49.4	73.1	3.72	510.8	127.2	94.1	1347	0.6	6.4	-0.16	-2.3	411.8	-0.4	-0.1	955
Mo	852.1	544.3	7.99	101.5	50.5	22.3	3.79	250.3	122	88.1	674	0.07	5.96	-0.16	-2.1	189.8	-0.2	-0.2	542
SD	1354	861.5	0.25	62	25.3	197.8	0.74	192.2	336.4	100	1180	0.38	0.54	0.02	2.12	151.6	0.15	0.12	434.4
S	3.02	3.05	0.07	2.22	2.16	3.26	0.79	0.93	3.37	3.4	3.1	0.58	0.81	0.76	-3.3	0.67	-0.6	3.17	2.27
K	11.02	11.26	0.52	6.68	6.27	12.4	-0.4	0.91	13.1	14.1	11.9	-0.4	-0.1	0.72	13.0	0.36	0.82	12.3	6.81
CV	0.7	0.69	0.03	0.42	0.43	1.27	0.17	0.34	1.32	0.78	0.71	0.57	0.08	-0.13	-0.7	0.34	-0.7	0.62	0.42
V	1.6E6	6.6E5	0.06	3340	560	3.6E4	0.49	3.4E4	1.0E4	8680	1.4E6	0.16	0.31	0.0	4.7	2.2E4	0.04	0.03	1.8E5

Standard deviation is a measure of the dispersion of data around the mean. If data set standard deviation is small, they usually gather around the mean and if it is great, they are away from the mean.

Box-and-whisker plot: when the aim is emphasizing certain points of distribution, this plot is used to provide information. This plot enables comparisons between multiple data sets easily. Box-and-whisker plot has one rectangle (box) and two lines on two sides of the rectangle (whisker) that is drawn by the median, first (25%), third (75%) quartile, and minimum and maximum observed data. Using this plot, centrality, dispersion, and skewness of the data can be interpreted. Rectangle drawn has 25% and 75% length, which is equal to quartiles. Middle size is drawn as a line parallel to the width of the rectangle and thus rectangle is divided into two parts. On the other hand, using sorted data, minimum and maximum data that are within the inner borders are determined and a line from the middle of the rectangle is connected to these two points in form of a filled lines. These lines are called whiskers that start from the quartile and end in the above points. Each number located outside the inner borders is called outlier and if it is between inner and outer borders, it is a weak outlier shown with O. If it is over the border or in the external enclosure, it is called strong outlier (end) shown with (*). Using box-and-whisker plot, the following information is obtained:

- A) If the median is near the middle of the rectangle (box), data distribution is almost symmetrical.
- B) If the median is on the left of the middle of the rectangle, distribution is skewed to the right, and if the median is on the right of the middle of the rectangle, distribution is skewed to the left.

Skewness is an index to analyze the distribution and asymmetric symbol and the deviation from a normal distribution. Skewness studies the degree of symmetry or asymmetry of probable distribution of data around the mean.

Interpretation: If it is greater than zero, it has right skew distribution and most of the values are concentrated on the left part of the men along with maximum values and above on the right. If it is less than zero, it has left skew distribution and most of the values are concentrated on the right part of the men along with maximum values and above on the left. If the values are zero, the mean and median are equal and have symmetrical distribution around the average.

Kurtosis is a statistical graph used as an index to analyze the distribution of data as a sign of being smooth or without tipping in a distribution. Kurtosis is a measure of the steepness of the curve at the peak. The strain or chamfer of frequency curve compared to the normal curve is called kurtosis.

Interpretation: kurtosis greater than zero which is sharper than a normal distribution identified with values focused around the mean and a denser or heavy tail. This means that, it is likely that the maximum values are placed in this heavy tail. Kurtosis smaller than zero is wider than a normal distribution with a broad peak, probably maximum values are smaller than the normal distribution, and the values are widely scattered around the mean. In this distribution, variance is high. Kurtosis equal zero its shape is long and upward. Normal distribution is a correct sample for this type of distribution [Fig. 2].

The coefficient of variation (C.V.): This index calculated by dividing the standard deviation into the mean. It was use to compare two traits of a population with different units of measurement. It does not depend on unit of measurement. Observation data set with lower C.V has more consistency and homogeneity.

Correlation coefficient: Correlation coefficient shows two random variables X and Y by r in a population. Pearson correlation properties of elements and substances in the groundwater include: always $-1 \leq r \leq 1$ and independent of the measuring unit. When $r = 1$, the correlation between the two variables is strong and consistent. This means that the increase in one increases the other. When $r = -1$, the correlation between the two variables X and Y is severe and strong. This means that the increase in one decreases the other. When r is near to zero, correlation between the two variables is weak [Table 3]. In this table, the numbers significantly correlated are calculated with two stars with one percent error and one star with 5 percent error rate. As a result, significant numbers (from 0.4 to 0.75), if have two or one star can also show good correlation. While the ones with no stars, even if in the significant area can have a weak correlation. Negative values show reverse correlation with the intended parameters. However, values less than 0.4 mean linear or weak correlation, values between 0.4 to 0.75 mean significant linear correlation, and values between 0.75 and 1 are defined as strong linear correlation [16].

Table 2: Pearson correlation between groundwater quality parameters of Ghaemshahr-Joybar Plain(Slh;Sihalit, Slg; Slgypsum (2003 and 2015)

2015	EC	TDS	PH	Ca	Mg	Na	K	HCO ₃	Cl	SO4	TDI	Slc	Sld	Slh	Slg	Alk	CA1	CA2	TH	2003
EC	1	0.1**	0.05	0.7**	0.7**	0.9**	0.8**	0.55**	0.9**	0.7**	0.1**	0.43	0.6**	0.9**	-0.77**	0.5**	0.02	-0.6**	0.74*	EC
TDS	0.1**	1	0.027	0.7**	0.7**	0.9**	0.8**	0.5**	0.9**	0.8**	0.1**	0.4	0.6**	0.9**	-0.77**	0.5**	0.03	-0.6**	0.74*	TDS
PH	0.2	0.2	1	0.18	-0.03	0.04	-0.13	0.03	0.1	-0.02	0.06	0.7**	0.5*	0.13	0.03	0.07	.06	0.07	0.1	PH
Ca	0.9**	0.9**	0.21	1	0.8**	0.41	0.7**	0.62**	0.31	0.7**	0.7**	0.6**	0.8**	0.43	-0.66**	0.6**	-0.1	-0.07	0.98*	Ca
Mg	0.96*	0.96*	0.26	0.96*	1	0.38	0.77*	0.6**	0.38	0.68*	0.72*	0.41*	0.73*	0.41	-0.66**	0.6**	0.03	-0.03	0.93*	Mg
Na	0.99*	0.99*	0.19	0.9**	0.9**	1	0.60	0.35	0.97*	0.63*	0.89*	0.23	0.4	0.94*	-0.64**	0.35	0.06	-0.7**	0.42	Na
K	0.78*	0.77*	0.34	0.78*	0.77*	0.75*	1	0.55**	0.57*	0.68*	0.8**	0.34	0.57*	0.63*	-0.67**	0.55*	0.05	-0.3	0.76*	K
HCO ₃	0.74*	0.72*	0.16	0.8**	0.8**	0.65*	0.68*	1	0.22	0.08	0.61*	0.68*	0.75*	0.41	-0.045	0.1**	-0.5*	-0.4	0.6**	HCO ₃
Cl	0.98*	0.97*	0.19	0.88*	0.9**	0.99*	0.74*	0.59**	1	0.67*	0.86*	0.2	0.35	0.9**	-0.67**	0.23	0.25	-0.6**	0.4	Cl
SO4	0.92*	0.92*	.17	0.9**	.9**	.91**	.64**	.59**	.90**	1	.74**	.15	.41	.58**	-.99**	.082	.26	-0.2	0.7**	SO4
TDI	0.99*	0.98*	0.16	0.9**	0.95*	0.98*	0.74*	0.68**	0.98*	0.93*	1	0.47*	0.68*	0.87*	-0.7**	0.6**	-0.04	-0.6**	0.77*	TDI
Slc	0.6**	0.6**	0.78*	0.7**	0.7**	0.5*	0.67*	0.7**	0.51*	0.5*	0.55*	1	0.93*	0.33	-0.11	0.7**	-0.3	-0.1	0.6**	Slc
Sld	0.77*	0.76*	0.61*	0.8**	0.86*	0.7**	0.77*	0.83**	0.67*	0.66*	0.73*	0.95*	1	0.48*	-0.37	0.77*	-0.2	-0.17	0.8**	Sld
Slh	0.87*	0.87*	0.22	0.8**	0.86*	0.86*	0.8**	0.7**	0.85*	0.67*	0.86*	0.57*	0.75*	1	-0.6**	0.41	0.03	-0.7**	0.4*	Slh
Slg	-	-0.9**	-0.17	-0.9**	-0.9**	-0.9**	-0.6**	-0.57**	-0.9**	-0.1**	-0.9**	-0.5**	-0.6**	-0.7**	1	-0.05	-0.3	0.24	-0.7**	Slg

	0.9**																			
Alk	0.66*	0.66*	0.12	0.8**	0.7**	0.57*	0.72*	0.89**	0.52*	0.57*	0.6**	0.64*	0.75*	0.61*	-0.56**	1	-0.5*	-0.4	0.64*	Alk
CA1	0.3	0.29	-0.12	.28	0.2	0.27	0.37	0.01	0.33	0.27	0.34	-0.01	0.11	0.38	-0.27	0.14	1	0.45*	-0.06	CA1
CA2	0.3	0.3	0.12	0.22	0.2	.340	0.38	-0.16	0.43*	0.21	0.34	.058	0.13	0.43*	-0.21	-0.12	0.7**	1	-0.06	CA2
TH	0.96*	0.95*	0.22	0.99*	0.98*	.9**	0.8**	0.8**	0.9**	0.9**	0.9**	0.7**	0.85*	0.8**	-0.9**	0.77*	0.3	0.2	1	TH

** . Correlation is significant at the 0.01 level (2-tailed). * . Correlation is significant at the 0.05 level (2-tailed).

DISCUSSION

In Ghaemshar-Joybar study area, hydro-geochemical and physicochemical data are used with the help of statistical methods such as range, minimum, maximum, mean, median, mode, standard deviation, Pearson correlation, Skewness and kurtosis and conventional hydro-geochemical methods such as Piper and Gibbs for use in analysis, groundwater chemistry control mechanisms, and the factors affecting. Due to the geological status and retract of the middle part and the accumulation of water in the direction of groundwater flow, water stay time rises and this increases chemical reactions. For this reason, in the analysis of these graphs, the relationship between geological conditions, hydro-climate, saltwater and saline fossil groundwater intrusion, excessive exploitations, the reaction between water and rocks, and other effective factors in the control mechanism of groundwater can be used [8].

Statistical analysis: Statistical characteristic of chemical analysis of the study area can be seen in [Table 1]. In this table, the values of range, minimum, maximum, mean, median, mode, standard deviation, Skewness, kurtosis, and coefficient of variation of chemical parameters are provided. Given the normal test and assuming normal test error (α) 0.05, all selected factors have approximate value (P-value) more than test error (α), so there is no reason to reject the assumption of normality of the data (Table-2). By drawing bar graph of the elements and materials measured and calculated in groundwater, normal curve is compared with them. These graphs are drawn after normal test using Relation 1 and with the help of SPSS software after the data have been normalized and standardized. After applying the above, measured and calculated data are analyzed using statistical methods. The following is obtained by comparing statistical values for 2003 and 2015 [Table 2]:

- In both years, minimum values have not changed much, but maximum values in 2015 have increased in form of spots (16th well), especially in discharge area, while this increase has largely not reflected in the mean values. As a result, the radius of influence of these cases is not high and the wells around have normal trend.

- Relative harmony of the mean and median in 2003, and mean, median, and mode in 2015 shows relative homogenization of the solutions entering the aquifer in input in the direction of groundwater flow to drains. In the meantime, the most appropriate method for determining the measure of central tendency of water quality is median values.

- Higher ion frequency is based on the median values in 2003 as Na + K > Ca > Mg, HCO₃ > SO₄ > Cl in 2015 are: Ca > Na + K > Mg, HCO₃ > Cl > SO₄ [13, 14].

In [Fig. 2], box-and-whisker plot for 19 different parameters for 2003 and 2015 have been drawn. According to the figure, the data from these wells due to being out of quartiles and maximum are introduced as outliers, and as the distance increases, outlier of data increases. In this study, in 2003, wells including 18 and 9 (center and drain) and in 2015, wells 11 and 20 (drain) have strong outliers. Weak outlier data in 2003 includes wells 14 (input), 9 and 20 (drain) and in 2015 includes wells 20 and 21 (drain) [Fig.3]. Strong and weak outlier data in 2015 have been drawn into drain. This issue in 2015 can be due to increased pressure of bicarbonate solution (calcium and sodium) from input to drain. As seen in [Fig. 3], the line inside the rectangle shows the median. The medians of all major ions and substances such as TDS, EC, are TDI are located on the left side of the rectangle. This means that the slope of most of the parameters is towards percentile 25. The slope of this line that shows the groundwater quality-variables changes in 2003 and 2015 is positive or zero. The slope of the median line zero in 2015 has rather been more than 2003 and this represents the entry of almost uniform solutions (considering mean, median and mode parameters) making changes in the concentration of qualitative variables of the plain and making them fairly homogeneous. The length of the rectangles represents and index for the variance of the values of each variable from 25 to 75 percentile. The increase in length in 2015 compared to 2003, it clearly was saw in the parameters EC, TDS, and TDI. In [Fig. 3], the bar graph of the normal curve of the elements and substances in the groundwater of Ghaemshahr-Joybar has been drawn and the following is remarkable:

- In the height and number of columns peaks in 2003 and 2015 some differences in some parameters are observed. These differences are due to concentration of input solutions in various forms such as the influence of rainfall, input from the adjacent aquifers, leak, or spray from fossil saline aquifers and seawater intrusion into the aquifer. In the direction of groundwater flow due to the geology, the solution causes chemical

reactions between water and rock. Given the high depth and high stay time in the central parts towards the output, high the water stagnation leads to evaporation from that surface and the collection of these elements in different parts of the aquifer changes the concentration of the mixed solutions. The frequency (or columns height) and saturation parameters such as pH decreased, dolomite saturation did not change, but the rest of the parameters had change from limit low (HCO₃) to very high. In the meantime, EC, TDS, Cl, and Na show two to three times increase. The number of peaks in the histogram in most of the parameters from 2003 to 2015 shows a decline. Major cations and anions with EC and TDS in 2003 have two peaks, and only pH has three peaks. The peak can be caused by the arrival of three separate sulfate compounds, bicarbonate, and sodium chloride into the aquifer. However, the lack of homogeneity in the column of concentrations, especially in large amounts, is due to excessive increase of values along the study area from the end of the middle towards discharge. In 2015, pH had two peaks and EC, TDI, Ca, Mg, HCO₃ one point and one-sided columns, all from left to right, meaning right and positive skew are formed (TDS, Na, Cl, SO₄).

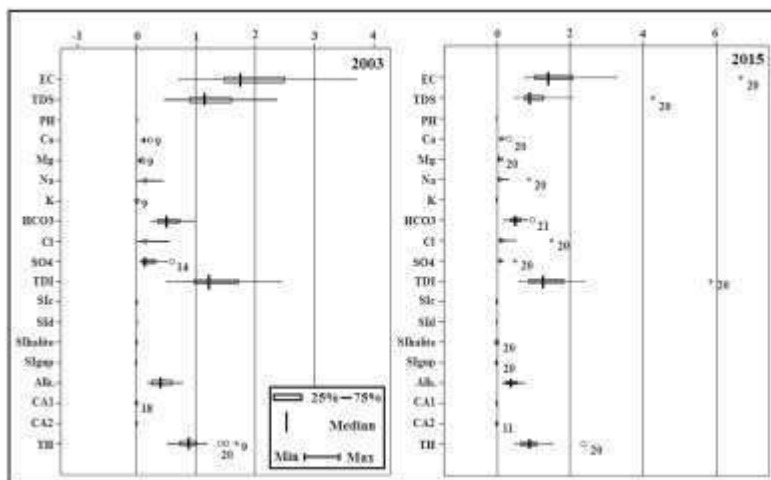


Fig. 2. Box-and-whisker plot for the various parameters of Ghaemshahr-Joybar (M;Mean, S; Skewness, K; Kurtosis, SD, Standard deviation, C.V.; Coefficient variance) (2003-2015).

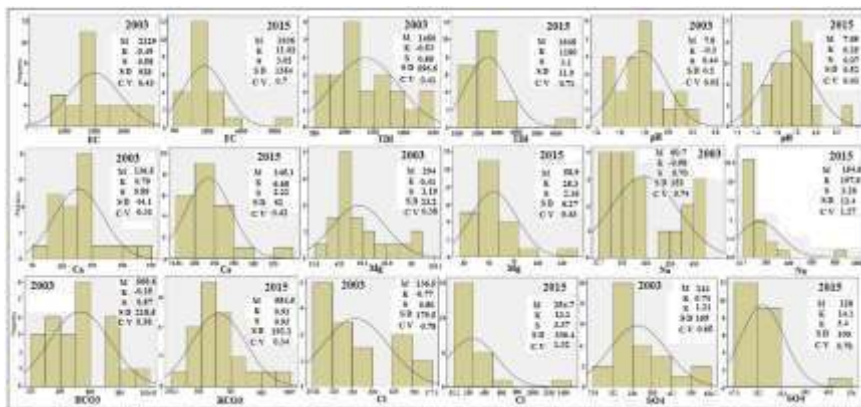


Fig. 3: Normal and bar curves of elements and substances in groundwater in Ghaemshahr-Joybar aquifer (2003-2015).

In this case, high values are placed at the end of the heavy tail of the distribution curve. Given that skewness values in the elements and materials measured are all positive, so the skew is right. Positive skew values in the curve of statistical distribution show that the bottom (heavy tail) on the right (in line with high values) is more than its left side and the bulk of the values (even taking into account the average) than the mean of each parameter tend to the left of the curve. Negative skew values indicate that the ending part is the higher than the distribution graph from the left and the bulk of the values are drawn towards the right of the mean. In positive Skewness, first, small amounts are relatively more than large amounts. Secondly, it represents the last section of the kurtosis curve of this statistical distribution to the right in line with the large amounts skewed, which are longer than the left side, and thirdly, the bulk of the values are drawn towards the left of each parameter. In fact, these three concepts can be due to different solutions, and in some areas from their mixing in the aquifer [Fig.3]. Thus, positive skewness values can be divided into low, middle, and high categories, each of which contains one group and one resource.

Continuity of the columns has reduced, which represents an increase of dispersion of high values in more areas of the study area. In this year, the number of tipping points shows the entry of calcium and sodium bicarbonate solution (from the southern part of plain and mountains of limestone, dolomite and marl) and sodium chloride solution (end of the middle section from the spill and spray of sodium chloride ions of saline fossil groundwater and discharge section and mixing it with saltwater intrusion). Another important aspect is the increase of rocks-water reaction and the formation of sodium bicarbonate and sodium chloride solutions, one part of whose sodium has derived from sodium-rich clay minerals (plagioclase). However, in general, unlike 2003, in 2015, two solutions and their mixing in the area play a central role in the formation of type of water. In hydraulic terms, the formation and composition of these solutions are due to reduction of the pressure of the water column in sweet aquifer due to excessive harvests and almost vertical rising of these ions into the aquifer. Because of water level drawdown in discharge zones, saltwater intrusion pressure enters into aquifers in almost a horizontal position. The combination of these factors along with the evaporation of salty water table in the discharge areas lead to increased intrusion of saline region in the area.

In general, the reduction of coefficient of variation is a reason for homogenization of the set of values along the study area. In the study area, values of the coefficient of variation (CV) in 2003 varied between 0.78 to minus 71.0 and in 2015 between 1.32 to minus 0.71. However, pH values have shown the lowest coefficient of variation in positive values [Table 1] representing a homogenous solution and almost neutral along the area. The standard deviation of cations and anions in both 2003 and 2015 is highly variable. In 2015, calcium cations (40%), sodium (29.3%) and magnesium (7%) had the highest increase, and potassium has dropped nearly 65%. The chloride anions (87%) increased, bicarbonate (12%), and sulphate decreased 37%. The standard deviation of pH is almost the same and low. It shows that, pH is around the center of the mean, which means good and uniform dispersion (neutral pH in both years) in the total study area [Table 1].

Reactions created can also be caused due to constant pH value (at neutral level) during these two years. The standard deviation of the main elements can be the possibility of the highest combination between chloride and sodium (from two sources, from the middle to drain), calcium, and sodium bicarbonate (from input to the middle section) and the mixing of cations and anions remaining in the area of the plain (calcium, magnesium, chloride, and sulfate). In fact, the removal of some compounds is due to lack of sufficient amounts of solvable anions and cations for chemical reactions. In general, the reduction of bicarbonate anion can be derived from the relative decline of rainfall and subsequent dissolution. Sulfate, with reduction of approximately 40% (based on mean, median and mode values) has had the largest decline. Although there is no gypsum deposits, the reason of reduced sulfate is probably the optimum consumption of sulfate fertilizers, absorption of part of it through the roots, and lack of enough solution for chemical composition, which have caused small amounts of sulfate ions to enter into the water. EC and TDS, almost have 0.62 relationship, the increase of standard deviation values from 2003 to 2015 has, respectively been 46% and 50%. This much increase reflects the large changes and number variety, especially from the middle part towards discharge and the homogenization in high amounts. These changes are created due to mixing of seawater and brackish fossil aquifers, indiscriminate harvesting, evapotranspiration, and water level drawdown. High and positive kurtosis values in 2015 are more than in 2003 representing a somehow pointed distribution tending towards the middle that have concentrated in lower part of the tail or heavy tail. Negative or low kurtosis shows a flat distribution, this means data set with little kurtosis tend a high oblong. By comparing the Skewness, it can be said that kurtosis follows the same pattern [Fig. 4] [Table 1].

To illustrate this pattern, skew curve relative to kurtosis is drawn in [Fig. 4]. Correlation of the graph is quadratic of share type. Share figure in 2015 is more complete and has a very high correlation coefficient. By comparing the charts of these two years with [Table 1], significant changes are observed in the study area.

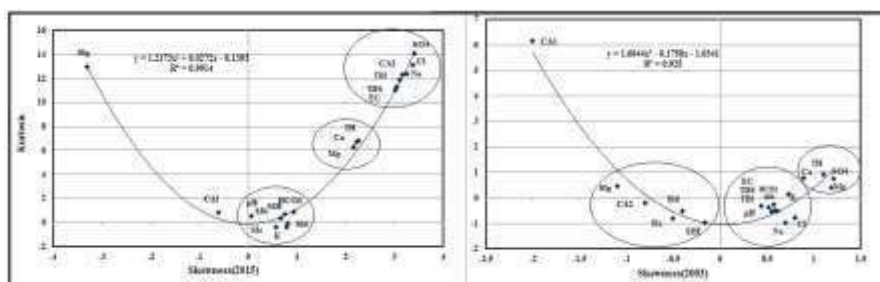


Fig. 4: Kurtosis to skewness chart in Ghaemshahr-Joybar study area (2003-2015).

Increased skewness and kurtosis in 2015 compared to 2003 reflects the diversity of chemical reactions. In 2003, elements and materials measured are nearly concentrated in one area and possibly chemical reactions take place within a specified range. This is while, in 2015, it is as three separate sets and evidently each group is the representative of chemical reactions in groundwater in the direction of the flow. In 2015, precisely ion exchange and the reverse (almost 50% displacement of soluble calcium and magnesium with

deposits sodium and potassium, and 50% reverse chemical reactions takes place) in the sodium chloride solution and its relationship with other groups can will be seen in [Fig. 4]. Given that in 2003, all chloro-alkaline are negative ion exchange prevails. In general, the concentration of ions in one area can be derived from the confluence of three solutions. In 2015, the completion of the curve and its proper distribution can be somewhat due to homogenization of the solution in the input to the aquifer. From figure 3, the type of solution is visible. Sodium chloride solution is due to spray of saltwater intrusion and leakage of chloride sodium ions from brackish fossil aquifers and the bicarbonates is due to dissolution of calcareous, dolomite, and marl sediments and communication of the solutions with each other. In 2015, the amount of pH (7.85) is somewhat more neutral compared to 2003 (7.8), and more homogeneous solution runs in the aquifer. In [Table 2], correlation matrix of data for different hydro chemical parameters of groundwater resources of Ghaemshahr-Joybar plain is provided. From the correlation matrix for 2003 and 2015, the following points have been obtained:

- Most data has positive relationship that reflects the direct relationship with the same hydro chemical data, except for parameters such as pH in 2003 that was negatively correlated with magnesium, potassium sulphate, and in 2015 with chloroalkane, and gypsum saturation profile (Sig), which means by increasing the pH, the ions and parameters listed decrease and or vice versa.

- The correlation coefficient in 2003 varies from 0.022 (a weak positive relationship between the EC-CA1) to 0.999 (strong positive relationship between HCO3-Alk). In 2015, the least correlation 0.003 was calculated for HCO3-CA1, and maximum correlation 0.997 between TDS-EC. In general, Sigup has a reverse correlation with all parameters in both years.

- A strong positive correlation is seen between TDS and EC with most of the parameters except for chloro-alkaline. This strong correlation is observed for both years, with the difference that in 2015 the correlation is much stronger and has increased compared to 2003. Of course, in [Table 3], correlation is obtained with one percent of errors (two stars) and 5% (a star) that can be significant. This means that even small amounts can show a good correlation. Generally, PH has been variable in the range of 7.5 to 8.2 in 2003, and 6.9 to 7.9 in 2015. This means that, it has changed from very weak alkaline state to neutral in 2015. In fact, in the entire study area, the moving solution has been homogeneous and uniform. Except for saturated calcite and dolomite, it has no correlation with any of the elements and materials, and it can be due to the consumption of the solution in saturated calcite and dolomite leading to neutralization of PH solution. However, significant correlations are observed between sodium, magnesium, and calcium with bicarbonate and sodium chloride and calcium, and sodium with magnesium as well as calcium, magnesium and sodium with sulfate (year 2015). The cases are weak in 2003 except for calcium with magnesium and sodium with chloride. In fact, these issues are under the influence of geological formations (water-rock reactions), evaporation and crystallization reactions, intrusion of salt water, and spray of sodium and chloride ions from saline fossil aquifers [Table 2].

Piper chart: according to mean values, ion frequency in 2003 is Na + K > Ca > Mg, HCO3 > SO4 > Cl and in 2015 is; Ca > Na + K > Mg, HCO3 > Cl > SO4. In order to understand the natural status of groundwater in terms of chemical better, using Piper chart(1944), and determining main anions and cations on the charts, one can determine facies of the study area [Fig.5].

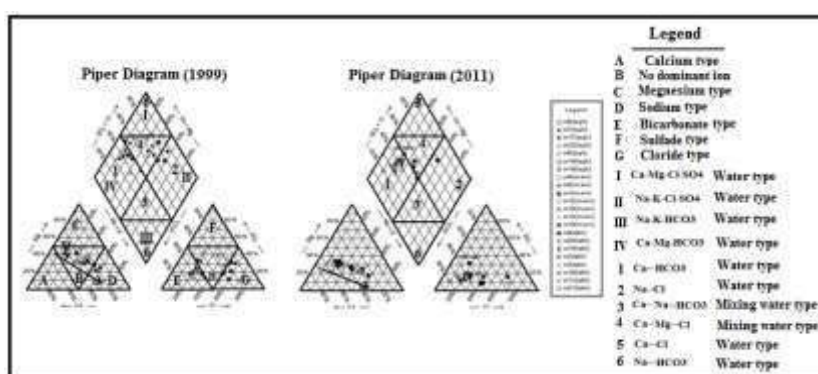


Fig. 5: Classification of ions in triangle diagrams and in Piper rhombus and anionic and cationic charts facies in the study area (2003 in 2015).

According to [Fig. 5], in 2003 and 2015, facies cationic form nearly moves in a straight line from calcium and magnesium side to sodium and potassium corner, which reflects the cationic change from bicarbonate calcic and magnesium (input) towards the sodium chloride (discharge) that is caused by changes in the composition of water on the cation exchange process [10]. This change is in the middle section, which is the deepest part

of the plain and the long lasting time of solutions. By combining the bicarbonate water (calcic and sodic) and intrusion of fossil salt water and seawater, the mixing water are formed and thus no ion is dominant, and towards output, sodium chloride waters are formed. In anionic bicarbonate facies, more bicarbonate and non-dominance of none of the ions and to some extent chloride was saw. Composition and water type in 2015 is similar to 2003, except that; Na-K-Cl-SO₄ type of water has been greatly reduced and most dominant form of water type is bicarbonate (calcic and sodic) and mixing of Ca-Mg-Cl with sodium chloride, along with calcium and sodium sulphate on the spot in the western part (well; 22) in input area, and end of the discharge on the beach (well 11) have been observed. These two wells have converted 2015 with cation exchange bicarbonate calcic (well 22) and sodium bicarbonate (well 11). According to the above description in the Piper rhombus in 2015, the water type of feeding water to drain is bicarbonate calcic (as point sodium bicarbonate) and mixed sodium chloride type. As a result, most type of waters in the study area are formed in the direction of groundwater flow from input to drain including Ca- HCO₃ (4 and IV) with Na-K-Cl-SO₄ (2 and II) (mostly sodium chloride) with a mixture of Ca-Mg-Cl water types prevailing. This can be due to a solution, which is alkali-rich in some places and is rich of alkali soils along the way. As a result, exchange and reverse ion exchange in rock-water weathering reactions play an important role in terms of exchange.

Gibbs graph: Gibbs (1970) explained a general model in relation to major anions of water chemistry to recognize these reactions. According to the results, he offered three major hydrological processes that include input from the atmosphere, weathering of rocks (reaction and interaction between water and rock), and evaporation and crystallization [Fig. 6]. Ghaemshahr Plain, due to humid conditions, with relatively good vegetation and rivers full of water, but due to rice cultivation, which requires a high consumption of water, high water table in the output of the plain, relatively high evaporation of groundwater, and saltwater intrusion has caused %50 of selected samples (11 wells) to be fall in water-rock reaction area in Gibbs diagram and the rest within the evaporation area (year 2015). The value in 2003 was about 45%. As a result, in the last 12 years, 5% has been added to evaporation and crystallization. However, the chemical weathering of minerals forming the rock, which is geology of the heights and alluvial deposits and evaporation- crystallization, is the main driving force controlling groundwater chemistry of the study area [13, 14].

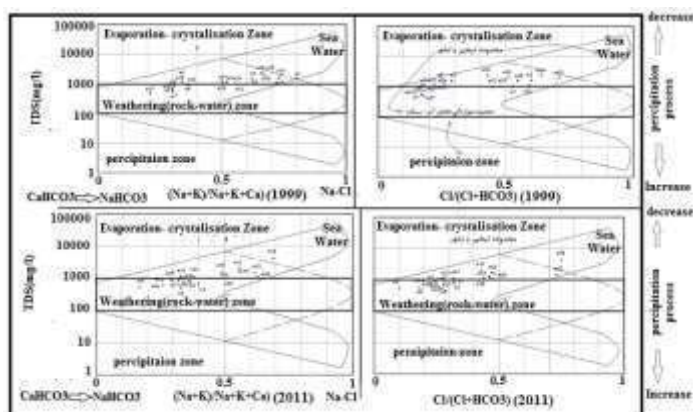


Fig. 6: Gibbs charts (anionic and cationic) in Ghaemshahr-Joybar study area.

RESULTS

Camel According to studies, the following results were obtained

Kolmogorov–Smirnov test with significance level of 95% and decision criteria of 5% was run to determine the normality of the data. Accordingly, there is no reason to reject the null hypothesis, and this means that the intended samples follow a normal distribution.

In this study, median and mode have been more effective in determining the ion frequency and have been of great help to common methods. Ion frequency obtained represents a performance increase of chloride ion and reduction of sulfate ion entry to the study area from 2003 to 2015. Given that in the area, there are no deposits of gypsum and the like, the reduction of the amount of sulfate compounds in groundwater in 12 years (2003-2015) can be caused by lack of adequate solution suitable PH conditions for the reaction. The existence of chloride is due to two sources of fossil water through leaks or spray of solution of sodium chloride and seawater intrusion into the aquifer. Pearson correlation showed that the main ions have a very strong correlation with each other, which confirms the geological relationships with groundwater and saltwater intrusion and saline fossil groundwater effects. In this connection, EC and TDS have a very strong correlation with all anions and cations and their sum (TDI) except PH. On the other hand, a strong correlation between sodium and chloride and calcium and magnesium with bicarbonate and to a lower extent sodium with

bicarbonate in both years shows the groundwater that result from limestone, dolomite and marl structure and their mixing in the mid-range in line with groundwater flow direction with fossil groundwater brackish and saltwater intrusion. Histograms and frequency charts with normal curve represent the number of solutions input and their scattering along the study area. By comparing the histogram and frequency curve with skewed, kurtosis, and the coefficient of variation values, generally increase of these parameters indicates asymmetry in the distribution. The presence of high spot samples causes the deviation of the distribution toward these values (high), as a result, the ending part or the heavy tail of the curve is related to high values. This in fact represents at least two or at most three very different populations, which probably stems from two or three sources of solution. Kurtosis can also follow this pattern, because according to the skewness-kurtosis connection diagram, it is a quadratic equation with a correlation coefficient above.

Piper method in 2003 shows the existence of three bicarbonate solutions (from the southern highlands including calcareous, dolomite, and marl sediments), sulfates (penetration of urban, rural, agricultural, and industrial wastewater and input through seawater intrusion), and intrusion of the sodium chloride solution through saline fossil aquifers and seawater. In 2015, bicarbonate solution and two different sodium chloride solutions are created. In 2003, reverse ion exchange prevailed, while in 2015 this amount reached 50% and includes the rest of ion exchange. This is justified as follows:

- In 2015, the governing reactions are unilateral ones between dissolved calcium and magnesium (dissolution of calcareous, dolomite and marl sediments in the study area) with sodium (rainwater) and solid potassium (marl, Na-feldspar) and deposits. In 2015, this reaction became bilateral and according to assimilation of water-rock reactions, suitable condition for the movement is created.

- Sulfate shows relative 40% decrease in 2015 compared to 2003, given that there are no deposits of gypsum in the range, this reduction could probably be due to reduced consumption of sulfate fertilizers or optimized fertilizer consumption. On the other hand, absorption causes a significant portion of the reduction of these ions in groundwater. Studying statistical methods with commonly used method in hydro geochemistry and their comparison represent a relatively good coordination between the two. Thus, statistical methods can be used as an adjunction in analysis in the studies to achieve better results.

CONFLICT OF INTEREST

There is no conflict of interest.

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FINANCIAL DISCLOSURE

None

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ARTICLE

THE STABILITY ANALYSIS OF THE SLOPE OF THE EMBANKMENT DAM OF MOSHAMPA

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ABSTRACT

One of the important points in dam designs is that there are many methods to investigate the stability of embankment dams; among them, Limit Equilibrium methods have been mostly used in terms of simplicity and spending less time and costs. In this study, by numerical modeling method and using Geoslope software, it has been tried to analyze the stability of embankment dams in order to remedy the defects in the Limit Equilibrium methods. The study dam is Moshampa, which is a gravel reservoir dam with the central Natravay core. The results from the analyses with Geoslope software show that embankment dams with a clay core have an appropriate behavior in several cases in terms of stresses and seepage-caused forces and are stable in terms of statistics, as well as their implementation economically is more affordable than other types of dam.

INTRODUCTION

Embankment dams are made of embankment materials that their behavior and properties can be changed by changes in the moisture content, changes in the stress extent, changes in the drainage position, changes in the time, or changes in other factors. This is one of the main distinctions between embankment structures and concrete and steel structures.

Due to basic need of the vast country Iran to harness and store the surface waters in order to provide water for drinking water consumption, water needed for agriculture and industry, electric power generation, control of flood and river flooding, etc; as well as the first step in the development and utilization of the country's water resources is construction of high dams.

With regard to the changes in the soil properties in contact with water and given that an embankment dam is in relation to water and its associated reservoir forces, so the stability of embankment dams has long been of interest to researchers and experts in dam engineering science.

With respect to the mentioned points and given that dams are structures that breaking and damaging them can cause irreparable life and financial damages, technical and economic considerations in the design of high dams in Iran have shown that in many cases, embankment dam with clay core is preferred over other options in dam designs and is a preferred choice in final design; so that statics show that in our country, of about 300 constructed and under-construction dams, more than 200 dams are of embankment dams type, which reveals the importance of this type of dams in many ways. Hence, controlling the stability of this type of dams seems to be an essential and serious issue. The central core in embankment dams and gravel dams has the task of sealing and storing water behind the dam. Due to the impermeability property of clay and its abundance in the nature, the central core is most often made of clay.

Structural integrity of the dam should be preserved during its performance or during events occurring in the operation time. For this purpose, the corresponding range of load and stress conditions will be discussed. Often, in all predictable events, the dam stability is provided by stresses placed on acceptable levels and the integrity of the dam core. In this study, due to the use of clay materials as the core of the dam, the stability issue of the dam slopes in the upstream and downstream will be discussed, and the dam Moshampa will be analyzed and evaluated as a case study.

In another study, it has been tried to investigate two scientific issues of the day, i.e. the slope stability and the neural network; and the slope stability coefficient of the embankment dam with the neural network was determined and compared with the outputs of the finite element Plaxis software. For training the neural network, the information obtained from 150 models of embankment dams in the finite element Plaxis software were used, and also the impact of effective parameters on the slope stability coefficient of embankment dams was determined [1].

During the investigation of a case study on Ilam dam by numerical modeling using Finite Element method and Geoslope software, the stability of embankment dams was analyzed to eliminate defects in the Limit Equilibrium method [2].

KEY WORDS

Embankment, dam, water

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During another study, by the use of Geoslope software, the safety factors against slip and rupture on the slopes of an embankment dam with fixed specifications and geometry were investigated in two ways of Entry and Grid&Radius&exit, and it was shown that the results for the safety factor in the case Grid&Radius for the upstream and downstream slopes is about 75% more than the case Entry&Exit [3].

The stability analysis of embankment dam

In embankment dams, the core prevents water seepage. A segmentation embankment dam usually includes a central dense Natravay embankment core or an embankment core with slope toward upstream or a clay mixed core that its dimensions depend on the availability and specifications of materials in the site or close to it and will be required to prevent high seepage gradients. The core of embankment dam is run in the form of a rolled clay core or an impervious area such as a thick cover or a thin diaphragm or sheets of wood, steel, asphalt, or masonry. The following figure shows the rolled clay core of the case dam Moshampa which has been used in the analyses.

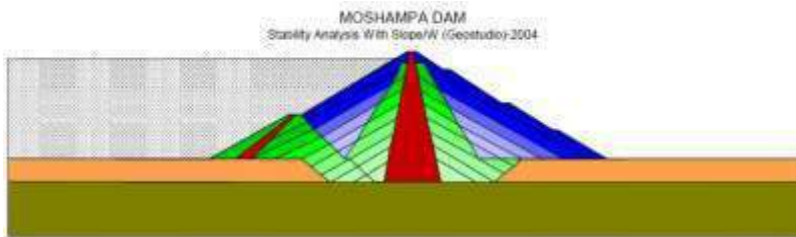


Fig. 1: The clay core of Moshampa dam.

The core in the place of embankment dam can be built in three forms and positions as follows:

1. Vertically in the middle or center of the core;
2. Slightly steeped towards the upstream of the dam;
3. Quite steeped towards the upstream of the dam.

If the downstream of the core has the slope 1V:0.5H or its slope is more towards the upstream, then the core is considered as moderately slanting core. The core is considered as slanting core if the shell of the downstream and the core have a self-stable slope at about 1V:1.25H. Usually, this amount of slope is used in the gravel dams in which the downstream sell, firstly, is made independently, and after a while, the filter and the core are run on the upstream. The upstream slope of the core is always selected more softened than that of the downstream because the water level increases as the water depth increases, and the core width should be increased.

There are different methods to investigate the static stability of the embankment dams. Some of these methods are: 1) limit equilibrium; 2) limit analysis (lower and upper limits of the plasticity theory); and 3) Finite Element method. The methods 1 and 3 are very common to determine the slope stability of ranges of an embankment dam. The Finite Element method is appropriate for the determination of distribution of stresses and strains within the levee and its foundation. These stresses and strains provide a complete feature of the behavior of the dam and offer the possibility to calculate the safety factor by comparing the shear strength on the surface in which the most vulnerable surface can be moved. Anyway, over the last few decades, the development of the Finite Element method combined with the increasing abilities of the strong computers allows designers of the embankment dams to analyze stresses and strains accurately and with real assumptions. The accuracy of the results, in fact, is only subject to the reliability of the input data on soil characteristics of the construction site.

In the analysis by the Finite Element method, the minimum and maximum principle stresses are calculated throughout the body and the foundation of the dam, and the shear stresses are determined from the results of the principle stresses. The resulted shear stresses are compared with the existent shear strength throughout the body and its foundation and then conclude the safety factor in the face with fracture. The Finite Element method for the first time was suggested by Clough & Woodward for Geotechnical problems in 1967, but application of this method for analyzing the large embankment structures such as embankment dams was introduced by Dancan in 1996. In 1976, Clough and Zienkiewicz offered too general reports for the static analysis of the embankment dams. In 1976, Kullhaxy & Gurtowski studied the phenomenon of load transfer and Hydraulic Fracturing in the segmentation dams and they found that the phenomenon of load transfer in the embankment segmentation dams occur because of changing hardness in the adjacent areas. Keskin et al (2004) have investigated the effect of the Natravay core thickness and the seismic coefficient value 1 on the stability of both upstream and downstream slope of Kizilaca dam. Their aim has been to determine the final choice of the slopes of the Natravay core from the perspective of the optimal stability of the outer slopes of the dam, to construct economically the Natravay core and to determine whether or not withdraw the alluvium below the dam.

Based on the studies conducted by Bob & Mermel (1968) after the phenomenon of overtopping, the most important factor (over 30%) for the failure of embankment dams stems from the piping phenomenon. Cracks caused by the negative effective stresses from the impact of forces acting on the body of the dam

are one of the causes of this phenomenon, which can be estimated by the Finite Element method. So understanding the distribution of stress and deformation in the dam body to analyze cracks and development of them is inevitable.

The phenomenon of stress transfer or arching

One of the important and dangerous issues in the embankment dams is the arching phenomenon inside the dam body. This phenomenon consists of leaning the core (stress transfer) due to being softer than the stiff shell which reduces the vertical pressure on the core; (or vice versa) this phenomenon occurs due to the differences in the core density relative to the shell (or vice versa). The coefficient of arching within the core of embankment dams is obtained by the equation (1):

$$(1) \quad \text{Arching coefficient} = \frac{\sigma_v}{y \cdot h}$$

In which, σ_v is the total vertical pressure within the core (Kap), y is the specific gravity of the core (KN/m³), and h is the embankment height (m).

If stresses at each elevation value reduce to values smaller than water pressure at the same values because of arching, then it might result in Hydraulic Fracturing or formation of cracks caused by high water pressure.

Fracturing

Fracturing of embankment dams can be caused by the slope instability of the downstream and upstream of the dam. Typically, slipping occurs as a result of the loss of shear strength across weak planes or inside soils. With the release of uncontrolled waters hold behind the dam, it becomes clear that a small amount of fracturing has been occurred, and any abnormal appearance of the soil shear strength that is in contrary to the basic functions of the waters behind the dam properly represents the fracture, which can be a result of the arching phenomenon.

Comparing the Stability Analysis in the Finite Element Method and in the Limit Equilibrium Method
The main unknowns in the stability analysis of the roof slope in the Limit Equilibrium method is the normal stress at the bottom of each piece. The safety factor for each piece in the limit equilibrium method is same, and each piece has a balance of forces. The advantage of using the stresses resulted from the Finite Element method is that the safety factor is independent for each piece and finally calculates the total safety factor. In this case, the safety factor against the slipping is obtained by equation (2):

$$F.S = \frac{\sum_1 \tau_r \Delta L_1}{\sum_1 \tau_0 \Delta L_1} \quad (2)$$

In which, τ_r is the shear strength of each part of the slipping surface, ΔL_1 is the length of the slipping surface component, and τ_0 is the shear stress in the i -th component surface. The value of τ_0 is determined by the use of the stress analysis of each element and also τ_r is obtained by considering Mohr-Coulomb law and by the use of equation (3):

$$\tau_r = C + (\sigma_n - u) \tan \phi \quad (3)$$

In which, u is the pore water pressure. The local concentration of the shear stresses could not certainly be achieved in the arrangement of the limit equilibrium, in which the normal stress of the bottom is basically caused by the weight of the piece, and this is one of the concentrations in the Limit Equilibrium method. The Finite Element Analysis is a method that, in addition to the safety factor against fracturing, investigates deformations as well, but the Limit Equilibrium methods achieve only the safety factor against fracturing. The accuracy of the embankment dams design depends not only on the prediction of the safety factors of slopes but also on the prediction of displacements. So, displacements can be restricted within the limits of acceptable that for this end, the use of analytical methods based on the stress-strain relations of materials is suggested.

Geoslope software

Geoslope software have the potential to enter the material properties close to the field conditions, and unlike other software, is able to analyze the semi-saturated environment. Program SIGMA/W is a Finite Element software product that can be used for the analysis of stress and deformation of embankment structures. Also, its comprehensive formulation helps to analyze both simple and too complicated issues. Material properties in SIGMA/W can be exploited by the use of effective stress parameters for the analysis of drained soils or by total stress parameters for the analysis of non-drained soils.

Pore water pressure during construction of dam

In materials indicated by the total stress parameters, changes in the non-drained water pressure can be determined from changes in the total stress using the Skempton pore water pressure parameters A and B. By specifying the material properties as total stress parameters, the options of the pore water pressure parameters A and B exist and the program SIGMA/W determines changes in the pore water pressure

based on these parameters. The equation investigation for changes in the pore water pressure has been shown in equation (4) by the use of parameters A and B:

$$\Delta u = \beta \left(\frac{\Delta \sigma_1 + \Delta \sigma_2 + \Delta \sigma_3}{3} \right) + \alpha \sqrt{(\Delta \sigma_1 - \Delta \sigma_2)^2 + (\Delta \sigma_2 - \Delta \sigma_3)^2 + (\Delta \sigma_3 - \Delta \sigma_1)^2} \quad (4)$$

In which, $A=\alpha$ and $B=\beta$. The pore water pressure parameters A and B in the program SIGMA/W are defined using functions. The parameter B is defined as a function of the negative or positive pore water pressure which helps for the analysis of the saturated and unsaturated soil conditions. In this study, using the above-mentioned parameters A and B, the pore water pressures during the construction of the dam are estimated in the effect of the stress changes.

The relations governing on the stability analysis and slope/w software

The static analysis in this study has been done based on the application of the matric suction. In the stability analysis in the Limit Equilibrium method by the help of SLOPE/W, there are only two ways to apply the matric suction in the shear strength of unsaturated soil and the estimation of the safety factors; one of them is the determination of materials suction friction angle () which does not have a high accuracy due to considering it as fixed in the depth by the software. The second way is the definition of moisture curve of materials for the estimation of the expected suction from this curve which acts much more accurate the previous method (Krahn, 2014). Thus, in this study, according to the equation (5) (Vanapalli et al., 1996), the moisture curve of materials has been used to calculate the shear strength of the unsaturated soil and finally to estimate the safety factors:

$$s = c' + (\sigma_n - u_a) \tan \phi' + (u_a - u_w) \left[\left(\frac{\theta_w - \theta_r}{\theta_s - \theta_r} \right) \right] \tan \phi' \quad (5)$$

In which, c' and ϕ' are adhesion and effective internal friction angle, respectively; θ_w is the value of irreducible moisture; and θ_r is the moisture value at different suctions. The safety factors in the stability analysis by the Limit Equilibrium method as advised by Mahdavi et al. (2010) have been obtained based on the Morgenstern Method (Morgenstern, 1963). Because due to considering the synchronous effect of all the forces, it usually concludes a lower safety factor and has a less error percentage than other methods. The properties of the intended materials as the stuff of the homogeneous dam body was selected based on the unsaturated soil hydraulic database (UNSODA), and for this purpose, the soil sample with the code 2360 was selected from this database as clay soil with low permeability and was used in the modeling. The physical specifications, the average of the shear strength parameters, as well as the gradation curve of materials are presented in [Tables 1 and 2] and [Fig. 2].

Table 1: Specifications of the selected sample (Anon, 1996)

Sample number	Soil kind	The soil special dry weight (gr/cm ³)	The special weight of the soil solid grains (gr/cm ³)	The water content in the mode	volumetric content in saturated	Saturated hydraulic conductivity (cm/day)
2360	clay	1.73	2.573	0.492		5

Table 2: Specifications of the selected sample (Anon, 1996)

Soil kind	Optimal moisture (%)	Adhesion in the compressed mode (C ₀) (KN/m ²)	Adhesion in the saturated mode (C _{sat}) (KN/m ²)	Internal friction angle (degree)
Sticky clay soil	17.3	91	14	28

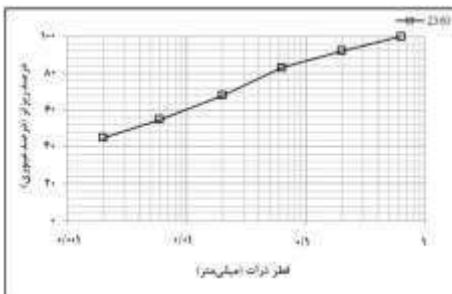


Fig. 2: Grained curve of the selected sample.

Determination of the parameters under investigation in the analysis for the seepage and stability of the reservoir rapid drawdown

The rapid drawdown occurs when the water level in the vicinity of the slope falls so sharply that the soil inside the slope does not have enough time to drain and the fryatic level inside the slope could not appropriately follow the final level of the reservoir water and stays for a while in its original location

THE IIOAB JOURNAL

(Griffiths & Lane, 2000). One of the most important factors in the phenomenon of the rapid drawdown is drawdown ratio and drawdown rate. The drawdown ratio is expressed as L/H, where as shown in Figure 3, L is the value of drop in the reservoir level due to the drawdown and H is the balance of normal water level in the reservoir. Also, according to Figure4, the drawdown rate means the dropped balance of the reservoir water as compared to the time, which is shown by R, and its unit is centimeters per day (cm.day) or meters per day (m.day) (Berilgen, 2007). America Development Organization (Anon, 1987) has suggested the critical drawdown rate as equivalent to 0.5 feet (15 cm) per day. To investigate the effect of the drawdown rate on all the analyses, four rates 0.15, 0.5, 1, and 2 were used.

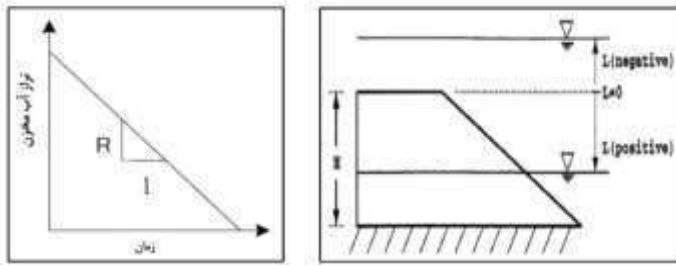


Fig. 4: Drawdown rate (Berilgen, 2007). Fig. 3: Drawdown ratio (Griffiths & Lane,2000).

Soil water characteristic curve was estimated by the use of four methods existing in seep/w software. In addition to them, based on the real data UNSODA, a total of five kinds of soil water characteristic curves were obtained. Also, the permeability functions were estimated based on the three methods available in seep/w software and by the default of the above characteristic curve. The statistic parameters of Root Mean Square Error (RMSE) and the indicator Nash-Sutcliffe (NSE) were calculated to determine the curve by the Best Estimation in relation to the real data UNSODA (KBE) and the Worst Estimation in relation to the real data UNSODA (KWE) and were used in its modeling according to [Table 3]. In addition to the selection of the above permeability functions, the use of linear estimation (Ksat) (Linear Estimation: in zero mutric suction, $K=K_{sat}$ and in mutric suction=-100kpa, $K=K_{sat}/100$), which is equal to the saturated hydraulic conductivity and is independent of mutric suction and the function obtained from the real data (KUNSODA), generally has led to the application of five kinds of hydraulic conductivity function in all the analyses. An example of hydraulic specifications of materials in order to use in the modeling has been provided in [Table 3]. In addition to the stability analysis, the soil water functions indicated in the following table has been used in Transient State Seepage Analysis (rapid drawdown of the reservoir) as well.

Table 3: Hydraulic conductivity and sticky soil water functions in order to use in the modeling

Hydraulic conductivity functions	Soil water functions	Symptoms
K_{BE}	θ_{BE}	$K_{BE} (\theta_{BE})$
K_{WE}	θ_{WE}	$K_{WE} (\theta_{WE})$
K_{LE}	θ_{BE}	$K_{LE} (\theta_{BE})$
K_{LE}	θ_{LE}	$K_{LE} (\theta_{LE})$
K_{LE}	θ_{sat}	$K_{LE} (\theta_{sat})$
K_{UNSODA}	θ_{UNSODA}	$K_{UNSODA} (\theta_{UNSODA})$
K_{sat}	θ_{sat}	$K_{sat} (\theta_{sat})$

Designation of the optimal dimensions of the homogeneous dam level

In this study, the optimal geometric dimensions have been calculated based on the genetic algorithm provided by Montasery et al. (2010) located on the impermeable foundation, which almost is in accordance with the existing design criteria; and comparing to the method proposed by American Development Organization, it suggests smaller dimensions, but it has similar results when comparing to the values proposed by Sherard. The above algorithm has been proposed to design the optimal dimensions of heterogeneous embankment dams. Thus in this study, to determine the optimal dimensions of homogeneous embankment dams, the same stuff of core and shell materials are selected, and the optimal dimensions are calculated based on this. Data necessary to determine the optimal dimensions of the homogeneous embankment dams section are: dam height (H), dam crest width (b), the water level of the dam upstream (h), the effective adhesion and angle of materials internal friction, the maximum dry density and permeability density of materials.

RESULTS

Dynamic analysis of the dam moshampa

In this section, dynamic analyses of the dam Moshampa on critical section are examined. The history of input acceleration, the geometry of model, material properties and the method to determine displacements are provided and finally, residue displacements are calculated.

Analysis using equivalent linear method

In the Equivalent Linear Method, three parameters are taken into consideration: maximum shear modulus G_{max} , changes in the modulus reduction ratio G/G_{max} , and damping with the shear strain. The solution is completely linear elastic, but by some times of trails and errors the best shear modulus and the intended damping for the equilibrium equation are calculated.

Determination of displacements the slipping block newmark

In the Limit Equilibrium method, the safety factors less than 1 in the quasi-static conditions represent the movement of the slipping surface under investigation. In these circumstances, in fact, the earthquake force is more than the resistance of the considered slope, and the difference between these quantities leads to applying the force on the slipping block and finally displaces the block. This idea was proposed by Newmark for the first time. The difference between the induced acceleration and the critical acceleration k_y results in the speed in the slipping block, and finally, displaces the block. In fact, during an earthquake, the slipping mass moves across the plane from the moment that the safety factor is less than 1, and stops at the time and location in which the stress from earthquake is less than the resistance of the slipping surface, and the balance is reestablished. Based on the relative displacement quantity of the slipping surface that may be in the range of a few centimeters to several meters, the stability and instability of the dam is investigated.

The slope stability of the dam body is estimated by the use of a computer program GEO-SLPOE/W-2004. In this program is based on the methods Bishop and Spencer, and is able to estimate the safety factor on the fracture levels in the circular, wedge or any arbitrary form by the use of body segmentation methods. In this program, the fracture level related to the least safety factor is obtained, which is compared with the allowed safety factor under development by authorities.

Seismic input on dynamic analyses

The conducted dynamic analyses are based on the earthquake history in MCL conditions. The earthquake acceleration history and acceleration response spectra with 5% damping has been obtained. The history of input acceleration has been obtained by reforming the acceleration history of water station. In addition, to have more reliability and control in the stability calculations based on the recommendations of the Southern California Earthquake Center Regulations "DMG 117 Guidelines", for seismic coefficient $K=0.15$ with a minimum of safety factor $S.F=1.1$ and finally for an earthquake with a magnitude $M=7.4$ and $a_{max}=0.43g$, seismic coefficient $K=0.20$ (which is equal to the maximum accelerations of designation of the seismic countries such as "Turkey, Korea, and Japan" as well) with a minimum of safety factor $S.F=1.00$ was done as well. The history of the crest acceleration is as in the [Fig. 5].

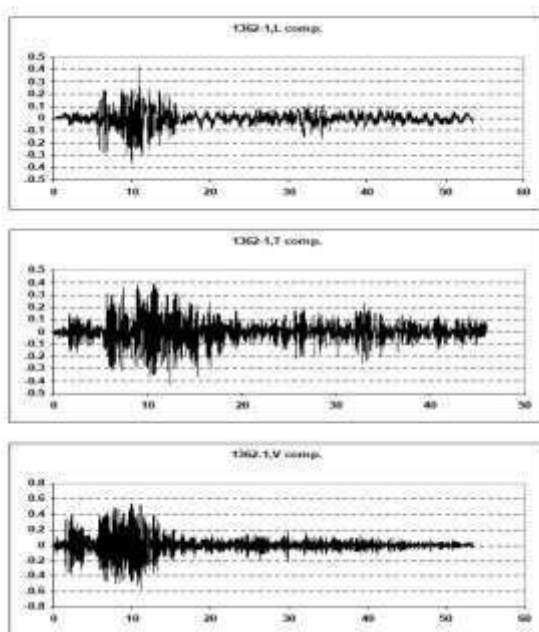


Fig. 5: The acceleration of the reformed water map for MCL level.

Materials Properties in Dynamic Analyses

As mentioned previously, the dynamic analyses have been done by the Equivalent Linear Method. It was noted that usually, there are three basic parameters as follows:

- The maximum shear modulus of materials
- Shear modulus reduction with increased shear strain
- Increased damping with increased shear strain

All above parameters are obtained from the special dynamic experiments. Also, some relations offered by different researchers can be used that in these studies this way has been applied.

Table 4: The maximum shear modulus for the dam body

Material kind	Area	Maximum shear modulus (Gmax)	Reference
Clay core	1	$3270 \frac{(2.97 - e)^2}{1 + e} (\sigma'_0)^{0.5}$	Hardin & Black (1968)
Filter and drainer	2	$220 K_{2max} (\sigma'_0)^{0.5}$	Seed & Edriss (1970)
Corner-rounded sell stone	3	$8400 \frac{(2.17 - e)^2}{1 + e} (\sigma'_0)^{0.55}$	Kokusho & Esashi (1981)
Rockfill	4	$\frac{13000 \times (2.17 - e)^2}{1 + e} (\sigma'_0)^{0.55}$	Kokusho & Esashi (1981)

Table 4: the values of critical accelerations and residue displacements in the upstream and downstream slipping surfaces

Slope	Slipping block	Critical acceleration coefficient (Ky)	Horizontal displacement residue (cm)	Vertical displacement of (cm)
Upstream	SU1	0/19	44	21
	SU2	0/24	83	40
	SU3	0/25	107	51
	SU4	0/27	145	69
Downstream	SD1	0/29	0	0
	SD2	0/43	9	5
	SD3	0/45	23	12
	SD4	0/54	24	12

Slope Stability Analyses of Slopes of Moshampa Dam Body

1. Critical sections
2. Load mode
3. The mode of construction ending
4. The mode of stable seepage
5. The mode of half-full reservoir
6. The mode of rapid water drop in reservoir

Table 6: The allowed intended safety factors in slope stability analyses

Mode	Load mode	Load mode	Minimum of allowed safety factor
1	End of construction	1/4	For the upstream and downstream slope
2	Half-full reservoir	1/5	For the upstream slope
3	Rapid water drop in reservoir from the normal balance	1/2	For the upstream slope
4	Stable seepage from the normal balance	1/5	For the downstream slope
5	Mode 1 with earthquake loading	1/15	Seismic coefficient equal to 0.1g
6	Mode 1 with earthquake loading	1/10	Seismic coefficient equal to 0.12g
7	Mode 1 with earthquake loading	1/00	Seismic coefficient equal to 0.15g
8	Modes 2 and 4 with earthquake loading	1/15	Seismic coefficient equal to 0.12g
9	Modes 2 and 4 with earthquake loading	1/10	Seismic coefficient equal to 0.15g
10	Modes 2 and 4 with earthquake loading	1/00	Seismic coefficient equal to 0.2g

Overall Conclusion by the Limit Equilibrium Method

From the results of the slope stability analyses conducted on the critical sections of the dam in different loading modes and in static and quasi-static conditions, it can be concluded that, in general, the stability of much of the dam, which is located in riverbed and alluvial foundation, determines the slopes of the dam body. According to the analyses results, the stability of the dam slopes on this location in static conditions has been well provided; and in the quasi-static conditions, the stability of the dam slopes are well provided as well.

Static analyses and seepage analyses in the finite element method by the plaxis software

The results of the seepage analyses are expressed to determine the seepage amount of the body and foundation of the dam and the flow gradients and, in general, to investigate the stability against the seepage forces.

The Aim of Seepage Calculations

1. To determine the equi-potential lines, water pressure, and current
2. To calculate the output rate of the body and foundation;
3. To calculate the hydraulic gradients in the dam core and current focus points.

Sections under Examination in the Seepage Analyses

According to the longitudinal profile and cross-sections of the dam, it is observed that there is an alluvial foundation with depth ~22m and length ~120m from the riverbed bellow on the dam axis, which is exploited to seal the foundation from bellow the core. To gain an estimation of the output rate and the gradients available in the foundation, the rock foundation section with depth 200m has been modeled.

Table 7: Permeability characteristics of the materials of the body of the dam Moshampa

Material kind	Clay core	Filter	Drainer	Upstream and downstream shell	Rockfill in the exterior shell of the upstream and downstream
Permeability coefficient (cm/s)	$K_x = 1 \times 10^{-6}$ $K_y = 1 \times 10^{-7}$	$K = 1 \times 10^{-4}$	$K = 0.5$	$K = 1 \times 10^{-3}$	$K = 0.1$

Table 8: The results of seepage analysis in section 1 (in the riverbed) of Moshampa dam with the sealing curtain in different depths

Depth of the sealing curtain	Maximum gradients in the clay core	Average gradient in the foundation	Maximum gradient in downstream output of the core	Lifting force in downstream	Total output rate	Total output rate	Output rate ()
0	1/7	1	0/2	1/5	274	8650000	$1/37 \times 10^{-3}$
60	1/7	0/7	0/1	1	220	6940000	$1/1 \times 10^{-3}$
80	1/7	0/6	0/1	0/9	195	6160000	976×10^{-6}
100	1/7	0/4	0/8	0/7	173	5450000	868×10^{-6}
120	1/7	0/3	0/6	0/6	154	4850000	768×10^{-6}
140	1/7	0/3	0/6	0/5	134	4230000	670×10^{-6}

Table 9: The results of seepage analysis in section 2 (section in the flanks) of Moshampa dam with the sealing curtain in different depths

Depth of the sealing curtain	Maximum gradients in the clay core	Average gradient in the foundation	Maximum gradient in downstream output of the core	Lifting force in downstream	Total output rate	Total output rate	Output rate ()
0	1/4	1	0/2	2/2	330	10500000	$1/65 \times 10^{-3}$
70	1/4	0/5	0/15	0/9	170	5250000	833×10^{-6}
90	1/4	0/4	0/1	0/7	132	4160000	660×10^{-6}
120	1/4	0/3	0/05	0/5	108	3400000	540×10^{-6}

140	1/4	0/2	0/05	0/4	97	3050000	485×10 ⁶
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CONCLUSION AND SUGGESTIONS

With regard to the complicated permeability texture in the foundation of Moshampa, two different sections have been considered to analyze the seepage and to determine the output rate and the hydraulic gradients in the core and downstream of the body. To obtain the total output rate with respect to the permeability texture of the foundation, the length of sections 1 and 2 has been considered equal to 200m. For section 1 (section in the riverbed) in the case with and without sealing curtain with depths 60, 80, 100, 120, and 140, the seepage analyses have been done. For section 2 (section in the flanks), the sealing curtain with depth 70, 90, 120, and 140 has been analyzed as well.

The output rate from the total body and the foundation resulted from all section in the case without the sealing curtain has been about 20000000m³/year, which is significantly reduced by embedding the sealing curtain with different depths. Also, value of the average hydraulic gradient of the lifting force in the foundation and the downstream foundation is reduced significantly by embedding the sealing curtain. With regard to the permeable texture of the foundation rock and that the permeable texture implies in the lack of a rock with a very low permeability at depths of up to 120m and by embedding a sealing curtain with depth 120m, the hydraulic gradients are in the allowable mode; and based on the analysis results, the deepness of the sealing curtain to more than 200m does not have a significant impact on the output rate reduction, and with respect to this issue that sealing injection for most dams constructed in the world that do not have a foundation with a very low permeability at low depths usually is in the water height, in this project, the depth of sealing curtain is suggested equal to 120m. In this case, with respect to the analyses, the total output rate at about 260Ls is reduced equal to 8200000, which is equivalent to ~1% of the reservoir volume that is in permitted level.

CONFLICT OF INTEREST

There is no conflict of interest.

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None

FINANCIAL DISCLOSURE

None

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ARTICLE

EXAMINING THE MEDIATING ROLE OF ASSERTIVENESS IN RELATIONSHIP AMONG NEUROTICISM, CONSCIENTIOUSNESS AND BODY IMAGE AMONG CLIENTS OF SPORTS CLUBS

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ABSTRACT

The purpose of this study was to determine the mediating role of assertiveness in relationship among neuroticism, conscientiousness and body image among clients of sports clubs. Having used the multistage sampling method, it was attempted to select a sample group of 308 women and men who had commuted to sports clubs in districts 2, 5 and 10 in Tehran, Iran. It should be mentioned that this was a descriptive-correlational study. Then, the necessary data were collected through the NEO-FFI Personality Inventory, Fisher's Body Image Questionnaire and Gambill-Richey Assertiveness Scale. The data were analyzed through the multivariate analysis (the path analysis approach). The results revealed that the conceptual model was fitted to the collected data. Besides, it was indicated that there was a statistical significant relationship between path coefficient for body image and assertiveness.

INTRODUCTION

Taking a glance at hierarchies of social values in different societies at different periods shows that elegance and ideal body image is one of the important social values embedded with diverse manifestations and implications. Accordingly, there is too much emphasis on this phenomenon in such a way that its absence can sociologically deprive individuals of many social benefits and it may lead to frustration and subsequent negative consequences (Zokai, 2006). Sclafani believes that a person's concept of his/her body is considered as one of the most important part of his/her self-concept. Besides, physical traits are among the stable concepts that have always been acknowledged in parallel to the concept of personality during human history. Given the very distant past till now, people believe that fat individuals are sociable and happy and, conversely, skinny individuals are shy, anxious, anxious and nervous. Besides, it is believed that athletes possess healthy spirit. The idea that there is a relationship between individuals' skeletal structure and his/her psychological and behavioral characteristics has existed for centuries before the emergence of scientific psychology (Motahari, 2010, as quoted by Raqibi & Mina Khani, 2011). On the other hand, psychologists are now well aware that the psychological dimensions of human beings are directly affected by their physical and corporeal conditions. Interestingly, the human body and the functions of organs are affected by psychological and mental exercise (Khibanchi, 1997, as quoted by Islamian, 2011).

KEY WORDS

Neuroticism, body image, assertiveness

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Every person has a mental image of his/her own body which constitutes the main ingredient of his/her own personality. Regarding the studies conducted on personality traits, it can be asserted that the notion of conscientiousness essentially comprises goal-oriented behavioral traits and comprehensive management of impulses. Given the notion of neuroticism, it may be argued that emotional stability is placed against a range of negative emotions such as sadness, irritability, nervous tension and so on. Considering the range of social relations, it seems that interpersonal skills play a key role in successful performance in the society. As such, the physical skills are not considered the sole sufficient condition for attaining a desirable life. The assertiveness skill is one of the aforementioned interpersonal skills that play a key role in social and behavioral health as well as a successful performance in life (Shahni Yeylaqi & Rezai, 2001; Qara Quzoqlu et al., 2008, as quoted by Jalali & Pour Ahmadi, 2010). It should be noted that self-worth and life satisfaction may not be achieved in the absence of these skills. Accordingly, Alberti and Emmons (1970) found that assertive individuals attained far more success in social situations compared to less-assertive individuals. As a result, they feel more confident about themselves. Conversely, those who had low self-esteem experienced more inhibition in expressing their beliefs, rights, desires and views and, thus, they were less-assertive individuals (Alberti and Emmons, 1970, as quoted by Kirst, 2011). The body image of any given individual is composed of feeling of body satisfaction, self-esteem and beliefs about appearance (Spangler & Stice, 2001, as quoted by Assar Kashani et al., 2012). Alberti and Emmons (1970) found that assertive individuals attained far more success in social situations compared to less-assertive individuals. Nicol and Suzanne (2003) examined the relationship between personality and dietary behavior in adolescents and found that there was a significant negative relationship between neuroticism and healthy eating and obesity and that the latter factor led to an inappropriate body image. Noor Molla (2007) investigated the relationship between self-esteem, personality traits and body image and concluded that there was a negative relationship between body image dissatisfaction and self-esteem. Besides, it was indicated that there was a positive correlation between neuroticism and body image dissatisfaction. Cruick Shank (2006) asserted that some of the personality traits were negatively associated with negative body image and concerns about appearance. Having studied the personality traits, it was concluded that the body image and eating behaviors of individuals afflicted with personality

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traits (low levels of neuroticism) were less correlated with body dissatisfaction and negative self-image (Behnava et al., 2009). Kalogiannis (2006) investigated the role of sport and physical education in the development of self-concept and found that teaching physical education in a proper manner could help children and adolescents to form an objective body image and gain a positive physical self-esteem. As a result, they felt more confident about themselves. Conversely, those who had low self-esteem experienced more inhibition in expressing their beliefs, rights, desires and views and, thus, they were less-assertive individuals (Alberti & Emmons, 1970, as quoted by Kirst, 2011). A research conducted by Damhari and Hamdavi (2014) aimed to examine the simple and multiple relationship between students' personality traits and their concerns about body image. The results of correlation and regression analysis showed that personality traits (conscientiousness and agreeableness) were negatively correlated with concerns about body dysmorphic disorder. These findings suggested that there was a significant relationship between assertiveness and self-esteem. Besides, it was noted that there was a direct relationship between self-esteem and body image. It also confirmed the probable relationship between assertiveness and personality traits. According to the research conducted in relation to personal traits and body image and given the probable impact of assertiveness as a powerful mediator, it seems that the following questions should be raised: A) Is there a goodness of fit between conceptual model and the collected data? B) Is there any significant positive relationship between neuroticism and body image? C) Can assertiveness explain significant part of the variance in body image? D) Can assertiveness mediate the relationship between neuroticism, conscientiousness and body image?

MATERIALS AND METHODS

The Given the purpose of study, it was indicated that this was a basic research. Regarding the methodology, it was indicated that this was a descriptive-correlational research. It should be noted that path analysis was used to examine the particular model of relationship among variables (Sarmad, Bazargan & Hejazi, 2012). The population of this study was composed of male and female clients of sports clubs in Tehran city in the summer of 2015. Since the multistage sampling method was used in this study to collect the desirable data, it was attempted to randomly select 3 districts (out of total 22 districts) of Tehran. Thus, the districts 2, 5 and 18 were selected thereof. Then, the researchers visited the Physical Education Department of these three districts. The list of clubs in this districts as well as their addresses was provided to the researchers. Given the aforementioned clubs, it was attempted to randomly select and visit 3 sports clubs in each district. Having coordinated with the directors of selected clubs, it was tried to distribute questionnaires among all members and clients of sport clubs. Since the sample size is a key element of any given research and given this issue that this has a decisive influence on the research results, it seems essential to determine the sample size in accordance with data analysis. All experts in the field of SEM agree that, compared to smaller sample size, a larger sample size can help researchers to estimate and interpret the results of SEM because the latter leads to less sampling error (Schumacher & Lumks, 2004, as quoted by Meyers, Gamst & Guarino, 2006). However, there is no absolute method for determining the sample size. Some researchers consider a minimum sample size of 100 and believe that a sample size of 200 or higher is favorable. Guadagnoli (1998) proposes that modeling and path analysis approach requires a sample size of 300 or more participants/items (Meyers, Gamst & Guarino, 2006). The sample group consisted of 308 individuals (150 women and 156 men) and 2 persons who did not respond to the gender question. It should be noted that the latter individuals were selected among those clients of sport clubs in Tehran.

Tools

Body image

The Fisher's Body Image Questionnaire was used to measure body image in this study. The questionnaire was developed by Fisher in 1970 and had 46 items. Each item had a value between 1 and 5 (very dissatisfied=1, dissatisfied = 2, average=3, satisfied= 4 and very satisfied = 5). A score of 46 indicated a disorder and a score higher than 46 (maximum 230) showed no disorder. The areas measured in this test included the head and face (questions 1 to 12), upper limbs (questions 13 to 22) and lower limbs (questions 23 to 28). The other 18 items gauged the attitudes of participants towards the general characteristics of body (questions 29 to 46) (Fisher, 1970, as quoted by Asgari et al., 2008). The validity of the test was confirmed by Yazdan Jou in Iran. The Pearsn's correlation coefficient for the test in the first and second runs were determined 0.81, 0.84, 0.87 and 0.84 for first-year students, second year students, third-year students and total students, respectively. Given the significant level of the aforementioned coefficients, it could be argued that there was a significant relationship among different administrations of body image test (Asgari et al., 2008). The short-form version of NEO- FFI Personality Inventory, which was embedded with 60 questions, was used to measure extraversion and openness to experience. It should be noted that the NEO- FFI Personality Inventory was developed by Costa and McCrae (1985). They made use of factor analysis and concluded that the following five dimensions could affect individual differences in terms of personality traits: (N) neuroticism, (E) extroversion, (O) openness to experience, (A) agreeableness and (C) conscientiousness. Actually, its name was derived from the titles of the first factors. Costa and McCrae tested the questionnaire on 208 U.S. students within a three-month interval and obtained validity coefficients between 0.75 and 0.83. Given the validity of the NEO Test, Garusi Farshi (2001) attempted to run the test on a sample of 2000 students studying in University of Tabriz, Shiraz University, Shiraz University of Medical Sciences and Tabriz University of Medical Sciences. Finally, they reported a

correlation coefficient between 0.56 and 0.87 for the main five dimensions. The Cronbach's alpha coefficients for each of the main dimensions of neuroticism, extraversion, openness, agreeableness and conscientiousness were determined 0.86, 0.73, 0.56, 0.68 and 0.87, respectively. The content validity of this test was investigated via determining the correlation between Self-Report Form (S) and Observer Evaluation Form (R). Consequently, the maximum and minimum correlations (0.66 and 0.45) belonged to extraversion and agreeableness (Garusi Farshi, 2001). Atash Rouz (2007) made use of internal consistency method and the Cronbach's alpha coefficients for each of the main dimensions of neuroticism, extraversion, openness, agreeableness and conscientiousness were determined 0.74, 0.55, 0.27, 0.38 and 0.77, respectively. In this study, the Gambill-Richey Assertiveness Scale was used to measure the notion of assertiveness. The questionnaire was developed in 1975 and had 40 main items. However, it was attempted to modify some items because they failed to comply with Iranian culture. Finally, the questionnaire consisted of 22 questions. The test items required assertiveness behaviors. The participants would be asked to respond to questions based on a five-point scale. Regarding the reliability, there was a high correlation among the test items. Besides, the load factor of different test items was determined between 39% and 70%. Gambill-Richey reported a reliability coefficient for 0.81. Shohreh Amoli (as quoted by Mahmoudian et al., 2004) removed the aforementioned 18 items, adjusted the items with Iranian culture and attempted to determine the reliability coefficient for the aforementioned element among 40 female junior school students within a 25-day interval in Tehran Psychiatric Institute. Finally, she reported a reliability coefficient for 0.82. In addition, professors of Allameh Tabataba'i University in Tehran confirmed the validity of the test. Actually, the factorial reliability of test items was determined between 0.39 and 0.75 (Bahrami, 1996).

Table 1: The mean, standard deviation, skewness and kurtosis of neuroticism, conscientiousness, assertiveness and body image

Variable	Mean	SD	Skewness	Kurtosis
Neuroticism	20.59	7.22	0.625	0.139
Conscientiousness	34.40	7.05	-0.337	-0.428
Assertiveness	84.73	11.59	0.424	0.136
Body image	170.10	21.94	0.424	0.294

[Table 1] shows the mean and standard deviation of research variables. The abovementioned table shows that the skewness and kurtosis indices of factors have not exceeded the ± 2 limit. This shows that the distribution of data has been normal across all the research variables.

Table 2: The relationship among neuroticism, assertiveness and body image

Variables	1	2	3	4	5	6	7	Cronbach's alpha
1) Neuroticism								0.773
2) Conscientiousness	-0.419**	0.220**	0.041	0.349**	--			0.817
3) Assertiveness	-0.312**	0.266**	0.133**	0.149**	0.195**	--		0.946
Body image	-0.318**	0.298**	0.171**	0.183**	0.395**	0.479**	---	0.831

*p<0.05, **p<0.01

Given the results presented in [Table 2], neuroticism and conscientiousness dimensions were significantly related to assertiveness and body image variables at 0.01 level. This relationship was positive in terms of neuroticism but it was negative in terms of other dimensions. It should be noted that the internal consistency of the research tool was determined through the Cronbach's alpha coefficient. Accordingly, the concerned questionnaires were embedded with acceptable reliability coefficients.

Research hypotheses

- 1) The path coefficient for dimensions of neuroticism and conscientiousness and body image is statistically significant.
- 2) The path coefficient for assertiveness and body image is statistically significant.
- 3) The assertiveness variable can significantly mediate the relationship between personality traits (neuroticism, extraversion, openness to experience, agreeableness and conscientiousness) and body image.

The path analysis was run through AMOS (Version 7.0) Software and Maximum Likelihood (ML) Estimation in order to analyze the aforementioned research hypotheses.

Table 3: Total, direct and indirect path coefficients for neuroticism, conscientiousness, assertiveness and body image

Paths	Total effect		Direct effect		Indirect effect	
	Standard parameter β	Standard error	Standard parameter β	Standard error	Standard parameter β	Standard error
Neuroticism-body image 0.025	-0.140*	0.064	-0.052	0.062	-0.089**	0.017
Conscientiousness-body image 0.022	0.290**	0.057	0.237**	0.052	0.017	0.017
Neuroticism-assertiveness	-0.240**	0.057				
Conscientiousness-assertiveness	0.047	0.059				
Assertiveness-body image	0.369**	0.049				

* $p < 0.05$, ** $p < 0.01$

Given the results presented in [Table 3], the total path coefficient (total of direct and indirect path coefficients) for neuroticism was negatively related to body image (β -0.140, $p < 0.05$) and the total path coefficient for conscientiousness was positively related to body image (β -0.290, $p < 0.01$). Generally speaking, the aforementioned coefficients were significant at 0.01 level.

Given the first hypothesis, entitled “the path coefficient for dimensions of neuroticism and conscientiousness and body image is statistically significant”, it may be argued that the path coefficient for neuroticism is negatively related to body image and the path coefficient for conscientiousness is significantly and positively related to body image.

Given the results presented in [Table 3], the path coefficient for assertiveness was positively related to body image and the latter relationship was significant at 0.01 level (β -0.369, $p < 0.01$). Thus, any given increase (1 standard deviation) in assertiveness led to an increase (0.369 standard deviation) increase in body image. Given the second hypothesis, entitled “the path coefficient for assertiveness and body image is statistically significant”, it may be argued that the path coefficient for neuroticism is positively related to body image and the latter relationship is significant at 0.01 level. Thus, one may assert that the assertiveness can positively predict the body image.

Regarding the results depicted in [Table 3], it may be argued that the indirect path coefficient for neuroticism is negatively related to the body image and the latter relationship is significant at 0.01 level (β -0.089, $p < 0.01$).

DISCUSSION AND CONCLUSION

1. Similar to any other psychological aspect, the body image is considered an evolutionary part of any given human being. Given this, one might refer to a research conducted by Noor Molla (2007) who investigated the relationship among self-esteem, personality traits and body image and found that there was a negative correlation between body image dissatisfaction and self-esteem. Besides, he found that there was a positive correlation between neuroticism and body image dissatisfaction. Cruick Shank (2006) argued that there was a negative relationship between some personality traits and body image dissatisfaction and concerns about the appearance. Having studied the personality traits, it was concluded that the body image and eating behaviors of individuals afflicted with personality traits (low neuroticism) were less correlated with body dissatisfaction and negative self-image. A research conducted by Damhari and Hamdavi (2014) aimed to examine the simple and multiple relationship between students' personality traits and their concerns about body image. The results showed that the conscientiousness was a significantly and negatively correlated with concerns about body dysmorphic disorder (low body image). These findings suggested that there was a significant positive relationship between neuroticism and concerns about body dysmorphic disorder.

Nicol and Suzanne (2003) examined the relationship between personality and dietary behavior in adolescents and found that there was a significant negative relationship between neuroticism and healthy eating and obesity and that the latter factor led to an inappropriate body image. Eskandar Nejad (2014) examined the probable correlation between perception of body image and physical activity in women and men in terms of different levels of body mass index (BMI) and found that obese individuals and those with normal weight had the highest and lowest understanding of their body shape, respectively. Consequently, almost half of those people with normal weight perceived themselves more or less than their actual situation. As such, the latter finding can indirectly explain the negative relationship between neuroticism and body image. So, all the investigations conducted in line with this research hypothesis may confirm the aforementioned result.

2. There was a statistically significant relationship between path coefficients for assertiveness and body image. It was concluded that the aforementioned path coefficient was positive and significant at 0.01 level (β 0.369, $p < 0.01$). Accordingly, the assertiveness could positively predict the body image. Thus, it can be stated that negative emotions and behaviors and poor cognitive processing about body image and appearance could led to distorted body image and negative self-concept. The perception and

understanding of any given individual about his/her own body constitutes one of the most important part of his/her self-concept. The body image of any individual is composed of feeling of body satisfaction, self-esteem and beliefs about appearance. Besides, the latter factor can affect the self-esteem coefficient in any given individual (Spangler & Stice, 2001, as quoted by Assar Kashani et al., 2012).

On the other hand, those individuals whose self-esteem is not dependent on external factors and are more likely to stress on the abilities and achievements gained in life and depend on their internal states, pay less attention to concerns about weight and body organs. In addition, they are less likely to experience eating disorders as a result of low self-esteem. If individuals hold an inconsistent notion about the physical form of their body compared to public opinion, they will adopt an inappropriate body image about themselves and their organs. Therefore, the latter factor leads to a feeling of low self-concept, an imperfective self and, subsequently, low self-esteem in them (Atashpour et al., 2005).

Rod and Lennon (1994) conducted a research, entitled "the relationship between attitudes to gender roles, body satisfaction, self-esteem and women's appearance management", to examine the aforementioned variables among university students. The findings showed that attitude to the role of gender and body satisfaction lasted a positive impact on self-esteem.

Alberti and Emmons (1970) found that assertive individuals attained far more success in social situations compared to less-assertive individuals. As a result, they feel more confident about themselves. Conversely, those who have low self-esteem experience more inhibition in expressing their beliefs, rights, desires and views and, thus, they are less-assertive individuals (Alberti & Emmons, 1970, as quoted by Kirst, 2011). Therefore, it can be asserted that there is a direct relationship between assertiveness and self-esteem and body image.

Qobari Bonab and Hejazi (2007) attempted to gauge the relationship between assertiveness and self-esteem and academic achievement in gifted and ordinary students and concluded that there was a significant positive correlation between assertiveness and self-esteem in both groups. The latter finding is indirectly in line with the results of this research hypothesis.

3) The assertiveness variable can significantly mediate the relationship between neuroticism and conscientiousness and body image.

Behnava et al. (2009) examined the relationship between body image and personality traits and found that there was a negative relationship between data distribution in body image and characteristics of neuroticism. Besides, it was indicated that there was a statistically significant positive relationship between body image and personality traits (extraversion, openness to experience and agreeableness). Besides, Sabeti et al. (2007) investigated the relationship between personality traits and sexual beliefs and indicated that there was a significant positive relationship between conscientiousness and openness to experience and emotional stability (low neuroticism) and beliefs about body image. In other words, the latter findings confirmed the existence of a significant negative relationship between neuroticism and body image. A research conducted by Damhari and Hamdavi (2014) aimed to examine the simple and multiple relationship between students' personality traits and their concerns about body image. The results showed that conscientiousness was negatively correlated with concerns about body dysmorphic disorder (low body image). These findings suggested that there was a significant relationship between neuroticism and concerns about body dysmorphic disorder. So, assertiveness may predict the relationship between neuroticism and body image through a desirable model.

Limitations of the study

Since the participants in this research were clients of sports clubs, the duration and numbers of their exercise were unclear. Therefore, their impact on the body image was unclear. Another limitation was that the research sample was consisted of limited number of participants. As such, the results may not be generalized thereof. Besides, the data were based on participants' self-reports and, consequently, the reports may be subject to bias. The assertiveness should be effectively and practically taught to those individuals afflicted with neuroticism to eliminate the negative impact of the personality traits, especially neuroticism. Besides, it is suggested that a larger sample should be subject to more comprehensive testing tools so that the results may be generalized to a higher level.

CONFLICT OF INTEREST

There is no conflict of interest.

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FINANCIAL DISCLOSURE

None

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ARTICLE

THE INVESTIGATION OF THE STRATEGIC THINK TANK IN ISLAMIC AZAD UNIVERSITY OF GAEMSHAHR

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ABSTRACT

The present research is aimed to investigate the Strategic Think tank in Islamic Azad University of Gaemshahr so that in the light of it, the understanding about think tanks status in the studied organizations can be gained. In terms of aim, the study is functional, and in terms of research methodology, it is cross-sectional and descriptive scanning. The study population has been two groups, the first of them consisted of 12 faculty members of the university's Think Tank; and the second group consisted of all 300 faculty members of the university; that the size and the population of the second group, according to Cochran method, were determined 160 people, and samples were selected by the use of relative stratified sampling method. The data collection method has been by library and by field, that the required information were collected through questionnaire and were analyzed through the software SPSS. To investigate the questions of the questionnaire, inferential and descriptive statistics was used. The research results imply that the think tank exists, but it has a performance within very weak-weak, the most important causes of which respectively are: 1) the highest rating on the fifth items: the performance of the think tank in offering appropriate solutions and strategies in order to take appropriate decisions with the average rating 6.95; 2) the second priority on the sixth items: how to improve the quality of the determined public policies and its feedback on the society with the average rating 6.45; 3) the third priority on the third items: the performance of the think tank in solving the problems of the education system with the average rating 5.95; and on the eighth items: clear understanding and nobility of the authorities on the positive functions of the think tank formation in the university with the average rating 5.95; 4) the fourth priority on the first items: the quantity of holding the meetings and sessions monthly and seasonal with the average rating 5.45; on the fourth items: the performance of the think tank in solving the management and administrative macro-problems with the average rating 5.45; and on the seventh items: the flexibility of the senior upstream officials and allocation of the specific and determined budgets to practice the determined strategies by the think tank with the average rating 5.45; 5) and finally, the last and the least important priority on the second items: the quality of holding the meetings and sessions and discussing various issues with the average rating 4.45; on the ninth items: the extent of your satisfaction with the specified budgets in the university to form the think tank with the average rating 4.45; and on the tenth items: the interaction and consultation between the senior authorities and faculty members of the university with the average rating 4.45. In addition, from the viewpoint of the faculty member, the think tank with the average rating 2.95 is within the weak-middle range. Finally, the suggestions are offered.

INTRODUCTION

In the developing countries, the weakness and lack of effective think tank and the existence of often incomplete, inaccurate or processed information make statesmen and politicians with a downfall which is mentioned as "wrong decision" (Danaeifard et al., 2001). In general, the objectives of the above tanks formation are to develop the strategic think, provide data analysis context, process ideas, and give expert opinion to facilitate administrative decision-making (Bromley, 2006). The role of the think tank is important because it could provide politicians and managers with being influenced by intellectuals and professionals (Starkey, 2002).

Different definitions have been proposed for strategic think tank and the way of their organizing. The idea of developing the strategic think tank was first proposed by Thomas Clarkson, the founder of the Anti-Slavery Association in Africa in 1782. In this idea, he portrayed, with high accuracy, the conditions of slaves trading and transferring them from Africa and ethical principles governing on it [10].

Most researchers believed that to survive in the competitive environment, the think tank should adopt the strategies that lead to increasing the management allocations and improvement of the network. However, according to Astaraki (2002), [11],[12], and Tanert (2006), a useful and effective attempt is that the think tank should reconsider its organizing every few years; work in the realms of idea and thought; have further attention on Applied Sciences; show more flexibility to employ professional, expert, and efficient researchers in projects and research teams; have more attention on early-return plans than long-term plans; and understand audiences' identities in the successful tanks. The tanks should be aware that the important ideas are not always affective on the attraction of audiences and do not lose the intelligence and tact to use opportunities and situations [5]. Also, McGann considers that the funding strategy from multiple resources is critical for the think tank and emphasizes on the importance of financial transparency and effective communications with media, and believes that in order to guarantee the independence of the think tank, it is necessary to have transparency about the way of financing and the quality of communications. Also, the necessity of transparency or a similar degree of transparency compared to the successful tanks and the other leading counterparts is considered (McGann, 2005). The think tank as databases classify the research findings and make them available to the policy makers and politicians, which are used in the preparation of the agenda for the policy makers (Danaeifard, 2008). McGann, who has conducted extensive researches for the American think tank, is considered as an expert with international experience in this field. According to his personal experiences in a survey conducted in 20 European countries, he has identified three different kinds of the think tank; and based on this study, he considers that the think tank have four functions: 1) to conduct short-term and long-term researches; 2) publication of books or articles that focus on short-term pragmatic issues; 3) consideration of public, policy

KEY WORDS

The think tank, the strategic think tank, Islamic Azad University

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makers, and media opinions; and 4) to provide the government with stable personnel (McGann, 2005). In the recent years, the role of think tank in improving the quality of public policies has become more important; because the think tank affect the adoption of better policies, and in the viewpoint of experts and scholars, understanding this impact could be affective on taking base decisions in order to revise and improve their participation in the cycle of public policies (preparation of agenda, development, implementation, and evaluation) (Alavani, 2007).

In today universities, the process of policy-making and decision-making at various levels needs specific organizing. Rapid enhancements of the world and growing dimensions of improvement are factors that determine the necessity for rapid development of policies and patterns of decision-making; something that is not possible without the use of new ideas, and documentation and summarizing the experiences and opinions of experts and creative peoples. The speed of local developments and the emergence of cross-sectional requirements in the new era, in most cases, have led to consumption of predecessors' intellectual assets of by universities in the country; and due to the lack of investment in the intellectual foundation, inadvertently, the past capital is spent widely and universities are involved in routines. For example, it can be acknowledged that in health education, research, and ... systems, there is nothing but copying, and also in their executive areas, thought position and philosophical do not appear. The think tank is a rational strategy to strengthen the thinking and idea-processing institutions. It seems that the strategy of the think tank when faced with destructive politicization, translation, and populism mentalities in university and research tanks, can guide society towards innovation and creative decision-making.

The think tanks are environments to nurture talents and educate institution and university elites and provide the update context and the emergence of such forces. Accurate identification and description of the university issues, critical assessment of policies, current programs and issues and emerging issues and offering views, conversion of general ideas and raw suggestions into applicable policies and programs, the localization of policies derived from benchmarking and comparative studies, preparing the ground for the constructive exchange of information and opinions between experts, the identification and education of experts in policy-making researches, creating consensus among executives and conducting futurology and foresight studies are among the think tank tasks.

In addition to what was said, one of the reasons and necessities for building the think tank in university and scientific tanks is their incomplete efficiency. In addition to educating the experts in all fields in the country, universities should address developmental researches and provide a space for the development of thought and creativity. In such a situation, in addition to performing the university tasks, the think tanks could also be a space for attracting the elites of the country. However, the present study seeks to examine the situation of the think tank in Islamic Azad University of Gaemshahr.

Research literature

Theoretical bases of research

The origin of creating the think tank

By the addition of needs and the complexity of responding to them, the complexity of the existing relationships, the speed of environmental development, and dynamics of structures in all areas, the need to make right decisions and more creativity is sensed because one of the problem-solving solutions in the field of management is creativity; i.e. to find an appropriate and optimal answer to developments and events. In this regard, one of the tools for creativity and making new ideas that makes rid of the bad habit of action before thinking or thinking after action and provides an opportunity for conceptualization and making concept is the think tank; the main mission of the think tank is intellectual and advisory support for policy-makers and decision-makers and manipulation of the idea and knowledge in order to fulfill the organizational goals (Adiani, 1:2006).

The Think tanks, with the goals they have ahead, invite somehow to self-esteem and self-awareness, following it self-reform is achieved as well. To achieve an agreement on the vote, debate occurs and thus creativity also shows itself. The think tank is an institution or organization that offers ideas or advices about political, trade, social, military, and etc. issues based on collective and hierarchical action; In other words, organizations that employ theorists and thinkers to provide policy-makers with analyses and guidelines for macro issues. The think tanks are the strategic research and thought-making tanks that conduct applied research by basic meditations and generate thoughts, ideas, and knowledge for universities and research tanks and make them operational for politicians and executives. The think tank, by engaging in issues and challenges that are beyond the abilities of individuals or average specialist groups of shows its role well. Long-term and in-depth study is the wok style of the think tanks. The think tanks have had a good development but in different names that their substance is the think tank; Different names such as institution, foundation, think club, policy-making tank, and other names that by referring to process of their activities, it could be received that they act in the form of think tanks. The think tank members can be classified in the two groups of intellectual elites and instrumental elites. Theoretical (intellectual) elites are those who have academic experience; or in other words, they know the science and theory of the topic, have understood the human thought theoretically, and also have the necessary information about interdisciplinary concepts. The second or instrumental groups are those who have had activity experience in different fields in the past and have enough experience to thinking.

The think tanks could originate from basic and important issues or stem from an individual's or a small group of experts' mind. In general, two main reasons for creating these tanks are mentioned:

First, the need for building a national institutional had been sensed so that it does qualified research in national and international subjects, in particular the subjects related to the foreign policies, because there were not any constitutions in this context. Second, there was no institution that can bring together professionals and experts in these subjects. As a result, think tanks obviate these needs by the help of brainstorming techniques.

Understanding the nature of think tank

Think tanks as the substrate shaping public opinions and decision-making for community managers, in some communities, have an affecting mission. This mission is getting deeper and more effective. In future societies that cultural, social, political, scientific, technological, and economic movements will not be formed exclusively in terms of time and thought of a government and the party forming that government, those are strategic think tanks that could be the guiders for these movements based on their own knowledge and value. In the not too distant future, the think tanks would be the mechanism for applying the knowledge of scientists in practice and society, specially, for playing the role of humanities and social sciences in policy-making and decision-making area. The way of organizing the think tanks also plays an important role in the richness of their research and activities. Experts believed that the members of the think tank group might offer effective returns and work results. Nevertheless, it should be noted that adoption of more appropriate tactics by management in order to organize think and research groups and form the strategic think tanks will make achievement of results and finding more effective and satisfactory. As such, Strachan (2002) believes that the review of groups' performance and organizing are considered as an opportunity, so three tasks should be considered: first, there are several options, based on which the think tank activities can be organized; second, it is necessary that some information about the way of doing operations in different conditions are offered by groups in the think tank; third, senior managers of groups in the think tanks should be offered helpful advices, so that in the assessment of the nature of existent organizing as the best and the most appropriate situation for doing the considered activities, they could attempt effectively (Raymond, 2002).

In some viewpoints such as McGann and Boucher (2005), tanks have been divided into different groups of research institutions that do activities on the university think tanks like advisory think tanks based on the contract and for-profit, and the interest groups of party think tanks and parties-affiliated research tanks; while Pohan (2008) notes that in general, discussions on the think tanks have witnessed major changes, such as changes based on public specialization in the recent years. This insight change differs widely from what was common in the literature of America and Europe in the past. In other words, some kind of mergers and acquisitions in the past views and what exists today towards these tanks has been done. The research conducted through comparing the think tanks in different countries including Europe and America imply the high influence of the way of organizing in effectiveness of their activities (McGann, 2007).

The theory and components of the think tank

The theory of think tank is to open mind in the fundamental areas of thought. This theory has three components:

1. A room for think-making and thinkers' conceptual thinking;
2. A room for providing think-makers and planners a recognition to promote the thinking culture in the society and organization;
3. A workshop for think-making and the revival of fundamental thinking based on the studies that these workshops are as the seat of thought and the extract of the think tank. In other words, the think tank has a research and education instruction and does local shaping, so that in all organizational areas, those who have the background of think-making and understanding the think, enjoy the necessary facilities and opportunities in scoring their thoughts (Hart and Vromen, 2006).

The tasks of the think tank

Three-task Strategy:

Organizing the activities of the think tank;

Promoting the knowledge of the think tanks group in the way of doing operations in different situations;

Offering useful advices for senior managers of groups in the think tanks to assess the nature of organizing used by the think tank and prepare the best situation and the most appropriate way for the think tanks. To do the considered works, another important factor that have attracted the attention in the tanks organizing is the impacts of the funding suppliers' decisions on the way of selecting the researchers by the think tanks.

Hart and Vromen believe that easy and sufficient funds are not always available for the think tanks, therefore in the case of funds shortage, the first part of activities that are usually excluded from the budget is the issues related to the scientific research and investigations in the body of governmental organizations. Hence, most suppliers of financing in the private sector request that the think tanks

address issues based on the applied projects rather than producing new ideas. At the present, most think tanks are under this pressure that firstly, they should be more flexible in the researcher selection; secondly, rather than offering long-term programs and ideas, they should address issues, effect of which will be short-term and early-returned; thirdly, thoughts and imagines based on the knowledge, relying on the professional reputation and scientific rating of its provider might not be applicable, or the applicant or client, exclusively with emphasis on the scientific and professional status of the theory and idea owner would not be interested in accepting the idea, but in such cases, with the critical attitudes stated towards such ideas, they would prefer to reach their considered achievements by conducting research that personally provides their financial resources (Hart and Vromen, 2008).

Barriers to organizing the effective think tanks

One of the important challenges that always preoccupy the minds of policy-makers and politicians is the investigation of different alternatives of different combinations of possibilities and the selection of the best existing objects for decision-making based on data and information. In the developed countries, with regard to the time element, the above tasks have been devolved to the groups consisted of knowledgeable, experienced, outstanding, and renowned researchers, so that after their reviews, they present the best existent options to policy-makers and managers for decision-making. Now, the above tanks, which have been mentioned as the strategic think tanks, have significant application in most countries of the world. Also, in our country, according to the Fourth Economic, Social, and Cultural Development Program, the establishment of the think tanks has been placed on the government agenda. In the industrial countries, the tasks of data collection, their processing, and decision-making based on the provided information have been devolved to the groups consisted of researchers with scientific experiences in policy-making and management, so that after the investigation of different alternatives and combinations of various possibilities, they offer the best existent options for decision-making to managers. Hart and Vromen introduce a new kind of think tanks that always at the time and place, to evolve ideas, seeks to hold seminars and meetings to increase discourses. In most cases, the world of think tanks differs somewhat from other emerging professions. In a wide range, the strategic think tanks are increasingly shaping horizontally or by operating beyond geographical boundaries and other directions. This means that equations related to the principles priorities of the think tanks formation are changing, and at the present, the serious attention of the strategic think tanks is focused on building expertise to manage complex networks of the policy-making process (Hart & Vromen, 2008).

The strategic think tanks in Europe, with the participation of a large number of institutions and researchers in different areas, have been structured. The existent of various sources of funding for the think tanks has led to the formation of a more effective organizing for these tanks. For example, the increased scientific validity for the studies of the tanks is provided through appropriate financing for each project. In this regard, McGann and Boucher, with emphasis on numerous obstacles being faced by think tanks, especially the existent conflicts and tensions between financing and scientific validity as well as the challenges shaped by interactions between decision-makers and the media, believe that the capabilities and capacities of some think tanks are practiced only if the conflicts between scientific validity on the one hand and the need to create effective consultations to reach decision-makers on the other hand are managed in the best way (McGann & Boucher, 2008). Bell et al. believe that the strategic think tanks now have had successful activities in most major decision-making bodies and even in the private companies in the industrial countries of the world, so that it could be claimed that the rapid development of these activities are somehow related to the human enhancements in the different fields. In general, the objectives of these tanks formation are development of the strategic thinking, creating the context for analysis, ideation and presenting the professional and expert opinion to facilitate administrative decision-makings. Identifying the characteristics of the think tanks has a high impact on the way of their organizing; including the identification of objectives and visions of the think tanks in organizations and different countries that can be affective in identifying their specifications (Bell et al, 2005).

Research history

Sharifi in 2012 in his study on the investigation of the role and the importance of strategic thinking in the organization investigates the real sample in applying these think tanks in the organization. In the study conclusion, the author emphasizes on the importance of strategic thoughts in the organization in order to prepare long-term programs in the organization, and in his opinion, for competitive and complex environment, having practical and applicable thoughts is an appropriate solution which depends on having new think tanks. In a study by Danaeifard et al. in 2011 under the title of "the promotion of policy-making capacity for the country: typology of the role of the think tanks", the study results show fourteen classifications of opinions and beliefs of participants in both public and private sectors. The classified views have pointed out to the different roles of the think tanks in public policies of the country; and these roles respectively are interpretable as policy-makers, recommenders without role, conservatives, supporters, low-oriented critics, negativists, independent tank, uncoordinated actors, policy critics, ineffective fanatics, responsibility-escapers, efficient influencers, positive amplifiers, and unknown capacities. The roles evaluated by the participants in groups were similar, selected and evaluated have been considered as "the new roles" of the think tanks in the field of public policies which has been obtained by Q-like analysis, the attention to the magnitude of the operating load in the analysis, the importance of job positions of the group participants, the number of group members, and the factors that have expressed a large percent of the total variance. In a study by Lajavadi, KharfElahi and Mottaghi in

2010 under the title of “barriers to effective organization of the strategic think tanks”, the study population has consisted of the management faculty members of State Universities across the country. The study results obtained by t-test and Friedman test showed that some barriers have had the most significant impact on the effectiveness of organizing the think tanks. Also, there is a direct and strong relationship between organizing the tanks and their effectiveness. On the other hand, three factors also have not been considered as the barriers to effective organization of the think tanks and have not been approved. Bauer in his article in 2011 under the title of “the role of information technology in the establishment of the strategic think tanks” has investigated the organizations that have used information technology as a more competitive advantage than competitors and have benefited from the formation of the creative and innovative think tanks in order to fulfill the goals of the organization in accordance with new technologies; viewing the profiles of three senior managers of the study organizations are seen: identifying the organization situation; identifying gaps or unfulfilled opportunities; and tracing the environmental factors. Bauer considers these components as the output result of the think tanks in successful organizations that, relying on the latest technologies while facilitating the realization of their goals, try to ensure a continuous growth. Pohan in his study in 2008 about the creation and development of think tanks considers the emergence of a large number of problems and also the existing issues in the inter-organizational communications as a result of poor management of the think tanks and emphasizes that in many cases, the implementation of the ideas and attitudes within and between independent firms, as a management method, has not enough accuracy, delicacy, and firmness, devotes much time to build trust and attract others, and especially in the absence of governance structures and contractual arrangements with effective and appropriate usage to ensure the real and special cases, it lacks the necessary decisiveness.

MATERIALS AND METHODS

The research methodology

This research is Applied-Res in terms of the aim and is descriptive-scanning and cross-sectional in terms of method; and in terms of information gathering, it can be considered as a kind of field research.

The study population is two groups, that the first consists 12 faculty members who are members of the think tank of Islamic Azad University of Gaemshahr, and the second consists of all 300 faculty members of the university; so that the volume and the sample of the second group, according to the Cochrane method, was determined 160 people, that the samples were selected by the relative stratified sampling method. The tool for gathering the required data on the investigation of the situation and performance of the think tank in Islamic Azad University of Gaemshahr has been a questionnaire based on [6] study. This questionnaire includes three parts of: 1) general questions, 2) 10 specific questions to investigate the performance of the think tank from the viewpoint of the think tank members, and 3) 19 specific questions to evaluate the think tank situation from the viewpoint of the faculty members.

Validity of this study questionnaire is of formal and content validity kind; that in this regard, the content of the questionnaire was analyzed by honorable supervisor; and after identifying and declaration of their opinion, the used questionnaire was recognized as appropriate and in accordance with the model. To determine the stability, the method of Chronbach’s alpha calculation has been employed, so that the amounts of the calculated alphas for the variables of the think tank performance and the think tank situation equaled to 0.85 and 0.87, respectively, have been used.

The theoretical framework of the research

The think tanks which have been formed informally nearly in 1800, and in 1960, after World War II, they have been recognized and noted; and also, as the substrate shaping public opinions and decision-making for community managers, in some communities, they have an influential mission. To investigate the status of the think tank in Islamic Azad University of Gaemshahr, the previous studies conducted on the think tanks were studied. So far, limited in the country studies have addressed the “think tank”. Most of these studies lack a comprehensive conceptual model to investigate the status of the think tank. Of the few good studies conducted in this regard has been the study by [7]. In their study, these researchers investigated the barriers to effective shaping and organizing the think tanks by employing the comments of the management faculty members of the State Universities in Iran and identified the barriers. By referring to the contents of the interviews and the gathered articles and scientific resources of the study, they identified 16 factors as the study indices to identify the barriers to effective organizing in the think tanks and compared and analyzed these factors by statistical tests. Due to the proximity of the present study subject to Lajavardi’s et al study as well as the sameness of the study population members in both studies, in this study the pattern used by the mentioned researchers is used and the status of the think tanks in Islamic University of Gaemshahr is addressed.

The research questions

1. Is there the think tank of Islamic Azad University of Gaemshahr?
2. If the answer to the question 1 of the research on the existence of the think tanks in Islamic Azad University of Gaemshahr is positive, from the tank members view, how is their performance and how are prioritized their ratings?

3. From the viewpoint of the faculty members, how is the status of the think tanks in Islamic Azad University of Gaemshar?

Using descriptive statistics methods such as drawing frequency distribution, frequency percent, relative cumulative frequency, mean, median, standard deviation, minimum, and maximum tables and charts, the data were described; and inferential statistics methods such as Kolmogorov-Smirnov, one-sample t-test, and Friedman test were used to analyze the data. The software SPSS was used to evaluate the research questions, and Kolmogorov-Smirnov test was used to assess the normality of the data obtained from the study variables.

Data analysis

Descriptive findings

In the descriptive assessment, of 10 members of the think tank, the all were male, and of 169 faculty members, 136 were male (80.5%) and 33 were female (19.5%); in the marital status of 10 members of the think tank, all were married; of 169 faculty members, 22 were single (13%) and 147 were married (87%). In the age ranges, of 10 members of the think tanks, 2 (20%) were 31 to 40 years old, 6 (60%) were 41 to 50 years old, and 2 (20%) were above 50 years old; and of 169 faculty members, 66 (39.1%) were 31 to 40 years old, 60 (35.5%) were 41 to 50 years old, and 43 (25.4%) were above 50 years old. Finally, in the work experience discussion, of 10 members of the think tank, 2 (20%) had 6 to 10 year's experience, 2 (20%) had 11 to 15 year's experience, 4 (40%) had 16 to 20 years experience, and 2 (20%) had above 20 years experience; and of 169 faculty members, 16 (9.5%) had less than 5 years experience, 51 (30.2%) had 6 to 10 years experience, 55 (32.5%) had 11 to 15 years experience, 34 (20.1%) had 16 to 20 years experience, and 13 (7.7%) had above 20 years experience.

Analytic findings

After gathering the data related to the study variables, the Kolmogorov-Smirnov test was carried out, the results of which showed that the study variables were normal; therefore parametric tests were used to assess the questions and respond to them.

The first question of the study: is there the think tank of Islamic Azad university of gaemshar?

According to the conducted investigations and follow-ups, it is indicated that in Islamic Azad University of Gaemshahr, 12 faculty members were appointed under official verdicts as the think tanks members of the university, so the think tank exists in Islamic Azad University of Gaemshahr.

The second question of the study: If the answer to the question 1 of the research on the existence of the think tanks in Islamic Azad University of Gaemshar is positive, from the tank members view, how is their performance and how are prioritized their ratings?

To answer the second question, a questionnaire consisted of 10 questions has been used to assess the performance of the tank from the viewpoint of its members.

As noted above, to answer to this question, the questionnaire was distributed among the think tank members of the university, and by continuous pursuits, 10 questionnaires were completed and collected.

Table 1: The statuses of responds to the performance indices of the think tank by its members

Statements	Very low	Low	Middle	High	Very high
1 The quantity of holding meetings and sessions monthly and seasonally	6	4	-	-	-
2 The quality of holding meetings and sessions and discussing different issues	8	2	-	-	-
3 The think tank performance in solving the education problems	5	5	-	-	-
4 The think tank performance in solving macro management and administrative problems in the university	6	4	-	-	-
5 The think tank performance in offering appropriate solutions and strategies to take appropriate decisions	3	7	-	-	-
6 How to improve the quality of the determined public policies and its feedback on the society	4	6	-	-	-
7 Flexibility of the senior upstream authorities and allocation of the specific budgets to exercise the determined strategies by the think tank	6	4	-	-	-
8 Clear understanding and full control of the authorities on the positive functions of the think tank formation in the university	5	5	-	-	-
9 Your satisfaction with the specific budgets in the university for the think tank formation	8	2	-	-	-
10 Interaction and consultation between the senior authorities of the university and the faculty members	8	2	-	-	-

Table 2: The descriptive indices of the variable of the thinks tank performance from its members view

Research variable	Number	Mean	Median	Mode	Standard deviation	Minimum	Maximum
The think tank performance	10	1.41	1.40	1.40	0.18	1.10	1.80

The think tank performance variable from its members view has the mean 1.41, the median 1.40, the mode 1.40, the standard deviation 0.18, the minimum 1.10, and the maximum 1.80, that the mean 1.41 over the theoretic mean 3 lays within very low-low.

According to the results, the members of the think tank in Islamic Azad University of Gaemshahr evaluated the performance of this tank as low and very low. However, by the lack of holding the tank meetings, this result seems reasonable. Naturally, when meetings are not hold regularly and in presence of members, the tank would not have any performance or have a very low performance.

Also, according to the assessment of the statements (indices), the priority of each of them through Freidman test is presented in [Table 3].

Number	Statements	Average rating	Priority
1	The think tank performance in offering appropriate solutions and strategies to take appropriate decisions	6/95	First
2	How to improve the quality of the determined public policies and its feedback on the society.	6/45	Second
3	The think tank performance in solving the education problems	5/95	Third
4	Clear understanding and full control of the authorities on the positive functions of the think tank formation in the university	5/95	Third
5	The quantity of holding meetings and sessions monthly and seasonally	5/45	Fourth
6	The think tank performance in solving macro management and administrative problems in the university	5/45	Fourth
7	Flexibility of the senior upstream authorities and allocation of the specific budgets to exercise the determined strategies by the think tank	5/45	Fourth
8	The quality of holding meetings and sessions and discussing different issues	4/45	Fifth
9	Your satisfaction with the specific budgets in the university for the think tank formation	4/45	Fifth
10	Interaction and consultation between the senior authorities of the university and the faculty members	4/45	Fifth

According to [Table 1] and Friedman ratings, the highest rate is for the fifth index: The think tank performance in offering appropriate solutions and strategies to take appropriate decisions with the average rating 6.95; and the lowest rate is for second statement: The quality of holding meetings and sessions and discussing different issues with the average rating 4.45; ninth: Your satisfaction with the specific budgets in the university for the think tank formation with the average rating 4.45; and tenth: Interaction and consultation between the senior authorities of the university and the faculty members with the average rating 4.45.

The third question of the study: from the viewpoint of the faculty members, how is the status of the think tanks in islamic azad university of gaemshar?

Before examining the research question, we do the descriptive investigation of the variable. [Table 4] presents the descriptive indices such as mean, median, mode, standard deviation, maximum, and minimum.

Table 4: The descriptive indices of the research variable from the faculty members view

Research variable	Number	Mean	Median	Mode	Standard deviation	Minimum	Maximum
The think tank status	196	2.95	2.84	2.42	0.54	2.00	4.42

As shown in [Table 4], the think tank variable has the mean 2.95, the median 2.84, the mode 2.42, the standard deviation 0.54, the minimum 2.00, and the maximum 4.42; which in terms of descriptive, the calculated mean (2.95) is less than the theoretic mean, so the think tank status in Islamic Azad University of Gaemshahr, from the faculty members view, is less than average.

After the normality test and proving the descriptive indices of the research variable, the third question of the study has been investigated. To investigate and analyze the study question, the one-sample t-test was used. As the statements are with five-option Likert responses, the resulted mean for each variable was compared with the theoretic mean with the value 3, the null hypothesis in this test is the mean less than or equal to 3, and when the value of the computational t is large or the value of sig. is less than 0.05, that

means that the level of that variable is higher than the average, and if the value of sig. is higher than 0.5, that means that the level of the considered variable is less than or equal to the average.

Table 5: The investigation of the think tank status in University of Gaemshahr from the viewpoint of the faculty members using the one-sample t-test

Variables	The constant value of the test 3					Test result	Status
	Mean	Standard deviation	t-statistic	Degree of freedom	Probability		
Strategic tanks (whole questionnaire)	2.95	0.54	-1.09	168	0.95	Null hypothesis confirmation	Inappropriate

To investigate the status, the following hypotheses are used.

H0. The think tank status in Islamic Azad University of Gaemshahr is not sociable from the viewpoint of the faculty members.

H1. The think tank status in Islamic Azad University of Gaemshahr is sociable from the viewpoint of the faculty members.

$$\begin{cases} H_0 : \mu = 3 \\ H_1 : \mu \neq 3 \end{cases}$$

As it can be seen, the research variable, i.e. the think tank has the mean 2.95 and the standard deviation 0.54, and with regard to the t-statistic value -1.09 and the probability value 0.05, the null hypothesis of the research is confirmed; so the think tank status lays in less than the average 3. Therefore, the think tank status in Islamic Azad university of Gaemshahr has not a sociable status.

CONCLUSION

First, Kolmogrov-Smirnov test was used to investigate the data distribution of the quantitative variables; and the results showed that the research variables have normal distributions; and after conducting this test and achieving this result, we were allowed to use the parametric test in order to investigate the research questions.

The results indicate that the think tank exists, but it has a performance within very low-low range, and the most important causes of it, respectively, are: 1) the highest rating on the fifth items: the performance of the think tank in offering appropriate solutions and strategies in order to take appropriate decisions with the average rating 6.95; 2) the second priority on the sixth items: how to improve the quality of the determined public policies and its feedback on the society with the average rating 6.45; 3) the third priority on the third items: the performance of the think tank in solving the problems of the education system with the average rating 5.95; and on the eighth items: clear understanding and nobility of the authorities on the positive functions of the think tank formation in the university with the average rating 5.95; 4) the fourth priority on the first items: the quantity of holding the meetings and sessions monthly and seasonal with the average rating 5.45; on the fourth items: the performance of the think tank in solving the management and administrative macro-problems with the average rating 5.45; and on the seventh items: the flexibility of the senior upstream officials and allocation of the specific and determined budgets to practice the determined strategies by the think tank with the average rating 5.45; 5) and finally, the last and the least important priority on the second items: the quality of holding the meetings and sessions and discussing various issues with the average rating 4.45; on the ninth items: the extent of your satisfaction with the specified budgets in the university to form the think tank with the average rating 4.45; and on the tenth items: the interaction and consultation between the senior authorities and faculty members of the university with the average rating 4.45.

Suggestions based on the research findings

Based on the obtained data and the results of the present research questions, some suggestions for improving the statuses of the strategic think tanks in Islamic Azad University of Gaemshahr and other universities are offered as follows:

1. The allocation of a suitable budget and various financial suppliers in the university plays a positive role in the formation and the appropriate status of the think tanks.
2. To exploit the professional views in the university plans by the enjoyment of all scientific capabilities and the experience human forces of the university.
3. The existence of flexibility, understanding and consultation between members (faculties) to take common decisions in the think tanks undoubtedly will be effective in upgrading the place of the this tank to create thought.
4. The practical believe of the senior authorities of the university to the participative management system and the extent in which suggestions and critiques are welcomed by the faculty members in order to achieve the university goals and programs.

5. The transparency and explicit, real, and suitable accountability of the senior authorities of the university.
6. To introduce the role and the place of the strategic think tanks in generating thoughts to create tendency among the faculty members to join in such a tank in the university will be effective.

CONFLICT OF INTEREST

There is no conflict of interest.

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None

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ARTICLE

EXAMINING THE EFFECT OF THE DELPHINIUM ON TOXOPLASMA

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ABSTRACT

Introduction: Nowadays, parasitic diseases because of the similarity of the properties of eukaryotic cells in terms of therapeutic are faced with some problems which in some cases leads to discontinuation of the chemical treatment and since from ancient times in IRAN, herbal treatment was acquainted. The aim of this study is to determine anti-parasitic plant on the extract of Delphinium on the animal models. **Methods:** In this study a laboratory method and appropriate number of mouse (*Mus musculus*) in groups with ten members and control groups has been used and sample mice with *Toxoplasma gondii* parasitic RH strain were infected and then treated it with extract of Delphinium which has been obtained as ethanol form and finally, it compared with treated samples with anti-parasitic drug, results with Prism Chart pad software were explained and analyzed. **Results:** Results showed that a meaningful statistical relationship in tested samples with the extract of Delphinium and pharmaceutical samples will be obtained. In these results, weight changes between control and test group with 95.5% confidence was observed in high dose groups. In hepatomegaly evaluation in control and test groups, wet liver weight evaluation was considered as an index for hepatomegaly and in control and test groups was not observed a meaningful difference and from the other way in splenomegaly evaluation in control and test groups, wet liver weight was measured as an index for splenomegaly that there was not a meaningful difference in this case. **Conclusion:** It is obvious that results obtained from statistical samples and findings cannot be used of delphinium extract like traditional treatment methods for the other medicinal plants for *Toxoplasma gondii* parasite infection treatment.

INTRODUCTION

Today, along with growth and cultural and social development of communities, increasing many different diseases with different reasons, especially drug-resistant, especially in poor communities is ongoing. In all countries of the world inclusive our country, parasitic diseases and health problems, especially in less developed regions have a wide range. Undoubtedly, attention to various aspects of human life and attention to the treatment of parasitic diseases in the way that have less harmful effects and be economically more cost-effective are important factor in the development of any human society. On the other hand some parasitic diseases such as *Toxoplasma gondii* as one of the most common parasitic infection of humans and other homeotherms with a very wide geochartical spread has attracted the attention of many scientific circles.

Since the *Toxoplasma gondii*, as an mandatory intracellular single-celled parasite can lead to toxoplasmosis by eating raw and half cooked meat, blood transfusions, organ transplants or rarely happens by random insemination in laboratory events or on congenital by the transmission of cause of disease (Tachyzoite) from an infected mother through the placenta to fetus occur.

Given that today, even in progressive societies, maintenance of pets, especially cats can be seen in abundance, as a result, man is exposed to the catching of parasitic infection in the every period of his life from fetus life in the womb to childhood and adult life. In the present era, occurrence of Toxoplasmosis infection, always are considered to be in the two serious and dangerous population groups. First group, patients suffering from immunodeficiency or members use immunosuppressants for some different reasons and second group are fetuses that their mothers are infected to the severe toxoplasmosis during pregnancy which in the 61 percent, there is the probability of infection transition to the fetus through the placenta.

Maternal infection during the first trimester of pregnancy leads to abortion in most cases and mother infection in the second trimester of pregnancy and third trimester of pregnancy cause complications in the fetus and congenital toxoplasmosis lead to clinical protests such as chorioretinitis (usually two-way), mental and motion retardation, anemia, jaundice, splenomegaly, pneumonia, microcephaly, hydrocephalus and intracranial calcification and epilepsy in infants are the most common symptoms and lesions of the central nervous system and is said that *Toxoplasma gondii* chorioretinitis cause 35 percent of chorioretinitis in infants and adults [6].

This parasite in patients with immune deficiency also causes encephalitis, meningoencephalitis, hemolytic anemia, pneumonia, myocarditis, pericarditis, hepatitis and polymyositis which are the most common manifestation of the people involved in the central nervous system (encephalitis *Toxoplasma*) [7]. Currently, the preferred treatment of toxoplasmosis is combination of synergistic, pyrimethamine and a sulfonamide such as sulphadiazine. This treatment causes problems for clinicians, especially for people with severe disorders of the immune system, such as patients with HIV. Almost 50 percent of patients with HIV treated with the combination of pyrimethamine – sulphadiazine show symptoms of severe poisoning that led to discontinuation of treatment. Pyrimethamine is causing osteoporosis and blood poisoning, and also due to the creation of teratogenic effects should not be taken in the first trimester. Sulfadiazine in addition to crystalluria and hematuria cause hypersensitivity reaction in people.

KEY WORDS

Toxoplasma gondii,
Delphinium, traditional
 medicine, *Mus musculus*,
 Toxoplasmosis.

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This combination is not able to completely eradicate the parasite in the host and when the parasites as cysts in the brain are deployed will not be affected by this combination. In patients with immunosuppressants suffering from toxoplasmosis, treatment should be continued during the life and in most cases, as soon as not to use the drug, severity of illness can be seen, on the other hand, drugs are potentially toxic and due to this, sometimes, usage of them in long time in patients with HIV, make some unwanted severe effects that cause to giving up the drug and furthermore because pyremithamine is teratogenic and its usage dose not advice in pregnancy periods[9]. Human at the first according to experience for treatment of their illness used plants which are close their environment and now according to world health organization's statistics, near 80 percent of world population use the herbal drugs that this statistic s is not developed countries is higher and in developed countries are lower. Because of some problems caused by chemical drugs and also drug resistance, thinking of building and using the herbal plant in some parasitic disease in cow and sheep in Iran and world is increasing as a need [10].

MATERIALS AND METHODS

In this study which is based on the use of pharmaceutical laboratory studies, at first we collect delphinium plant from Tehran and Lorestan (near Borujerd), in the spring, its growing season and due to herbal extract which is existing in the delphinium, first, dry the plant organs in the environment and then divide it to some small pieces then to check all the existing compounds in plant extract, drench the chopped plant with methanol in the 1000 milliliter, then after 48 to 72 hours, separate aboveground organs of plant from the solution and then to more purification in case of additional materials, the solution with green color with the use of What man Filter Paper filtered. Finally, under vacuum, solvent extracted from solution and the cured extract obtained.

In this study, toxoplasma gondii parasite RH strain used which was always passaged in the parasitology field of Pasteur institute of Iran. Due to proliferation of parasites, first 3 mouse heads infected to parasite RH strain which were infected to this strain from intra peritoneal and disease symptoms showed clearly, killed by ether then to reach to peritoneal fluid which contain a lot of tachyzoite inner and out of cell, sterilized physiological saline entered to them and regain. Result suspension under microscope in the black field was studied and after dilution, if there is 20 to 25 tachyzoite in each field of view of lens 40 and absent of microbial contamination and after counting neubauer slide, from tachyzoite to peritoneal of mouse, near 10000 tachyzoites was injected to the peritoneal of tested mouse to infect to severe toxoplasmosis disease and it can be said that this amount of parasite RH strain is deadly for mouse and during 5 to 6 days lead to animal's death.

For grouping to treatment , 40 healthy male mice with weight near 30g from pedigree animal field of Pasteur Institute of Iran was provided and in 4 different groups was grouped and were studied during 8 days. Herbal extract solution, v / v 10% ethanol 96 degrees and 90% physiological saline, three concentrations (1,10,100 milligrams per ml) provided. mice classified in groups of 10 and each group for 7 days one of the tested concentrations of plant extracts made extraversion to the possible effects of solvents (toxicity). Also, 40 mice weighing approximately 30 grams of the Pasteur Institute of Iran was prepared from animal pedigree and suspensions containing 10,000 Tachyzoites of parasites and was injected to the intra peritoneal to 30 mice of these mice and then mice were classified to 4 groups with 10 members.

The first group of patient mice treated with 200 ml of extract solvent in the survival time every day and the second group each day with 200 ml of the drug extract at a concentration of 100 mg per ml were treated during survival. The third group as control group served to compare the survival of patients treated with studied mice without treatment which were used and fourth group were placed as environmental control in the environment.

In each group, 24 hours after gavaging, animal were studied to study the disease amount or animal survival and cosmetic changes. In patient groups, time period between infection and animal death in each group was recorded and groups were compared in average time of survival with each other.

RESULTS

As can be seen in [Table 1], in the survey of solution's effect on healthy mice, weight of liver and spleen in each test group was examined and in the first and third group, 9 mice and in the second group, 8 mice were survived at the end of test time.

Table1: survey of liver and spleen weight in tested samples

Spleen's weight	Liver's weight	number	Spleen's weight	Liver's weight	number
0/31	1/58	1	0/23	1/51	1

0/20	1/53	2
0/18	1/66	3
0/29	1/71	4
0/17	1/75	5
0/27	1/67	6
0/24	1/64	7
0/34	1/77	8
0/51	1/60	9
0/27	1/65	MEAN
0/03	0/02	SEM
Weight of liver and spleen in gavaged mice with 100 mg/ml		
Weight of liver and spleen in gavaged mice with 1 mg/ml		
Weight of liver and spleen in gavaged mice with 10 mg/ml		

Spleen's weight	Liver's weight	Number
0/19	1/5	1
0/33	1/68	2
0/21	1/37	3
0/25	1/53	4
0/38	1/87	5
0/40	1/98	6
0/45	2/3	7
0/51	2/44	8
0/34	1/8	MEAN
0/04	0/13	SEM

In survey of effects on healthy mice group with plant extract solvent gavage, results of [Table 2] was seen as below and seen that these mice group, were gavaged for only seven days with plant extract solvent to survey, effect of toxicity of solvent. This group has 27.7 average weight which at the end of seventh day reduce to 25.9. This group was with 9 alive mice at the end of seventh day and the below table conclude weight of spleen and liver of this group at the end of this test. As you can see at chart 1, with respect to no special toxicity was observed at examination test of toxicity in different groups, high dose with 100 mg/ml was selected for patient treatment.

Table 2: weight of liver and spleen in healthy mice group with plant extract solvent gavage

Spleen's weight	Liver's weight	number
0/34	1/64	1
0/42	1/76	2
0/21	1/44	3
0/36	1/64	4
0/12	1/12	5

0/20	1/43	6
0/47	1/77	7
0/43	1/76	8
0/20	1/42	9
0/30	1/55	MEAN
0/04	0/07	SEM

Due to weight changes in control and test groups, chart was drawn with Prism Chart pad software and control and test group was examined from statistical which was accorded to chart number 2 with 95.5 % significant differences in High Dose group.

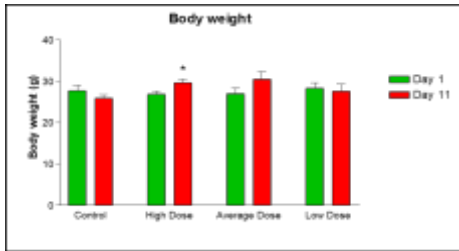


Fig. 1: Chart of toxicity amount in delphinium's extract.

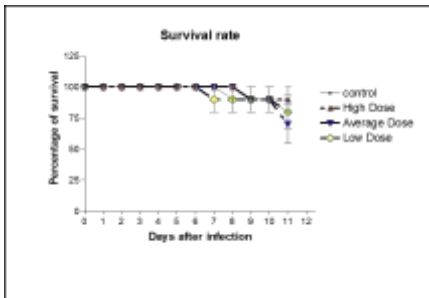


Fig. 2: Chart review of weight change in control and test groups.

Also, comparison of survival percent in control and test group according to chart number 3 which was drawn by Prism Graph pad software, control and test group was statistically analyzed which there was not any significant difference. (n=10mice/group, ANOVA).

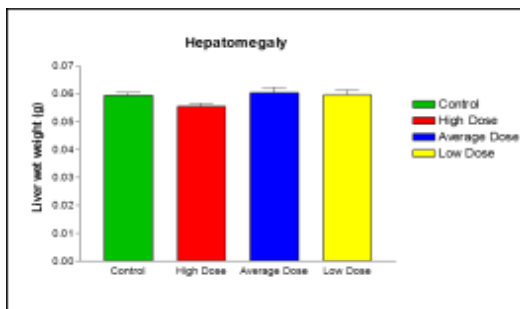


Fig. 3: comparison of survival percent in control and test group.

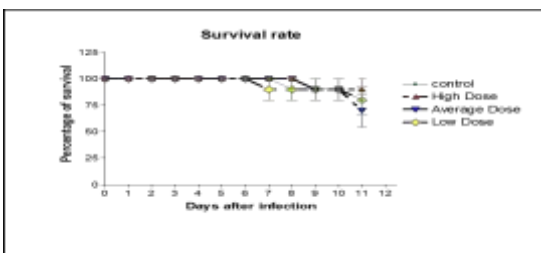


Fig. 4: Chart review of weight change in control and test groups.

Also, in comparison with survival percent in control and test group according to chart number 3 which were drawn by Prism Graph pad, control and test group were analyzed which there was not any significant difference(n=10mice/group, ANOVA).

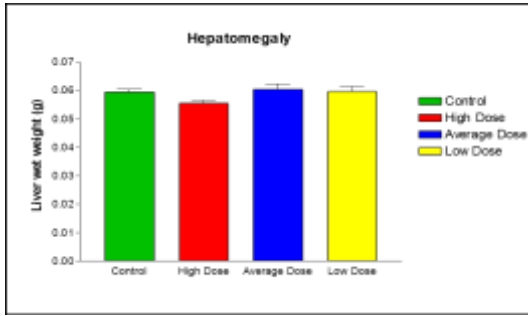


Fig. 5: Comparison of survival percent in the test and control groups.

In hepatomegaly assessment, in control and test groups according to chart number 4, wet weight of liver was considered as an index for hepatomegaly and under Prism Graph pad, control and test group was analyzed statistically which there was no significant difference(n=10mice/group , ANOVA).

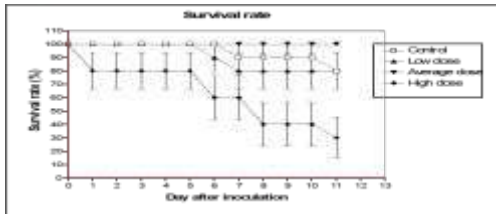


Fig. 6: Hepatomegaly evaluation in experimental and control groups

In splenomegaly evaluation in control and test groups, spleen's weight was examined as an index for splenomegaly and according to chart number 5 which was drawn by Prism Graph pad and control and test group was analyzed statistically and there was not any significant difference. (n=10mice/group, ANOVA).

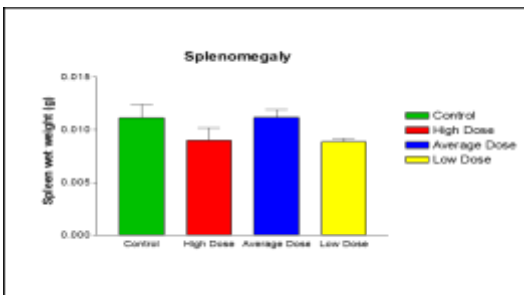


Fig. 7: splenomegaly evaluation in control and test group

In the study, patient mice had pharmaceutical solvent gavage that for 6 days, volume of 10% of ethanol 96 degrees and 90% of physiological saline was feed. In the first and second day of sickness, no difference between these groups of mice and healthy mice were observed. But on the third day of sickness, slight symptoms that include decreased mobility, secluding and lethargy was clear.

On the fourth day, symptoms such as lethargy, secluding and animal concentrating in the corner, not wanting to eat food, flanks going deep, hair bristling, closing the eyelids and sticky stools, more or less in these groups was observed and in the fifth day of sickness, symptoms of sickness was much higher and all mice were secluding in a corner of the cage and in this day, 5 mice were destroyed. On the sixth day, the mice immobilized and on this day,as well as four other mice in this group were destroyed and on the seventh day of study, the last mice in this group were wasted that by using the peritoneal fluid of mice and examining it under a microscope, severe toxoplasmosis cause of death was announced. But in patient mice with high doses of the drug solution 100mg / ml for 6 days with 100 mg ml equivalent to 200 micro liter were gavaged. Average weight of the first day of testing was equal to 34/5 grams and on the first and second day of sickness, there was no difference between the groups of these mice with normal mice but on the third day of sickness, slight symptoms include reduced mobility and secluding and lethargy was

apparent. On the fourth day, symptoms such as animal's lethargy, secluding and concentrating in the corner, not wanting to eat food, flanks going deep, hair bristling, eyelids closing and sticky stools, more or less seen in this group and in the fifth day, sickness symptoms were get more and all mice in this group were secluding on the corner of the cage and one mouse were died. On the sixth day, mice were motionless and six other mice from this group were destroyed. On the seventh day, study of last three mice which were destroyed in this group, with respect to peritoneal fluid providing from these mice and analyzing it under microscope, sever toxoplasmosis cause of death was announced. On the patient mice group lacking treatment which kept in similar conditions like the others groups and was as control patient and no drug neither gavaged nor injected. At the first of our test, average weight was 30.75 gram and at the first and second day of sickness, no difference was between these groups with healthy mice but at the third day of sickness, slight symptoms including mobility reduction, secluding and lethargy was clear. At the fourth day, symptoms including lethargy, secluding, concentrated animal in the corner, not wanting to eat food, flanks going deep, hair bristling, closing the eyelids and sticky stools, more or less seen in this group. In addition, one mouse in this group had vanished. On the fifth day, symptoms was much higher, mice secluded in one corner of the cage and three mice in this group were destroyed. On the sixth day, mice were quite funky and fetide and mice were completely immobile and three others from this group were destroyed.

On the seventh day, the last three mice in this group wasted and due to the peritoneal fluid provided from these mice and examine it under a microscope, acute toxoplasmosis cause of death was announced. In the study of healthy mice groups and non-gavaged that were kept in similar conditions and other groups were fed the same food and water but were not infected with toxoplasma. No mouse waste and an average weight of the mice on the first day of testing were 15/33 and 25/35 gram at seventh day.

With these findings to examine the effects of delphinium on sick mice for 6 days, 200 ml of the pharmaceutical solution was injected intraperitoneally. On the first day of test, average weight of this group was equivalent to 34 g. In the first and second day of the disease, there was no difference between the groups of mice with normal mice but in the third day, mild symptoms include secluding, lethargy was visible, the fourth day, symptoms such as lethargy and secluding, center concentrating animal, not wanting to eat food, flanks going deep, hair bristling, closing the eyelids was apparent symptoms but on the fifth day, symptoms was much greater and all mice were secluded in a corner of the cage. On this day, 8 mice were wasted. On the sixth day, mice were immobilized and 2 last mice were wasted and by providing the peritoneal fluid of mice and examining it under a microscope, sever toxoplasmosis, cause of death was announced. But in the patient group with intra peritoneal injection of high dose of delphinium for amount of 100 mg / ml to 6 days Just intra peritoneal injection to an amount equivalent to 200 ml with an average weight of 34/3 gram on the first day of testing.

In first and second day of sickness, no difference was between these mice group with healthy mice. But at third day of sickness, slight symptoms of sickness include, reducing mobility, secluding and lethargy was visible and on the fourth day, symptoms such as lethargy, secluding, not wanting to eat food, flanks going deep, hair bristling, closing the eyelids was seen and 2 mice were destroyed. On the fifth day, sickness symptoms were much higher and all mice were secluding on the corner. In this day, 4 mice wasted. At the sixth day, mice were immobilized and the 4 last mice wasted too that according to providing the peritoneal fluid from these mice and analyzing them under microscope, severe toxoplasmosis was announced the cause of death. In patient mice lacked treatment which kept in similar conditions and were considered as control for patients and for this group, no drug was injected. Average weight at the first of test was equivalent to 33/9 gram and at the first and second day of sickness, there were not any difference between these mice with healthy mice. But at the third day of sickness, slight symptoms of sickness include reducing mobility, secluding and lethargy was visible and at the fourth day, symptoms such as lethargy, secluding, center concentrating, not wanting to eat food, flanks going deep, hair bristling, closing the eyelids was seen.

At the fifth day, sickness symptoms were much higher and all mice were secluding at the corner and 6 mice were wasted.

At the sixth day, mice were immobilized and 4 last mice wasted and according to peritoneal fluid providing of these mice and analyzing it under microscope, cause of death was announced toxoplasmosis.

In healthy and patient group which lacked of intra peritoneal injection that kept at similar condition such as other groups and feed similar water and food but they were not infected to toxoplasma parasite, no mice were wasted because of animal house's condition and work condition and average weight of these mice at the first and sixth day were equivalent to 33/8.

DISCUSSION

In a study, the amount of activity and impact of *Consolida oliveriana* plant flavonoids in the trypanosome cruzi intracellular and extracellular forms was studied by Samira Boutaleb-Charki and colleagues that showed acetylated flavonoid compounds are potent inhibitors of epimastigote epidermal growth with similar activity of benzidazol [13]. In another study, anti plasmoid activity of Atisium chloride from *Aconitum orochyseum* plant was studied by Phurpa Wangchuk and his colleagues that this study provide first evidence in support of one of the treatments shown in Greece traditional medicine that these

alkaloids also shows a new potential anti-malarial structure [14]. Doroudgar and colleagues (2007) at a study surveyed concentration of 1, 3 and 5 percent of ethanol plant *Artemisia* plant hydroalcoholic emulsion (*Artemisia sieberi*) on the wounds that result from leishmaniasis major in BALB/c mice and concluded that the extract of *Artemisia* in used concentration is not effective on leishmaniasis major and microscopic examination of samples taken from mice under studied were positive.

In another study, flavonoid of *Delphinium staphisagria* plant on leishmania by Inmaculada Ramirez-Macias and colleagues were studied that studies showed that flavonoid derivatives are active on leishmania infantum and leishmania braziliensis [16]. In a study that was reviewed by Diaz and colleagues, cytotoxic activity of flavonoid derivatives of *Consolida oliveriana* plant that kaempferol tetra-acetate, quercetin penta acetate, trifolin hepta acetate, considerable toxicity showed [17]. In a study that was for determining for 3 species *D. D. glaucum*, *D. barbeyi* and *D. occidentale* from *Delphinium* family by James A. Pfister and colleagues was done, they resulted that *D. glaucum* have more toxicity in 3 species. In a study that was done by Grandez and colleagues, four alkaloids olivimine, olividin, 8-O-methylcolumbianine, 7alpha-hydroxycossonidine were separated from atmospheric organ [18].

In another study, alkaloids antioxidant activity of *Delphinium linearilobum* plant was done by Kolak Ufuk, in this study that spectroscopy technique was used for determination of adversity and structure. In study that was done by Zhou and colleagues, they could to separate three new alkaloids trifoliolasine A (1), trifoliolasine B (3), trifoliolasine C (5) for the first time from the Rannunculaceae family and they grow in china province (10). Khosh zaban and colleagues (2008) in a research reviewed the effect of *peganum* aqueous extract on severe toxoplasmosis on BALB/c mice and they treat mice with *Toxoplasma gondii* parasite RH strain which were infected as subcutaneously after 24 hours for 7 days. Result of this study showed that *peganum* extract lead to more survive on animal infected to *Toxoplasma*. In this study, best dosage of increase from the survive time was 300 micrograms/kilograms of mice weight from *peganum* aqueous extract [19].

In another study, aqueous and alcoholic extract of *Piper nigerum* + *fratescens* *Capsicum* + *Curcuma longa*, *Cinnamomum cassia* plants in 100 milligram/kilogram and 200 milligram/kilogram on day was reviewed on the swiss albino mice which was infected from intraperitoneal with 2×10^2 of tachyzoite for 7 days and it was observed that all treated mice were wasted until seventh day. On the eighth day, existence tachyzoites in peritoneal was counted and compared to patient control group that based this, the *Curcuma longa* had best effect of alcoholic extract that 100 milligram/kilogram dosage and 200 milligram/kilogram dosage on a day, respectively, 98/6% and 99/2% they had parasites prevention [20]. In a study that was done by Roostaeen and colleagues, anti-malaria activity of *Artemisia diffusa* plant extract on *Plasmodium berghei* on malaria mouse model, in vivo, was surveyed which showed that *Artemisia diffusa* plant extract can be for growth inhibitor of *Plasmodium berghei* in mouse body. In a study, activity amount and flavonoid effect of *Consolida oliveriana* plant on leishmania was studied by C. Marin, S. Boutaleb-Charki and colleagues that showed flavonoid compounds can be growth inhibitor promastigote and leishmania amastigote which flavonoid acetyl compounds can be more active.

In a study which was by Clotilde Marin and his colleagues on laboratory condition on trypanocidal activity from nine separated flavonoid aboveground organs of *Delphinium staphisagria* plant in both acute and chronic phase of chagas disease was studied. Anti-proliferation activity of this material against *trypanosome cruzi* on the epi mastigote, amastigote and tripomastigote forms was in some cases had stronger activity of anti trypanosomatid and lower toxicity of reference drug, benznidazol. [25]. Khoshzaban and colleagues (2007) in a watery extract effect and garlic pill reviewed on severe toxoplasmosis on BALB/c mouse and in this study, to severe infection in mice intraperitoneal 10000 tachyzoites of *Toxoplasma gondii* of RH strain was injected to mice and 24 hours after infection, treatment started and continued for 7 days and observed that control mouse group died after injection of toxic dosage of parasite along 4 to 5 days while 100 percent of treated mice was alive until fifth day and the result of this study showed that garlic extract lead to survive increase in infected animals with dosage that made it to *Toxoplasma* and the best effective dosage in the case of survive time of 200 milligram/kilogram of mice weights from garlic extract.

CONCLUSION

Generally, based on this study result, with considering results of the other studies in the case of medicinal plants on parasites cases, can concluded that in this study, to study the effect of *delphinium* plant on severe toxoplasmosis, at first, 40 healthy mice was classified into 4 groups. To one of groups, only drug solvent was gavaged. Three remained group respectively, with solution of plant with 1, 10, 100 milligram/liter were gavaged. Result of drug toxicity in one week was not considerable. Therefore, according to statistical results we reach to this resultant that plant extract was lack of toxicity and did not effect on liver and spleen of healthy mice.

Then, in the next study, 40 mice were classified on four groups and one group was considered as healthy control group. 30 other mice were infected to *Toxoplasma gondii* RH strain. One control patient group (lack of treatment), one patient group with plant high dosage solution of treatment and the last patient group had pharmaceutical solvent gavage. After 7 days, only healthy group was remained that showed *delphinium* does not have considerable effect on *Toxoplasma* parasite as the survive of infected mice in group under

treatment with plant was not considerable in compare to patient mice. It means that plant extract was not able to dextroy the parasite tachyite or inhibit from their proliferation and at last in the last study, 40 mice was classified in 4 groups. One group was as healthy as a control. 30 other mice were infected to toxoplasma gondii RH strain. One patient control group lack the treatment, one group of patient had treatment with high dosage of plant solution was as intra protenial injection and the last patient group had drug solution as injection in intra pretonial. After 7 days, only healthy group was survived that shows delphinium lack of considerable effect on toxoplasma parasite. As the survive of infected mice in group which was treated with drug was not considerable in comparison with patient mice. It means that delphinium was not able to destroy the tachyzoits of parasites or inhibit their proliferation.

CONFLICT OF INTEREST

There is no conflict of interest.

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None

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ARTICLE

PRODUCTION OF CARBON NANODOTS IN THE DETECTION OF MICROBIAL AGENTS

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ABSTRACT

Today, nanotechnology is one of the modern sciences and has affected all human life. This knowledge has been used in different fields such as the food industry. Since human beings are in dire need for food daily and permanently, any change in the food industry will have an important role in changing the quality of human life. One of the most useful tools in nanotechnology is the production of nano dots which are useful in different fields including the food industry in areas such as packing, molecular foods, labeling and monitoring, food additives, foods having a special releasing in body, and enzymes encrusting. Most researchers believe that nanotechnology is one of the foundations of the independence consolidation and national security of the country. Nanotechnology can be studied in two aspects of food safety and nutrition as well as overt and covert anti-hunger fighting. One of the most important different structures in nano-carbons is Dotty carbon clusters (carbon nano dots), and there are different ways to produce them. In this study, which has been conducted by the use of microwave method for producing carbon nano dots and then, it has used the Bioluminescence properties to verify microbial spoilage or destruct food vitamins in packed foods, the size of carbon nano dots in the nano dimension shows different qualities of light, and the survey found that the nano dots production by the mentioned methods can be useful in the visual detection of microbial contamination in food ingredients and vitamins or in labeling and monitoring in food additives and foods having a special emission in body and in enzymes encrusting.

INTRODUCTION

Carbons at the quantum level have passivizing surfaces that are very stable, and are highly regarded due to the properties of immune-reactivity before light, biocompatibility, low toxicity, cost-effectiveness and abundance of its raw materials in the nature. Carbon nano dots have a very good solubility in water because of the existence of a lot of carboxylic acid on their surfaces, and this has caused them to be functionalized by the use of organic, polymeric, inorganic, and biological materials. These nano-structures have attracted a considerable attention due to their very small dimensions and uniform structure, diversity of simple production methods, the ability to functionalize them, and specially the ability to replace them with toxic metal quantum dots. Carbon dots are a new generation of carbonic photoluminescents containing oxygen which are spherical and their size is less than 10 nm [1]. These nano dots were obtained by chance in 2004 when purifying single-walled carbon nanotubes via electrophoresis. Nano dots are special superior than organic pigments in terms of high solubility in water, bioavailability and biocompatibility properties, simplicity in surface functionalizing, low toxicity, the ability to fluorescence, and high stability against fading. Carbon dots are known as fluorescent carbons due to their strong fluorescence properties [2]. This characteristic of nano dots has led to complex catalyst systems based on carbon nano-dots in order to provide the cost-effective use of all sunlight spectrums. But it should be noted that in these nano dots, their less than 10 nm dimensions have a special optical catalyst, and their larger sizes have little or no optical activity [3]. Various materials including graphitic masses and carbonic materials such as nano diamonds [5], carbon nanotubes [11], soot [4], activated carbon [8], and graphite oxide [10] are used to produce these carbon nano dots by employing simple and inexpensive methods such as laser avulsion (Sonthanasamy, Ahmad et al. 2016), arc discharge [6], chemical oxidation [7], combustion oxidation [12], and microwaves and ultrasound [16].

METHODS

In this study, the synthesis of nanoparticles was made using the thermal effect of microwaves and a combination of polyethylene glycol and a sugar compound such as glucose or fructose. In this way, different amounts of polyethylene glycol and polysaccharide were solved in distilled water and the resulting clear solution was placed in a 500W microwave oven for 10 to 19 minutes, and after functionalizing agents and neutralizing to detect microbial agents cultured in TSI culture medium, it has been used.

RESULTS

With increasing the reaction and shelf life, the solution color was changed to yellow and finally to dark brown [Fig. 1].

Due to the reaction prolongation under microwave conditions, the generated nanoparticles become slightly larger and find the ability to have light emitting at higher wavelengths as well. In this way, after 5 to 10 minutes irradiation, microwave of carbon nano dots with sizes from 2.65 nm to 2.75 nm were obtained. Finally, the generated nano dots were resulted after removal of ethylene glycol by using the flooded concentrated sulfuric acid, and the generated carbonic mass were resulted by using distillation in 2M citric acid, and then by neutralization through sodium carbonate and removal of salt by the use of dialysis bag of 5 nm carbon nano dots [12]. The nano dots were deactivated through reaction with 4, 7, and 10-trioxo, 1 and 3-tridecan ethylene diamine, olein amine, or polyethylene glycol (PEG) at 120°C for 72h under a

KEY WORDS

Nanodot, microbial, photolytic, traditional medicine, *Mus musculus*, *Toxoplasmosis*

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nitrogen atmosphere, and finally, by creating a level agent binding to bacteria, they led to the nano dot binding to bacteria and finally, identifying the microbial agent. Infrared spectroscopy showed the Fourier transformation of a tensile band in the area of 1572 cm⁻¹ in accordance with carbon-carbon double bond and a vibratory band in the area of 1375 cm⁻¹ in accordance with carbon-hydrogen bond. From the images of Transmission Electron Microscopy (TEM), the existence of crystal structure consisted of a similar network space was demonstrated. Elemental analysis proved the existence of carbon nano dots rich of carbon and oxygen with 57 wt% carbon, 7.5 wt% hydrogen, 8.5 wt% nitrogen, and 27 wt% oxygen.

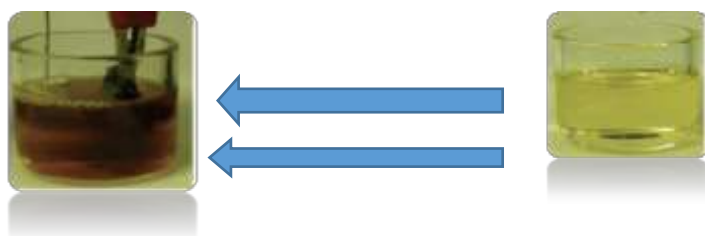


Fig. 1: The color change of the solution containing raw materials from yellow to dark brown with a higher irradiation time represents the generation of carbon nano dots.

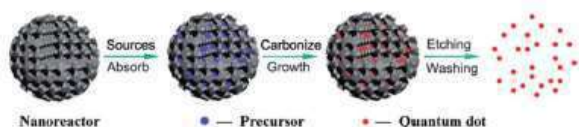


Fig. 2: Generation of carbon nano dots by absorbing microwave irradiation.

Nano dots generated in this way have absorption bands at about 320-260 nm. Carbon nano dots have an optical absorption with end stretching up to visible light range in the ultraviolet light range [Fig. 3].

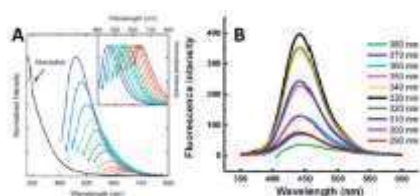


Fig. 3: The optical absorption on carbon nano dots in the visible to ultraviolet light spectrum.

Since the surface agents groups attached to nano dots are effective across absorption wave of nano dot, the nano dot absorption band increases into longer wavelengths after being functionalized with TTDDA or Organosilane (Gong, Hu et al. 2014). Two main optical characteristics of nano dots are based on the emission by surface energy traps and the effect of quantum size, so that the blue emission (shorter wavelengths) is resulted from the effect of quantum size and the green emission (longer wavelengths) is resulted from the effect of surface energy traps (Yang, Zhao et al. 2015). It should be noted that the exited optimal property of nanodots depends on the existence of the surface agents in the relevant nano dots and the nanodot size, so that according to the investigations conducted by Gang, Hu et al (2014), nanodots with a small size of 1.2 nm are dispersed in the ultraviolet area and nano dots with the size of 1.5-3 nm are dispersed in the area of visible light and the types with the size larger than 3.8 nm are dispersed in the area near infrared [Fig. 4 & 5] .

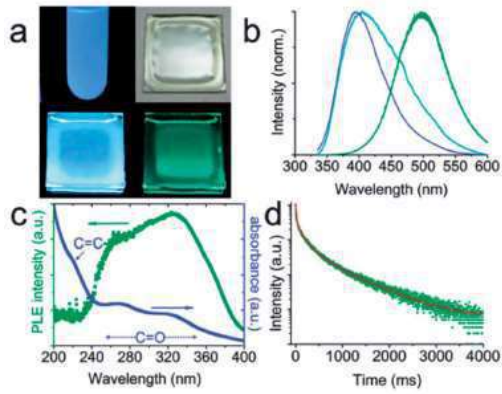


Fig. 4: Fluorescence property of carbon nano dots with absorbing the ultraviolet light.

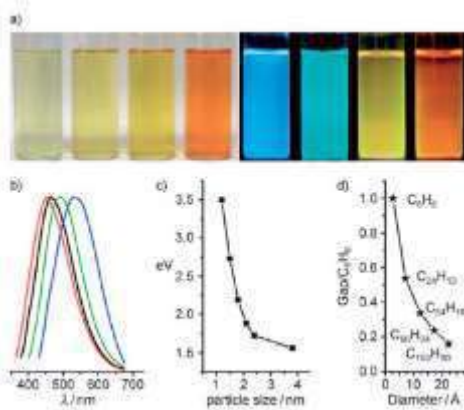


Fig. 5: Different emission spectrums of nano dots with different sizes.

Since agent groups have different energy levels, which can lead to produce a group of emission traps, when a light at a special wavelength is provoked, it causes the brightness of carbon nano dot, and in this case, the surface state of emission traps will determine the dispersion; now if the related carbon nano dot surface is neutralized through oxidation and other reactions of surface modification by the use of specified organic groups, then the light emission will simply be seen through shifting into red. Usually, surface-counteractive materials are agents having amine groups or polymers such as octadecylamine and/or polyethylene glycol. Research shows that different oxidation of nano dots surfaces leads to the emission of different optical colors (Shi, Li et al. 2016). In the investigations, it was indicated that carbon nano dots are used due to their unique light induction properties and the excellent ability of electron diffraction as a choice for photovoltaic and optimal catalyst applications. Therefore, by creating targeted surface agents on these nano dots and then by oxidation of the relevant surface agents through oxidizing agents that are created in bacteria – considered as agents of food spoilage – or oxidizing agents that are created as a result of physical destruction of nutrients including vitamins, carbon nano dots can be dispersed, and accordingly, by the use of optical imaging process from such a excited nano dots in the mentioned state, the contaminated food sample can be immediately identified, and even if the surface-oxidizing agent can be designed in such a way that it is exclusively produced by a special bacteria, a novel method for the detection of the relevant bacteria can be conducted. In this study, exclusively by creating surface agents bonding to bacterial antigens, the ability of optical identification of bacteria has been gained [Fig. 6.a & b].

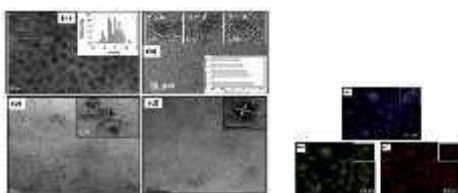


Fig. 6: a) different images of transversal electron microscope from generated carbon nano dots; b) fluorescence property of carbon nano dots employed in the detection of bacterial samples and vitamin agents or animal food agents.

CONCLUSION AND DISCUSSION

As expressed, due to the prolongation of the reaction under microwave conditions, the generated nano dots become slightly larger and gain the ability to have optical dispersion across longer wavelengths. In this way, after 5-10 min irradiation, carbon nano dots microwave waves in the size of 2.65-2.75 nm are resulted. This process in Liu & He experiments showed that 5 nm carbon nano dots have photoluminescence strength. Also, as expressed, the nano dots were deactivated through reaction with 4, 7, and 10-trioxo, 1 and 3-tridecan ethylene diamine, olein amine, or polyethylene glycol (PEG) at 120°C for 72h under a nitrogen atmosphere, and finally, by creating a level agent binding to bacteria, they led to the nanodot binding to bacteria and finally, identifying the microbial agent. Infrared spectroscopy showed the Fourier transformation of a tensile band in the area of 1572 cm⁻¹ in accordance with carbon-carbon doubled bond and a vibratory band in the area of 1375 cm⁻¹ in accordance with carbon-hydrogen bond. The existence of longer wavelengths after functionalizing carbon nano dots according to Gang experiments was completely clear. In the investigations, it was indicated that carbon nano dots are used due to their unique light induction properties and the excellent ability of electron diffraction as a choice for photovoltaic and optimal catalyst applications. Therefore, by creation of targeted surface agents on these nano dots and then by oxidation of the relevant surface agents through oxidizing agents that are created in bacteria – considered as agents of food spoilage – or oxidizing agents that are created as a result of physical destruction of nutrients including vitamins, carbon nano dots can be dispersed, and accordingly, by the use of optical imaging process from such a exited nano dots in the mentioned state, the contaminated food sample can be immediately identified, and even if the surface-oxidizing agent can be designed in such a way that it is exclusively produced by a special bacteria, a novel method for the detection of the relevant bacteria can be conducted. In this study, exclusively by creating surface agents bonding to bacterial antigens, the ability of optical identification of bacteria has been gained.

CONFLICT OF INTEREST

There is no conflict of interest.

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ARTICLE

A STUDY ON PAPER STRUCTURES AND RECYCLED MATERIALS

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ABSTRACT

Nowadays the design quality and the type of utilized building materials have a vital role in bolstering building's energy and to accomplish this task, architects and engineers' minds have been preoccupied with finding more available, feasible and permanent alternatives. Along with this line of thinking, the ever increasing world population necessitates pondering on recycling wastage especially in building industry in recent decades, to name a few of these thoughts we can consider: utilization of raw materials such as paper and paper waste that is very economical and of course environmental-friendly. Thus today in modern architecture, the quality of materials, utilization of recycled and environmental-friendly materials, using progressive methods of production and installation, modular production and speed in performing tasks, being economical in expenses, light weight of materials and facilities to transfer them and ... are inevitable and necessary to be taken in consideration. This study aims at studying properties and potentials of paper and recycled materials of paper waste and considering it as an option to be used in low-rise constructions as a structural component and also to be used in mid-rise and high rise constructions as a non-structural component. This study target at studying architectural qualities of such constructions, therefore the initial introductory part of this research is about paper and its history, paper materials structures, important experiences of paper utilization in constructions and successful instances in this ground. The second part is all about the necessity of green materials, introduction and recognition of paper materials that are non-structural and recyclable, properties of such materials and the production methods. Finally the last part discusses and concludes the potentials and possibilities of utilization of these materials in constructions and the perspective of such utilization and its role in architecture.

INTRODUCTION

According to ever increasing growth of infrastructural projects and also the problems and difficulties of implementation of building projects and the statistics that report on long implementation time of a project or lack of green materials in a project, architects pay enormous attention to new modular materials, using new building technology and materials which are cheap, simple, environmental-friendly, recyclable and easily implementable and constructible. The new form of today buildings are in accordance with modern human requirements and this distinction is not only because of the different design but also because of implementation problems and used materials in constructions. Human beings are entering a new era of life and due to this fact they are more sensitive to a number of issues as compared to the past. Human beings considering environment maintenance and economical use of energies seriously.

To elaborate on this we must say that our future environment depends on matters like less usage of fossil resources, more usage of clean resources, usage of recycled materials and life cycle and the reversibility of materials. The recent experiences have shown that paper that appears weak and unsustainable has many potentials be applied as a structural and non-structural materials that can meet a part of demands in construction and architecture. We continue with answering the questions that must cross our minds in this matter. Can we use paper and paper materials as a basic material in construction? Can we tackle weaknesses and lacks of paper materials? Can we replace recycled materials with raw materials?

This research has been conducted based and descriptive-analytic method of written and collected library documents, that after amalgamation and collecting has been presented as this essay.

STRUCTURAL PAPER MATERIALS

The history of using paper and cardboard in Japan is pretty old. Considering the earthquake-prone qualities of this area from the ancient times the design of the buildings was done in a way that the least possible harm occurs during intense earthquakes and it was the first target of their architecture. One of the best ways to diminish the amount of destruction of buildings during earthquakes is lightening the building and utilization of materials with lower weights. In architecture paper, cardboard and such materials are being used.

Traditional Japanese architects used to utilize paper sheets called shoji as a divider in different architectural environments. These paper sheets in addition to their light weight and plying the role of divider have an aesthetic aspect to offer to the architects. But what we study in this paper is way beyond the use of paper in Japanese architecture. Nowadays the paper is used as the most significant structural element of the building so that a particular form of paper has been able to replace steel, concrete and other building materials. It happens a lot that we throw away the core cardboard of toilet tissue papers or fax papers and plots but we never could imagine that all these materials can be used as structure elements in buildings.

KEY WORDS

key structures, material recycling, sustainable architecture medicine, Mus musculus, Toxoplasmosis

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Two recent decades witnessed considerable achievements in development of paper utilization in building equipment and tools, constructing permanent or non-permanent structures such as houses and exhibition halls. These varieties of paper usage is due to its potentials to take different shapes, raw materials, modern additives and the facilities that have been created by new production technologies. Geometric shapes and sections of paper in the form of pipes, folded sheets, honeycombs and crust grant us this capability to use them in architectural environments. The feasibility of creating different geometrical shapes with high resistance and slight mass provides its ground to be used in architectural environments. Because the raw material of paper is wood then its technical properties are similar to wood and a certain qualities of wood is concealed in paper. Pipe shapes of paper that resembles the wooden houses is one of the strongest geometrical shapes to be used in building construction and architecture. Form and shapes of paper usage in houses can be similar to the form and shapes of wooden houses.



Fig. 1: The machine which turns paper sheets into paper pipes.

If the paper sheets be cut into strips, smeared with glue and wrapped around round rods in a spiral form, a paper pipe with the cross section of tree trunk would be made. Paper pipes according to their expected functions can be made in varieties of diameter, thickness and length. The possibility of making a paste of paper again and its recyclability give us the opportunity to use it over and over again. Cheapness, facilities to change, simple technology, long lasting natural colors that's has been possible with new additives and having no wastage and debris have increase the utilization of these pipes. [8].

In Australia this pioneering act of using paper in architecture was implemented by a number of architecture students and their head Adriano Puppilli in Sydney University. They started their survey to target at making a two-story building with structural and non-structural paper products. Initially they designed structures in varied shape and with different experiments tested their mechanical strength. [Fig. 2].



Fig. 2: Examining mechanical strength of structural paper components.

Researchers finally concluded that the strongest and the most applicable of all was winged circular cross section rod. As we can see in the figure the extra edge that is put in the middle of the circle in addition to enhance resistance of the rod, has provided a good position for couplings. [Fig. 3].

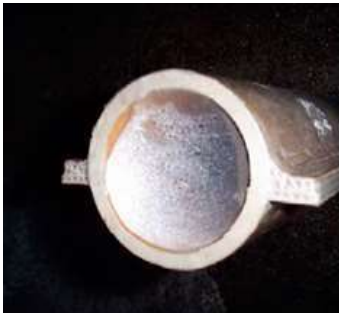


Fig. 3: Final cross section of structural paper component.

Researchers have examined building materials on their resistance to fire and with adding flame-proof materials have increased the resistance of these materials. After different tests and experiments they finally were able to make a pure paper two-story house. [Fig. 4] structural and non-structural elements of this house is completely made up of recycled, designed and constructed paper. (Papilla, 2003)



Fig. 4: The final structure made up of structural or non-structural paper components.

Shigeru Ban, Japanese architect, has used flat and piped cardboards extensively in building houses, urbanizing, big exhibition halls and emergency shelters. This architect has understood the potentials of paper materials and is one of the pioneers in constructing paper buildings. He has started using paper materials in his works since 1989 and has presented a number of valuable art works so far. [5].

Cardboard cathedral in 2002 was one of Shigeru Ban's famous buildings. Christ earthquake in February 2011, invaded a paralyzing damage to Christ cathedral in New Zealand- it was the symbol of town. To respond to this condition building of the cathedral ignited by the well-known artist of paper materials. Paper pipes with the length of 20 feet incorporated a triangular form. [Fig. 5].



Fig. 5: cardboard cathedral in New Zealand.

This model has been adopted the same geometrically plans and perspectives but there is a gradual modification in the angles of paper pipes. This cathedral has a capacity of 700 persons. It can be used as an event venue or a concert hall. The target of the architect was the exact opening of the building on the same date of earthquake incident i.e. February 2012.

One of the latest paper constructions so far is the temporary pavilion of world cup 2014 in the embassy location of Brazil in Japan Tokyo. To present a place to executing different activities of Brazil embassy in world cup 2014, Shigeru Ban designed a temporary pavilion in the opposite patio of the assistance building of this embassy in Tokyo. This strong construction has been made of very firm recycled cardboard and at the opposite side of this beautiful structure there is another magnificent building designed by the famous Brazilian architect Ruy Ohtake [Fig. 6].



famous Brazilian architect Ruy Ohtake [Fig. 6].

Fig. 6: World cup 2014 temporary Pavilion at the arrival place of the Brazilian embassy in Tokyo.

This pavilion was constructed by a group of Brazilians in Tokyo and was removed after world cup 2014, the structure of this cardboard building was based on a big pillar and thin rods on top of it that buttresses the translucent and plastic ceiling. This pavilion displays a porous wall from the street view that is filled sporadically with balls. Benches and tables of this place invite various social events. (Ban, 2014)

In our country in 2011 a small house was made with using a factory products of paper pipes in architecture faculty of Shahid Beheshti University. Even though these pipes were made for non-construction targets and basically do not have the necessary applications but have shown the potentials of paper and its hidden qualities in this sample. In Iranian sample two kinds of paper piped were used with the diameters of 17 cm for the walls and 10 cm for covering and ceiling. To couple and connect the walls, ceiling and floor together hemp ropes were passed through these pipes and connect these parts with stitches or pegs together. [Fig. 7] (Sartippour, 2012)



Fig. 7: The implemented sample of paper house, designed and engineered by Saeed Mashayekh Farid.

RECYCLE NON-STRUCTURAL PAPER MATERIALS

All the solid wastes (corruptible or none) which are produced in houses, the centers of production, distribution or selling food products, industrial, agricultural and commercial institutes, hospitals and treatment places are called debris. Throwing these debris away in addition to environmental pollutions will destroy a major part of reversible resources. Recycling industry nowadays is supposed to play a vital role in value added and better utilization of resources in the society.

The researchers of Jean University in Spain have taken another step in environmental-friendly aspects and have been successful to produce bricks from the paper waste. In this process they have produced brick from the wastage of paper factories with less cost and expenses. The wastes of paper factories is along with sludge and mixed with clay from the process of water waste treatment and then will be compressed and exit the machine in the form of paste and used for building materials. [Fig. 8]



Fig. 8: Produced paste from recycled materials.

The pieces of paste that are similar to sausages are cut according to the brick's size and measures and put in the furnace. This process demands less time as compared to traditional brick production. The paper bricks that are produced in 3*1*16 cm are transmitting temperature rather low that is considered of one of their greatest properties. The other merit of invention of this method is reduction of refuse in the place of refuse burial. [Fig. 9] [3].

Although these bricks have less pressure resistance as compared to traditional ones but they have considerable adherence and plasticity qualities and these properties are acquired by mixing a lot of paper refuse. These researchers are hopeful that adding barely, olive and bio-diesel refuse or sewage sludge to this mixture would make these bricks able to overcome their limitations and shortcomings.



Fig. 9: Produced bricks of recycled materials in Spain.

According to the priority of recycling refuse and wastage to their removal or burial, Indian researchers have also made paper bricks out of recycled refuse of paper. This was done by Professor Rahul Raleganokar from Visusavaria national technical institute in India (VNIT). The material used in these bricks was 90% from the recycled paper refuse and 10% cement. These combination was implemented mechanically and then the mixture was poured into the mold and compressed under pressure. After taking out from the mold the mixture is exposed to sunlight for some time. This recycled materials is of low cost production-wise and their light weight make them ideal and precious material to be used in buildings. [Fig. 10] [4].



Fig. 10: Brick production from recycled material and their trial by Indian researchers.

Chemistry researchers of one of the developmental technologies in Eastern Azerbaijan science and Technology Park were successful in producing super-light cellulose bricks from recycled paper fibers. In the production of this super-light brick they used cellulose recycled paper fibers that is considered to be a kind of natural polymer so that after mixing these materials together and molding them, these bricks can be used without any mortar or material added to them. Papers of dry cellulose refuse or newspaper and cartons enter the recycling line and after recycling they turn into paper paste they will be mixed with materials like polymers, Resins and others. Then they are put in contraction molds. Due to existence of humidity in paper structure of these bricks they will be exposed to a flow of dry air or driers to become as designed blocks. [Fig. 11]

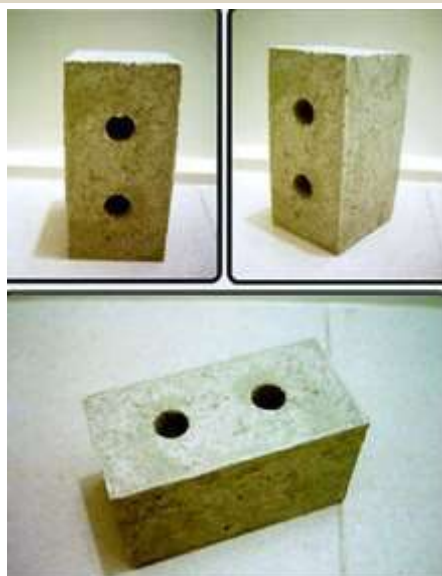


Fig. 11: Production of bricks from recycled materials by Iranian researchers.

Because these bricks do not require any mortar or added materials, for installation they connect together like pieces of puzzle and then a number of rods are passed through them and couple the bricks to the main structures of the building. These bricks can be used in non-porter walls, blade wall and interior parts of the building like EPS walls, and the mixture of these bricks are of ultra-light materials that their density is 0.5 g/cm^3 or 500 kg/m^3 , if we compare these numbers with building materials and structures similar to them the number will rise to $900\text{-}1700 \text{ kg/m}^3$ and because in construction the lighter the weight of the materials the safety of the building is higher this makes the product superb. If you utilize these bricks in the building there is no need of painting because these bricks can be produced with any color and the fire-proof property of these bricks is another merit that makes them superior to easily-catch-fire EPS walls. These bricks can be resistant to fire to 500 centigrade degree. After production of these bricks, their samples were given to Tabriz University students of civil engineering and the results were positive and after being approved by authorities and grabbing enough financial supports the mass production would be triggered very soon. [1].

Practical utilization of this product have been implemented in false ceilings and partition walls. These bricks with their ultra-light weight can be really economical and can decrease the cost of building to 30% of the total cost of construction.

According to surveys in brick production from recycled material and paper refuse, for better utilization of these materials and their mass production, it seems that there are shortcomings in these materials that can limit their usage. One of the pitfalls of paper materials is their low level of strength against humidity. In this field a number of surveys have been conducted that we will consider them. The researchers of Italian institute De Technologika headed by Roberto Singollani have invented a tool to connect cellulose fibers available in paper to nano- particles to create new properties in paper for example paper becomes resistant to water, finds some magnetic properties, becomes florescent or resists against bacteria. The results of this survey were published in Journal of materials. [1].

Researchers of our country have also conducted a number of researches in which they have applied colored coverings based on polymer to make fabric, paper and any kind of building materials water-proof. With utilization of this covering we can make fabric, paper and wood water-proof. This covering penetrates inside the surface and the polymer covering permeates slightly inside the crust while a thin layer of Nylon also covers the surface and make it perfectly water-proof. Because this covering is polymer, it has a great deal of resistance against acid, alkaline and also environmental changes and also is strong against friction and color peeling and chipping. These polymer coverings suggest a wide range of colors from colorless and lucid layers to other colorful spectrums.

The low resistance against fire is the other shortcoming of paper materials. Thus we can add chloride ammonium to the mixture in initial production stages and it makes the bricks more resistant to fire and incineration process starts with delay and difficulty. Or we can add Silicate sodium solution to the mixture to make it fire-proof. Of course the detail of applying these materials demands more field and operational work. (Najafi, 2007)

Thus with fundamental studies regarding block and brick production issues with the use of refuse and wastage and removing their shortcomings, we can achieve a new generation of green and sustainable materials in our country. Now we elaborate on the merits and qualities of prominent properties of bricks produced from recycled materials. Maybe the most significant property of these materials are the light

weight of them compared to their counterpart materials with the same shape, because the ultra-light materials are applied in their production. Resistance to fraction and chipping is one of the other merits of these bricks. The possibility of collapsing due to earthquake or temperature changes in these materials are pretty low in these blocks. This characteristic does not exist in gas blocks of concrete. These materials due to pores and bubbles existing in their structure are considered to be the best materials which are insular to temperature changes. Due to plasticity of these blocks they can be made in the form of tabs and crotch to make an appropriate coupling in the connection points of different blocks. The lack of crotch or tab in the materials can create a lot of problems in the implementation process and it uses more mortar to couple and connect the blocks and this adds to the cost of construction. In mass production of these materials they can be easily sawed, nailed, pierced and slotted and the place for mechanical and electronic equipment can be embedded. The feasibility of this block is really high in its transportation as compared to other products it has less weight and can be transferred in higher volumes. Because of the possibility of mixing these materials with Nano-particles and anti-bacterial materials they do not decay and the growth of mold or other micro-organisms on them is impossible and no insect can lay eggs in it. Due to available materials, the block can be a long lasting product and its properties would not change. The other merit of these materials are their characteristics of being environmentally-friendly. Studies prove that these materials and their production process due to the utilization of green energy is adaptable to environment fully, it does not only prevent harming the environment but also because it cares for refuse and recycling processes, the life cycle of environment can be damaged far less and also can be protected. With more studies this product can be produced according to national standards of construction and make it aligned with the section of 18 and 19 in technical qualities and strength.

CONCLUSION

According to what we mentioned earlier and the fact that today the design quality and consumed materials play a vital role in increasing the energy of the building and considering this fact that in our country one of the main problems is the lack of recycling technology for refuse and spending enormous expenses to refuse reduction and removal and environmental pollution and on the other hand no progress in prefabrication technology and lack of green material usage have created problems in urbanizing and construction. We can conclude that pondering on and investing in the field of optical materials of building using recycled materials is of grand importance. The experiences of using paper in architecture are of beauty, strength, simplicity and elegance. The humble sense of paper; and the capabilities that the new production technologies have created make it possible to shape the paper in varied forms such as pipe, box and sheet, and this plasticity have suggested paper materials as structural materials and non-structural materials like dividers in the buildings. Due to the industrial production of these materials in modular forms, we can witness in future the fast, easy, cheap and sustainable production of these materials in low-rise constructions as structural components with this method. In high-rise construction we can take advantage of non-porting members made by recycled materials.

Even though some part of paper materials merits were revealed, the construction based on them is still in its beginning. To develop and promote construction capabilities as we promoted the use of steel and concrete before we have to educate people about these materials as well. Repetition and sustainability of rational and justified experiences for paper technology application especially building temporary spaces can play an important role in introducing hidden and obvious effect of paper in construction and architecture. Even though paper material potential and capabilities have been proved to be able to create and architectural space in short-term and limited constructions, the utilization of it in permanent constructions demands more time and trial and error.

CONFLICT OF INTEREST

There is no conflict of interest.

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None

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ARTICLE

UTILIZATION AND PHYSICAL FEATURES OF PUBLIC OPEN SPACES IN BANDAR ABBAS, IRAN

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ABSTRACT

Public green spaces in the cities are one of the important urban spaces that increase the chance of physical and mental health of residents. Such spaces in terms of social, economic, and environmental functions enhance the quality life of people hence, these days investigation of urban green spaces seems essential to increase resident's health. This study explored all the physical factors that affect the chance of people to visit public open spaces in the city. After reviewing previous researches all the items that can be contributed to park utilization have been introduced, then a questionnaire was designed based on these factors to find out the items that associate with each factor and introduce the physical features of the public open spaces. The data was gathered by using questionnaire survey that distributed randomly in different public open spaces of the city. Finally 60 questionnaire was collected as pilot study to do correlation analysis. The findings of this paper showed the final items used to physical factors in determining the level of park utilization.

INTRODUCTION

Green spaces, especially parks, play an important role in improving the citizens' health and quality of life. Such spaces in a city can serve as a place where people can do various recreational activities. Fredric Olmstead introduces parks as an urban place where the residents can experience beauty of nature. It is also a place for relaxation, spending time, doing various sports activities, and playing various games far from the urban commotion [27].

Parks can also be introduced as a place for interaction between friends and neighbors. In addition, parks play a very beneficial role in increasing physical and sports activities among citizens. These places can provide a pleasant place for people to walk in and do other physical and recreational activities. Familiarity with people who use the park and kinds of activities they do can be helpful in increasing the quality and utilization of parks [19],[20]. Furthermore, a large number of studies have shown the effect of the physical environment on physical activities. Previous researches have also revealed that regular park users possess the required standards of doing physical activities as compared to those who do not use parks very often [8]. Furthermore, studies have pointed out the significant effect of the physical environment on the amount of the residents' physical activities. In this regard, physical characteristics of parks and other green spaces such as safety, comfortability, accessibility, and facilities play an important role in physical quality of parks [32]. Various physical characteristics and facilities of parks can influence various physical activities differently [8].

[3] introduced some factors related to the extent of utilization of parks by users. These factors include qualitative and quantitative characteristics, users' personal characteristics (social and economic status, age, gender, and race), psychological factors (individual barriers) effective on personal decisions, accessibility of local facilities, the extent to which the park can meet needs of the local users, parks' qualitative status, and safety. On the other hand, these factors can be categorized into three groups: individual characteristics, social characteristics, and physical characteristics of the environment.

The present study intends to introduce various physical factors that can influence utilization of parks and physical activities in parks reviewing the previous studies. As the case study, this paper studies parks in Bandar Abbas, Iran. The present paper is based on the results of pre-test of a comprehensive study of Bandar Abbas parks. It attempts to introduce the items associated with the measurement of physical characteristics of parks that influence park utilization in the city. The results of the reliability of these items proved using SPSS software shows that they can be used as reliable items to measure physical characteristics of parks.

Number of Parks

Number of parks and playgrounds in neighborhoods is associated with the amount of physical activities. For example, a survey conducted on 500 citizens living in 56 neighborhoods in Portland revealed that the citizens who lived in neighborhoods with more parks walked more than the citizens who lived in neighborhoods with fewer parks (Li et al., 2005). As reported by some studies and surveys, the larger the number of public places and green spaces is in a neighborhood, the higher the rate of the residents' physical activities is. Furthermore, a study conducted on female citizens of 6 different cities in Australia manifested that the citizens who accessed parks within the radius of 1 mile from their living place had more physical activities compared to other citizens. For each park within the radius of 0.5 mile from a household, 17 minutes of walking has been reported [5].

KEY WORDS

physical features, public open space, size of park, number of parks, Bandar Abbas traditional medicine, *Mus musculus*, *Toxoplasmosis*.

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Size of Parks

Previous studies showed that size of parks and green spaces was associated with utilization of parks and amount of physical activities. In this respect, an Australian study manifested that the total percentage of parks' space in neighborhoods had direct relationship with children's physical activities (Roemmich et al., 2006). According to the results, if park space increases 1%, children's physical activities will increase 1.4% showing that the size of the space allocated to parks in neighborhoods has positive effect on physical activities.

Some studies have also reported the role of park size in neighborhoods. For example, results of a study showed that bigger parks are less probable than small parks to be selected by users (Kaczynski et al., 2008). On the other hand, studies have revealed that bigger parks are of higher interest for users to walk in (Giles-corti et al., 2005).

Accessibility

Physical and visual accessibility to green spaces and parks are primary concepts in planning and such places and they are considered the essential parts of urban planning in many countries. Parks must be planned and located where they are clearly visible. Parks can provide various accessible facilities and opportunities for people and play an important role in enhancing urban life quality (Goodmann, 1968). In a city or neighborhood, sparsely located parks are utilized more than densely located parks. Accessibility and spatial distribution are two factors required to measure parks (Talen, 2000). According to Whyte (2000), the accessibility of a place can be evaluated based on its physical and visual connection in residential neighborhoods. An accessible and successful park is a place where people can easily reach and is visible even from a far distance.

Accessibility is defined as "individuals' ability or freedom to meet their needs for the purpose of maintaining their life quality" (Lau & Chiu, 2003). A public place is considered accessible if it can be reached by different individuals and provides various opportunities for different individuals. In this way, it can be regarded not only as an accessible point, but also as an accessible place. It is worth noting that accessibility should not be just based on an idealized healthy adult. Rather, it should be based on different individuals such as a senile person with a cane or walking stick, a mother pushing a stroller or an eight-year-old kid riding a bicycle (Harnik, 2003). Most of the studies conducted on accessibility and park use have been associated with green spaces ([19],[20] et al., 2008). Results of a study in Chicago revealed that the citizens who lived closer to a park utilized the park more than those who lived far from the park (Tinsley et al., 2002).

Generally, the larger the number of parks within the radius of 200 meters in residential neighborhoods, the more the parks are utilized since it is less required to use a vehicle or car. Another study conducted on different Australian neighborhoods showed that people prefer to use or visit the parks with the shortest distance from their living place (Gilles-Corti et al., 2005). Out of thirteen studies associated with physical activities and parks, eight studies manifested the direct relationship between proximity of parks and increase of physical activities. On the other hand, results of a study manifested that American adults who could access or reach parks easily did physical activities two times as much as those who lived within farther distances from parks (Kaczynski & Henderson, 2000). It has also been noticed that sidewalk green spaces are utilized more than parks or other green spaces in the neighborhood (Ferre´ et al., 2006).

Facilities and amenities

The quality and condition of sports and play equipment in parks can effectively increase or decrease park use. These facilities are of variable importance based on the characteristics of the environment ([19],[20] et al., 2008). A large number of studies have illustrated that presence of various sports and play facilities and equipment for children plays a significant role in encouraging people to attend and utilize parks. Some studies on parks in residential neighborhoods reported that even the nearby parks were not utilized by the residents due to the absence of appropriate play facilities and equipment for children (Veitch et al., 2006).

The activities based on which various sections and parts of a park are planned and built must be motivating enough to attract people to parks. The larger the number of activities in a place, the more the opportunities people can have to contribute (Whyte, 2000). Furthermore, one of the key advantages of public places is to be all-inclusive and appropriate for all individuals. In this respect, these places should cover all residents in a neighborhood and provide opportunities and services for various activities of different groups of people (Duffy, 2003). The presence of walking routes and paths in parks has been known important for park users (Lloyd et al., 2008). In addition, park facilities including appropriate seating place, drinking fountain, pergola, and rest room can positively affect the amount of users' utilization of a park ([19],[20] et al., 2008). Awnings or any place appropriate to cast shadow can also influence users' utilization, especially during the day (Tucker et al., 2007).

Another study investigated the role of facilities and amenities in thirty three parks in Ontario, Canada, the results showed that parks with more sports and recreational facilities and equipment were utilized for physical and sports activities more than the parks which were poor in this regard. In this respect, it was

revealed that parks with walking routes and paths were utilized twenty six times as much as the parks which did not have this path (Kaczynski et al., 2008). Also, a study conducted on four different parks manifested that parks which included play facilities, sports grounds, and walking paths were utilized for sports activities more than the other parks (Giles-Corti et al., 1996).

Attractiveness

The beauty of parks and green spaces plays an important role in the rate of park use by all age groups. Findings of a study revealed that if parts of a park become visually beautiful by planting trees, they will be utilized more than the other empty parts (Giles-Corti et al., 1996). In this regard, graffiti on the walls reduces park use. In addition, physical status of parks such as cleanness can encourage people to visit and utilize a park ([19],[20] et al., 2008). Also, green spaces in parks such as various trees, lawn, flowers, and fountains are effective factors in attracting people to parks. Green spaces in parks can increase fresh air in the environment leading to the individuals' willingness to attend and utilize a park (Lloyd et al., 2008).

Safety

A large number of studies associated with safety and utilization of local parks revealed that fear of crime was the most important barrier to the presence of people in parks and green spaces (Mowen et al., 2005). According to the results, the respondents pointed out that they would be willing to utilize parks if safety increased. In this regard, a study investigated the role of safety of neighborhoods in park use, the study reported that parents who perceived their neighborhood to be unsafe due to some anarchy and incivilities such as graffiti on the walls, litter, and unsafe nights, did not permit and encourage their children to attend and use local green spaces (Miles, 2008). The respondents who perceived safety and security in their neighborhood encouraged their children to play in the local parks and green spaces 6% more than the other ones. On the other hand, a qualitative study of 26 local parks in Montreal, Canada, revealed that parks which had less physical incivilities such as graffiti on the walls, were utilized more by the local residents (Coen & Ross, 2006).

Lighting, watchmen, high safety, and surveillance have been reported to important factors in increasing feeling of safety in parks and green spaces. On the other hand, the presence of the homeless, addicts and evidence of substance abuse such as syringe, harmful things such as broken glass, and bikers on the walking paths in parks can reduce safety in local parks ([19],[20] et al., 2008).

Chapman believed that physical characteristics are highly probable to influence our behaviors. Spaces are most effective when they are clearly defined and possess features such as sequence, variety, surprise, abstraction, and enclosure to establish safety and feeling of safety (Chapman, 2010).

Lynch believed that each space proposes and restricts the activities, therefore; the environment should be optimal and physically safe. According to Lynch, legibility is the most primary concept in an urban space. In his opinion, eligibility is helpful in easily knowing and understanding the urban elements so that we can imagine their relationship in an integrated framework. This helps us understand the space better and find ourselves in a safe space (Lynch, 1960). In this regard, Newman introduces defensible spaces that include real borders, symbolic borders, and surveillance opportunities. He believes that what is required in the unfamiliar space of neighborhoods in metropolises is a defensible space with a fairly average population density where the residents can control the neighborhood and prevent criminal behaviors [23]. It can be concluded that the experts and authorities believe that maintaining safety in urban green spaces is the basic duty. In this regard, it is essential to make efforts to achieve the optimal safety in urban green spaces since urban green spaces play an important role in the society and its safety.

Comfortability

Feeling of comfortability in parks is among the components associated with the presence of people in parks and green spaces. Comfortability in parks deals with issues such as seating place, relaxing atmosphere, shadow of trees, and well-paved paths for walkers (Pasaogullari & Doratli, 2004). Unfortunately, these issues have been ignored in many studies. According to the findings of previous researches, shadow of trees and awnings can positively influence park use in cities with hot and humid climate [14].

MATERIALS AND METHODS

The present survey studied different parks of various neighborhoods in Bandar Abbas, Iran. Bandar Abbas is located on northern coast of Persian Gulf in south of Iran. It is among the important southern cities of Iran and capital of Hormozgan Province. To collect the required data for this study, 60 questionnaires were randomly distributed in parks and green spaces of various neighborhoods in Bandar Abbas.

Each questionnaire consisted of 22 questions arranged in two parts and investigated the local residents' park use and physical quality of parks and green spaces. The first part of the questionnaires consisted of 17 questions and investigated factors related to the physical status of parks including comfortability,

safety, attractiveness, accessibility, amenity and facilities. The second part of the questionnaires intended to collect information about the participant's age, gender, and education. These 60 questionnaire were distributed as pilot study to test Cronbach's alpha of each physical factors of public open spaces.

The questions or items which investigated the relationship between physical quality of parks and users' satisfaction were on five-point Likert scale, from a little (1) to a lot (5). The respondents were asked to rate the physical quality of the park they had visited and utilized most frequently from 1 to 5. Then, the responses were categorized based on their association with one of the park characteristics for the purpose of testing and analyzing the reliability of items using SPSS software. According to Palant (2007), testing and analyzing the reliability of items reveals if the items are reliable enough to measure a factor. Using and calculating Cronbach's alpha coefficient is the most widespread way to test reliability as used in this study.

Results of Cronbach's alpha of each variables (physical factors) show how the items are in relationship with each other to be used to measure the physical characteristics of parks. They can also be used in future studies. The result of Cronbach's alpha coefficient varies between 0 and 1 for each item and the whole questionnaire. The closer the result is to 1, the more reliable the item is.

RESULTS AND DISCUSSION

In order to prove the reliability of the questionnaire items, a pilot study was conducted. In the pilot study, 60 questionnaires were distributed among the users of different parks in Bandar Abbas. The participants of the pilot study were 27 male and 34 female users aging from 18 to 68.

The data collected through the questionnaires were analyzed using SPSS software for the purpose of testing reliability. According to the results shown in Table 1, Cronbach's alpha of all items were reported to be above 0.6. Hence, they are reliable enough to be used to measure the physical characteristics of parks in the city.

Table 1: Results of Cronbach's Coefficient Alpha for Physical Variables of Park

Physical Characteristics	Items	Mean	Cronbach's coefficient alpha
Comfortability	Appropriate seating place Shadow of trees Type of carpeting	2.75	0.63
Amenity and Facilities	Sports equipment Children's playground Buffet or coffee shop	2.7	0.71
Accessibility	Easy accessibility to park by walking Easy accessibility to park from the street Easy accessibility to park using car	3.5	0.77
Safety	Park's lighting at night Presence of hooligans or annoying people Good visibility in park	2.6	0.70
Attractiveness	Beauty of trees Beauty of park's green space Beauty of pavements Beautiful lighting in park Park cleanness	2.6	0.63

According to the results of the present study, comfortability of a park deals with issues such as appropriate seating place, shadow of trees, and type of carpeting that provides an appropriate path for users to walk in the park. Facilities and amenities of park deals with providing facilities for sports activities and children play as well as a good place such as a buffet or coffee shop for eating and drinking. From the viewpoint of users, beauty of a park depends on cleanness of park, beauty of green space and trees, park's lighting at night, and pavements of park. Accessibility, introduced by a large number of studies as the most important factor associated with park use, is influenced by accessibility to park by walking, accessibility to park from the street, and accessibility to park using car. And safety is associated with factors such as park's lighting at night, presence of hooligans or other annoying people such as addicts, and good visibility in park. These factors are also introduced as important issues for defensible spaces.

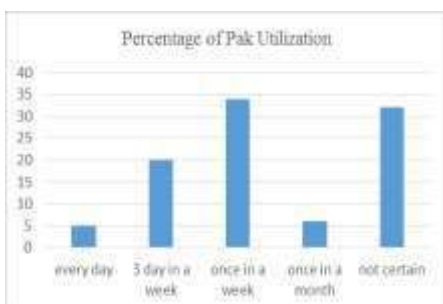


Fig. 1: Result of Park Utilization.

Based on the findings, the rate of people's satisfaction with physical quality of parks is shown to be at an average level or below. On the other hand, the results of the pilot study showed that only 20% of the respondents go to parks regularly and frequently (three time a week) and more than 50% of participants stated that they visit parks less than once in a month. The low utilization of parks by users and respondents can be inferred to be in relationship with the physical quality and status of parks as well as the small number of local parks in Bandar Abbas in some neighborhoods. Furthermore, 34% of the respondents pointed out that they mostly utilized local large parks in Bandar Abbas rather than neighborhood parks, hence, it can be concluded that in addition to the physical status of parks and number of parks, size and dimensions of a park can influence the users' selection and utilization of that park.

CONCLUSION

If parks are planned and designed based on the needs, they can be regarded as important facilities for doing recreational activities and spending leisure time. Furthermore, they will provide opportunities for physical activities which are helpful in improving the citizens' mental and physical health. Accessibility, safety, size of parks, number of parks, beauty, and facilities have been regarded by many researchers as the factors that influence utilization of parks and green spaces.

In this regard, accessibility has a direct relationship with park use. An accessible and frequently-visited park is a place located in the center of a neighborhood to be close to the households living in the neighborhood. In addition to accessibility, physical characteristics of parks can significantly increase park use as investigated and shown in this study.

Local parks should be devoid of strangers, addicts, and vandalisms such as graffiti on the walls and litter. Indefensible spaces can be adjusted by shortening and lowering the trees and hedging plants to prevent delinquency in parks. As a result, surveillance and safety increase and more users will attend and utilize the parks. On the other hand, developing green spaces in parks, fountains, and colorful carpeting can make parks visually beautiful. Seating places, shadow of trees, and facilities for various sports activities and children play can attract people of various ages to parks. If people of various age groups attend and use a park, vandalism reduces to a large extent. Increasing the number of trees, developing green space, appropriate lighting, and cleanness of a park provide a visually beautiful view of the park for the users. Finally, it can be claimed that high success and utilization of a park are achieved if all of the characteristics investigated in this study and not just one or some of them are considered. A local park is considered successful if it is planned and designed based on all of the factors mentioned and investigated in the present study.

CONFLICT OF INTEREST

There is no conflict of interest.

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FINANCIAL DISCLOSURE

None

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CARDIAC ARRHYTHMIA DETECTION BASED ON SIGNAL DECOMPOSITION WITH SINGULAR VALUE DECOMPOSITION (SVD) APPROACH-TIME PROPERTIES AND NEURAL NETWORK ERROR BACK-PROPAGATION (BP)

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ABSTRACT

Until a few years ago, the automatic classification of electrocardiogram signals has received great attention from the biomedical engineering. Recorded ECG signal has useful information about the rhythm and functioning of the heart. ECG signal analysis can show different kinds of cardiac diseases. Correct classifications of ECG heart beats are essential for Clinicians. In this paper, a new method is proposed for the automatic detection of arrhythmias that utilizes ECG signal decomposition using Singular Value Decomposition to extract features from input signal and neural network Back Propagation for classification of properties accompanied with temporal characteristics. In this article, twenty files from standard MIT-BIH database in a format of 420 signal samples are used. Each file contains several types of heart disease. As experimental results show, the proposed method is more accurate than other methods, so that it has the capability of four-class arrhythmia classification with accuracy of 98.82 %.

INTRODUCTION

ECG signal is indicative of cardiac activity. Important components of this signal can be divided into atria, complex QRS, ventricular depolarization and U wave. Figure 1 shows the various parts of the [Fig.1].

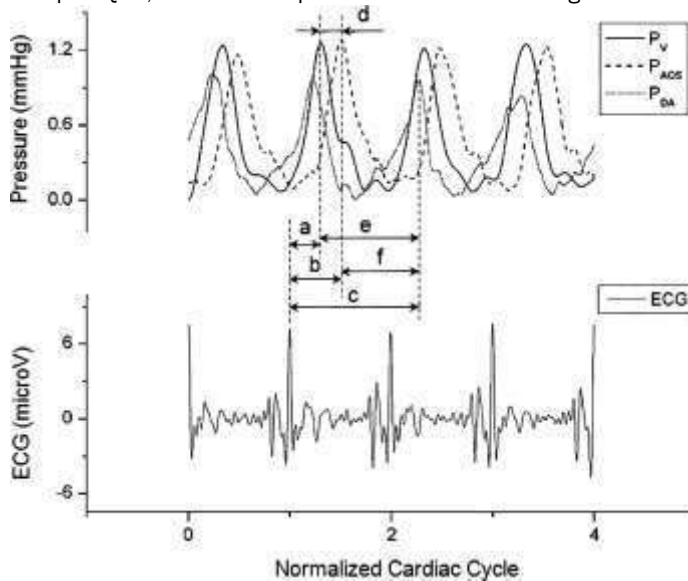


Fig.1 : Normal ECG signal.

As the World Health Organization statistics show, heart related diseases are major causes of death. Accordingly, diagnosis and appropriate treatment of heart diseases, largely avoids sudden death. There are many approaches to monitor heart activities. One of the known ways to evaluate the performance of the heart muscle system is ECG (Electro Cardio Gram) signal analysis. The advantages of this signal analysis are its ease and low cost [2].

Signal changes and obvious distortions found in ECG signal contain the message of a cardiac arrhythmia. Smart methods can be used to detect these distortions. But a question that arises is that which characteristic of ECG signal should be used to detect distortion since the whole signal does not contain valuable information.

In [3, 4], the morphological features of the ECG signal are utilized. Also, using specified and organized timescales is a technique that is utilized in [3-5]. Due to the inherent properties of the Hermite polynomials, the method presented in [6] has also used the same features.

To classify these distortions, various methodologies are used. For example, linear classifications [4], artificial neural networks (ANN) in [3,4,7,8].

KEY WORDS

ECG Signal, decomposition using SVD, neural network error back-propagation, cardiac arrhythmias, traditional medicine, Mus musculus, Toxoplasmosis.

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SVD decomposition

SVD decomposition or SVD transformation is one of important methods to extract the fundamental components of the signal. If A is an input signal which has dimensions of $m \times n$, then applying SVD one can write:

$$A_{m \times n} = U_{m \times m} \times S_{m \times n} \times V_{n \times n}$$

So one can write:

$$U \times U^T = I$$

$$V \times V^T = I$$

Matrices U and V are the left and right singular vectors of a matrix respectively and the matrix S is called singular values matrix. Note that I is the identity matrix.

Also, the matrix S only has non-zero values on the main diagonal. Direct correspondence exists between the columns of the matrix U and V with these diagonal elements of matrix S. Another important point that needs special attention is the order of these components, that if column components of singular vectors matrix and the diagonal components of singular values matrix have smaller subscript then, they worth more. It means precisely that components with smaller indexes have important information than others.

Proposed method

Here, first input signal pre-process to remove noise is done, then feature extraction using SVD decomposition method is performed and finally, classification with the aid of back-propagation neural network is done. Figure 2 shows the diagram of the method presented in this paper.

As shown in this diagram, first a pre-processing is performed on the input signal to eliminate high-frequency noises and Base Line that contains error. This is performed by a Gaussian low-pass filter and a Gaussian window. Then, in the processing stage, SVD transformation is applied to the filtered signal to extract the signal characteristics which contain important information. Then, these extracted features with time features are used to construct feature vectors. It should be noted that this vector should be normalized.

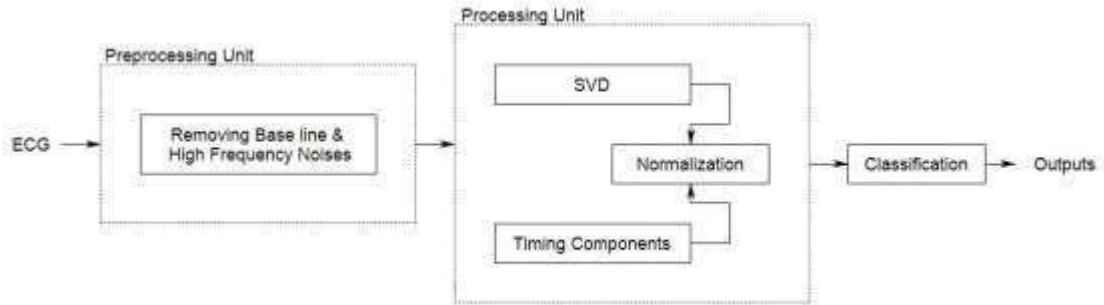


Fig.2 : Diagram of the proposed method for the diagnosis of cardiac arrhythm
The final step is to use the error back propagation neural network that should be trained for good input feature vectors.

In this paper, 22 records of the MIT-IBH database (Reference 13) are used that Table 1 is devoted to review these records completely.

Table 1 - used files from MIT-IBH database and their classes

Class	Record number in the database
Normal	100, 101, 103, 112, 115, 117, 121, 122, 123, 202, 220, 222, 234
RBBB	118, 212, 231
LBBB	109, 111
PB	107, 217

I. Extraction of signal features:

As mentioned earlier, to extract feature from the input signal, SVD decomposition method is used. First, the input signal is decomposed to the vectors U, S and V. As mentioned earlier, there exists a direct correlation between columns of the matrices U and V with the diagonal elements of the matrix S, so the elements of the singular values diagonal matrix are candidates for singular vectors of the input signal. In this paper, the singular values are used as features.

If A is the input signal, to extract feature, the following algorithm is presented:

1. Compute $[U, S, V] = SVD(A)$
2. for $i, j = 1: size(S)$
 if $(i == j)$
 $Val(i) = S(i, j)$
3. Return Val

In this situation, matrix Val contains features extracted from the A signal. This is a very good result because using this process, not only the key features of the input signal are extracted, but also the dimension reduction is done. One important feature of signal decomposition using SVD method like PCA is to reduce the dimensions of features.

For mentioned time features, the distance of the peak QRS of the current heart rate and the previous heart rate are considered [9].

II. Classification of Features:

Classes based on neural network are considered the best classification methodologies that are inspired from characteristic of the living organisms' nervous system. As we know, there are several methods exists for classification using neural networks. BP or the back-propagation neural network is used in this paper for classification.

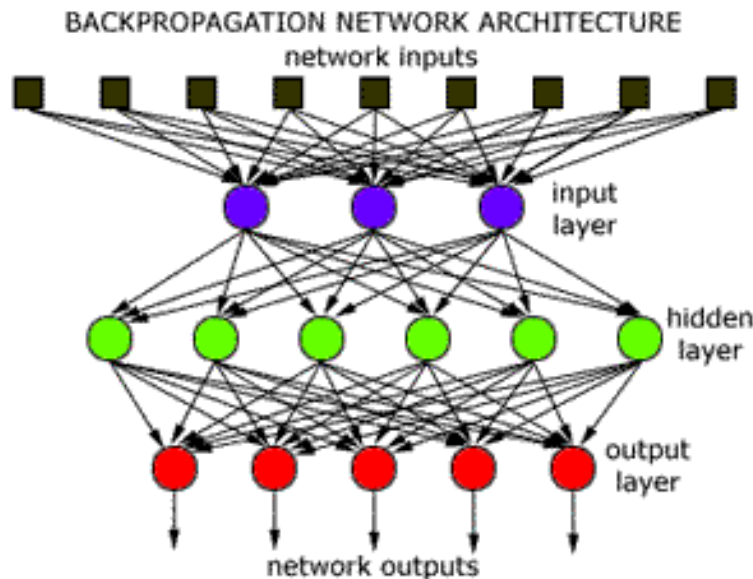


Figure 3 - Overall architecture of the back-propagation neural network

Neural network used in this paper is composed of an input layer, three intermediate layers and an output layer that thirty neurons for the hidden layer are considered. The activation function used in this paper is a bipolar sigmoid function and output layer neurons have linear function.

III. Test Results:

In this article, the following criteria is used to determine the efficiency of the method:

$$Accuracy = 100(1 - \frac{\#Error}{\#Total})$$

Accuracy represents the percentage of system efficiency; #Total is total number of samples and #Error is the number of examples that are not classified correctly. Table 2 demonstrates simulation results of the presented method in this paper, network efficiency is 98.82%.

Table 2 - Details of the performance of the presented method in this article

Classes	Number of Test Samples	Number of Test Samples	Error	Efficiency(%)
Normal	20	100	1	99
RBBB	20	80	1	98.75
LBBB	20	80	0	100
PB	20	80	2	97.50
Total	80	340	4	98.82

The above table compares the performance efficiency of the method presented in this paper with other known methods. It is obvious that, considering the number of files used from MIT-BIH database and the number of classes, proposed technique in this paper has higher performance efficiency than most other methods.

Table 3 - performance comparison of different methods for the diagnosis of cardiac arrhythmias

Method	Database	Classes	Efficiency(%)
Multi-Stage Neural Network [7]	10 files MIT-BIH arrhythmias database	Normal, PVC, PB, RBBB, atrial premature beat, fusion of paced and normal beat	88.33
Wavelet combined with time features and neural network [8]	22 files MIT-BIH arrhythmias database	PVC, Normal, Other beat	95.16
Wavelet and neural network [10]	7 files MIT-BIH arrhythmias database	PVC, Non PVC	97.04
PCA, Wavelet and neural network [11]	40 files MIT-BIH arrhythmias database	PVC, Normal, Other beat	97
Proposed method in this paper using SVD decomposition method and back-propagation neural network	20 files MIT-BIH arrhythmias database	Normal, PB, RBBB, LBBB	98.82

1- Conclusion:

In this paper, a new method was proposed for automatic detection of cardiac arrhythmias. Initially, using some filters, some input signal noises such as high frequency noises were removed, then using SVD signal decomposition method, not only convenient features were extracted from the input signal but also the dimensions of the features were reduced. Finally, using

the back-propagation neural network, feature vectors were classified. The result was very high accuracy of this method in the diagnosis and classification of cardiac arrhythmias. Accuracy and the number of classes in the proposed method in comparison with other methods had superiority. This method could classify four classes: normal, Left Bundle Branch Block (LBBB), Right Bundle Branch Block (RBBB) and palpitations (PB) with an accuracy of 98.82%.

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PERCENTAGE OF VEGETATION COVER OF RANGELANDS USING ETM⁺ IMAGE PROCESSING

CASE STUDY: RANGELANDS OF SAFAROUD WATERSHED, MAZANDARAN

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ABSTRACT

The aim of this study was to determine the percentage of vegetation cover of rangelands using digital data of Landsat 8 satellite sensor. For this purpose, satellite images of rangelands of Safaroud watershed in Mazandaran province (Iran) were prepared. Then, visiting the region, field data were taken by random-classified sampling method. In homogeneous regions, rangelands of the sampling units were determined randomly. In each unit, 10 plots of one square meter were placed on the circumference of a circle with a radius of 30 meters, and the percentage of vegetation cover of each plot was estimated. Average vegetation cover of 10 plots was considered as a percentage of the Central plot vegetation cover. For image processing, vegetation index and image fusion techniques were used. The estimation model of the region vegetation cover percentage was developed using stepwise regression statistical analysis on data obtained from field observations as the dependent variable, and analogous pixel value on satellite data obtained by processing the images as independent variable. In this model, images of raw data band 3 (b3), the fusion band 2 (his2) and TVI vegetation index were diagnosed as suitable images. By applying the model on the above images, region vegetation cover percentage was prepared. Using the Regroup technique, the map is divided into different classes, and cover classes map was prepared. Map accuracy was assessed using error matrix technique, and total accuracy and kappa coefficient of the map were calculated 78.2 and 74.5, respectively.

INTRODUCTION

Wide access to information of rangelands and the inability to access some mountainous areas are of the reasons for the use of remote sensing techniques that is able to produce information necessary to assess the vegetation cover and adopt appropriate management practices in all areas (Jabbari et al., 2015). With ground operations in part of the study area, and then determining the relationship between terrestrial information and satellite data, a model can be calculated and extended to the entire region. In order to utilize satellite images, different techniques are used for detection of more information on these images; vegetation indices and satellite data fusion are two examples of it. In other words, the vegetation indices include conducting a kind of arithmetic operation between pixels of a band with analogous pixels in other spectral band(s) for detection of information contained in satellite images (Andress Vina, et al., 2011). In this context, various indicators are designed in the world and different researchers have utilized them.

In a study comparing the use of different vegetation indices for mapping vegetation cover canopy in the Wildlife Refuge of Mote in Isfahan, Rahdari et al. (2009) evaluated different vegetation indices using LISS3 sensor of IRS satellite; and finally, with 78% correlation with cover canopy, SAVI was diagnosed as the best index.

Using digital data from ETM⁺ sensor and analysis of image fusion, spectral ratios and principal component analysis (PCA), Hosseini et al. (2007) developed the map of rangelands of Chamestan country region in Mazandaran province.

MATERIALS AND METHODS

Study area is rangelands of Safaroud watershed in West Mazandaran (Iran) with an area of 4660 hectares located in geographical area of 50° 25' 00" to 50° 34' 33" east longitude, and 36° 48' 35" to 36° 53' 00" north latitude. The region vegetation cover consists of one-year and permanent grasses, one-year and permanent shrubs.

Satellite Image Processing

In this study, images of ETM⁺ sensor of Landsat 8 satellite (4/8/2015) were used which were according to field observations. ETM⁺ sensor data have 7 spectral bands with spatial resolution of 30 m (60 m in the thermal band), and also panchromatic band with a resolution of 15 meter; using this band with other bands can lead to detection of a series of information especially the location information of panchromatic band.

In order to implement spatial data from a single-band image with high spatial resolution to multispectral images, various techniques have been developed which are called data fusion. For this purpose, different methods and algorithms have been developed. Color space conversion (HIS) is one of the most common methods. In this method, all multispectral bands are merged with a panchromatic band, and the images obtained contain information of both bands; color space conversion was used in this study.

Hosseini et al. () conducted a study on the application of primary bands and vegetation indices and fusion bands at the same time for mapping vegetation cover percentage, and they used data fusion techniques.

KEY WORDS

vegetation cover
percentage, satellite
image processing, data
fusion, stepwise
regression, Safaroud
watershed, traditional
medicine, *Mus musculus*,
Toxoplasmosis.

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After preparing the image and controlling its geometric match, bands were matched with the panchromatic band using topographic maps of the region so that the spatial resolution of all images were corrected and made equal to 15×15 while maintaining their spectral and radiometric resolution.

Terrestrial data collection

Field data collection was done with the deployment of 340 plots on 34 sampling units in homogeneous areas in different randomly classified vegetation types. Out of these, 16 and 18 units were used for mapping and assessing the accuracy of the final map, respectively. In each sampling unit, according to the spatial resolution of satellite data (30×30 meters), 10 one square-meter plots were placed on the circumference of a circle with a radius of 30 meters. A total of 160 and 180 plots were placed for mapping and assessing the maps, respectively; and the plots' vegetation cover percentage was measured. The mean percentage of vegetation cover per sampling unit was considered as the corresponding number in the same unit. [Fig. 1]

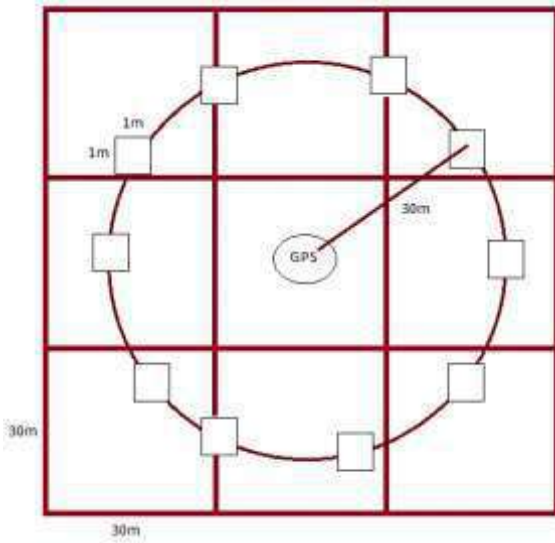


Fig. 1: Sampling method and plot deployment.

Statistical analysis and mapping of vegetation cover percentage

For statistical analysis, sampling units' locations were determined on the satellite images first. Then, average Digital Number (DN) for the nine pixels of each sampling unit from the primary bands, bands from image processing techniques (fusion) as well as vegetation indices provided in the software ERDAS IMAGINE 2014 were extracted. Numbers extracted from satellite images and field data were inserted into SPSS. Implementing the stepwise regression analysis among field data as the dependent variable (Y) and data derived from satellite images as the independent variable (X), different statistical models were evaluated. [Table 1]

Table 1: Variables used in this study

Dependent variable	Independent variables		
Field observation	Raw bands	Fusion bands	Vegetation indices
	B4 - B3 - B2 - B1 B7 - B6 - B5	His1 - His2- His3	MIRV2 - VNIR2 - VNIR1 - NIR - NDVI SAVI - IRI - MINI - TVI - PD322 - MIRV1

Finally, a model at the level of 5% error was introduced and implemented as an appropriate model. The output of running the model is the vegetation cover map of the region. In the next step, the map is divided into different classes using the Regroup technique, and at the end, the accuracy of the map was evaluated based on the field data (18 plots).

RESULTS

The results of the statistical analysis among terrestrial information and satellite images are presented in the tables below. In [Table 2], the results of stepwise regression analysis on indexes, primary bands and the bands from data fusion are presented.

Table 2: Results of stepwise regression analysis

Model		Sum of Squares	df	Mean Square	F	Sig.
3	Regression	2787.208	3	929.069	30.731	.000 a
	Residual	362.792	12	30.233		
	Total	3150.000	15			

a. Predictors: (Constant), B3, HIS2, TVI

In the final mode introduced, among the independent variables used, three variables of B3, HIS2, TVI were determined appropriate. In the [Table 2] above, total and mean squares are listed for regression and error sources. Given that sig value is less than 0.01, at 99% confidence, we can say that regression equation is approved. The regression coefficients are given in [Table 3].

Table 3: Regression coefficients used in this study

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
3	(Constant)	219.632	23.518		9.339	.000
	b3	-.021	.003	-1.846	-6.531	.000
	his2	-.005	.001	-1.198	-3.768	.003
	TVI	240.599	95.283	.339	2.525	.027

According to the coefficient in the table above, the final relation can be written as follows:

$$Y = 219.632 - 0.021B3 - 0.005HIS3 + 240.6TVI$$

Applying the above regression model on the images of B3, HIS and TVI, vegetation cover map was prepared. The map was divided into eight categories based on the Regroup technique. [Fig. 2]

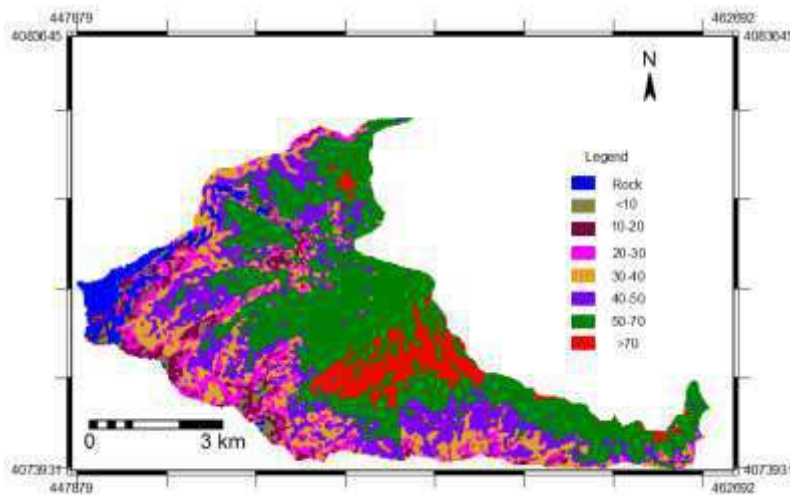


Fig. 2: Map of the vegetation cover classes in the study area.

The accuracy of the map prepared was examined with the help of 18 sample units; total accuracy and kappa coefficient for the map were 78.2 and 74.5, respectively.

DISCUSSION AND CONCLUSION

The method of collecting field data in this study is in such way that the field data can be matched with information on satellite images with high accuracy. Sepehri (2002) has used a similar method. Khajeddin (1996) has provided a method for field observation which is somewhat different with this method. Basically, all methods are statistically correct. The difference is in how they record the geographic coordinates of the sampling units.

The results show that the raw bands (except b3) have no strong correlation with vegetation cover. This proved the necessity of the use of satellite image processing techniques. Moreover, since the ingredients

of rangeland ecosystems such as green cover and cover, soil, rocks and pebbles status have different spectral reflectance status, the necessity of application of image processing techniques is evident. NDVI vegetation index, which is often used to evaluate vegetation, did not find significant correlation with vegetation cover in this study. Pickup et al. (1993) also reported poor performance of this index in vegetation cover. Among eleven indices studied, TVI vegetation index was introduced as the appropriate index in the regression model. Piro et al. (2004) reported the TVI index as an appropriate index to show the vegetation cover growth.

Of the total data fusion in regression equations, Band 3 (his3) showed the highest correlation. Using data from data fusion is offered by various investigators. Karimi Ashtiani (1999) emphasizes that although fusion by HIS method leads to heterogeneous and spectral changes in original and combined color images, on the other hand, it allows creating separation between the types of vegetation that are not divisible in the normal image.

The results of this study suggest that the use of satellite image and data fusion techniques, which improve images' spatial and spectral data, can enhance the results in the vegetation studies along with statistical analysis.

CONFLICT OF INTEREST

There is no conflict of interest.

ACKNOWLEDGEMENTS

None

FINANCIAL DISCLOSURE

None

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ARTICLE

EFFECTS OF PLANTING DATE AND TYPE OF MULCH ON ONION SEED YIELD OF AZARSHAHR CULTIVAR

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ABSTRACT

A split plot experiment using the randomized complete design was conducted in this research to study the effects of planting date and type of mulch on seed yield of the Azarshahr Onion cultivar. Planting dates were the main-plot factor at two levels (20 March and 3 April) and types of mulch the sub-plot factor at four levels (no mulch applied, transparent mulch, black mulch, wheat straw). Results of ANOVA of the data revealed that there were significant differences between the studied traits with respect to planting date, with the 20 March planting date being superior in most traits. The individual effects of mulch were significant on only a few of the studied traits such as seed yield and percentage of ripe umbles. However, the interaction effects of planting date and mulch on most of the studied traits were considerable, there were significant differences between the treatments with respect to traits such as stem height, number of remaining plants, diameter of umbles, seed yield per plant, seed yield per hectare, and 1000-seed weight and the treatments were superior to the control. The maximum seed yield (807.7 kg/ha) belonged to the treatment in which the planting date was 20 March and in which wheat straw was used, and the minimum (309 kg/ha) to the control treatment in which the planting date was 3 April and in which no mulch was applied. The lowest weed density was also observed in the treatment in which the 3 April planting date was used and black mulch was applied, while the highest weed density was that of the treatment with the 20 March planting date in which no mulch was used.

INTRODUCTION

Edible onion is the most important bulb vegetable and ranks second after tomato among the 15 vegetables produced in greatest quantities in the world (Pathak, 2000). Onion seeds are the factor of highest importance in improving the quality and increasing the yield of onion crops, and high 1000-seed weight and germination ability of onion seeds are of great importance for onion producers (Ogawa et al., 1974). In addition to genetics, environmental factors such as temperature, rainfall, soil conditions, and presence of beneficial insects influence onion seed quality (Alleoni et al., 2010). Planting date and mulching are both very important factors in onion seed production, and roots of edible onion are very shallow and require continuous irrigation. Anisuzzaman et al. (2009) studied the effects of planting date and mulching on yields of Taherpuri cultivar of onion and reported both of these two factors had significant effects on most of the studied traits and the maximum seed yield (460.85) was obtained by planting on 21 November and it rose to 529.06kg/ha when mulch was applied. Shaikh et al (2002) stated improvement in seed quality was effective in increasing onion yield and increased it by 30 percent. Islam et al (2002) reported mulching and onion size had significant individual effects on plant height, number of leaves, number of false stems, stem diameter, root length, and number of roots. However, their interaction effects on number of leaves and on diameters of false stems were not significant. Mulching preserves moisture and thus is effective in reducing water loss. Igbadun et al. reported that application of rice straw and black plastic mulches increased water use efficiency in onion crops and annual onion yield was considerably influenced both by water shortage and by mulching. Therefore, considering the positive effects of mulching and the considerable effect of planting date on onion seed yield in research conducted by various researchers, the present study intended to investigate the positive effects of these two factors on edible onion seeds under the prevailing conditions in North Khorasan Province from 2011 to 2013..

KEY WORDS

Edible onion, Mulch, Planting date, Seed production

MATERIALS & METHODS

This split plot experiment with two factors was conducted with three replications. Planting dates at three levels (20 April, 4 May, 19 May) were the main-plot factor and various types of mulch (black plastic, white plastic, and plant residues) the sub-plot factor. Onions of the same size (8-10 gr) of the Azarshahr cultivar were planted 20-25 cm apart. The plots were 1 by 1 meter, and the main fertilizer was NPK applied to the soil at 150, 100, and 180 kg/ha, respectively. Half of the nitrogen together with all of the phosphorous and all of the potassium were applied during land preparation, and the other half of nitrogen at the appearance of flowering stems and the formation of umbles. Microfertilizers were applied if needed. The land used for the experiment was thoroughly plowed and leveled, and residues on soil surface were removed. A light irrigation was applied before spreading the mulch to make the soil surface uniform and moist. One week after planting the onions, and at emergence of the seedlings, the mulches were spread over the ridges and their edges were placed inside the furrows. In the control plots also, weeding was carried out several times during the growth and development of the plants and, during the growing season, pests and diseases were regularly controlled. When about 10 percent of the seeds inside the umbles became visible, the umbles were harvested. This was carried out in several stages, and the harvested seeds were kept under suitable dry conditions for their moisture levels to drop to 6-8 percent. The seeds were put in packets that were closed and kept at low temperatures. During the growing season, traits including heights of flowering stems, numbers of leaves and suckers, days to 50 percent flowering, number of flowers per umble, number of seeds per umble, 1000-seed weight, and seed yield were

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measured. ANOVA of the data was performed using MSTATC, comparison of the means was carried out employing Duncan' multiple range test, and graphs and diagr were drawn using EXCEL.

RESULTS

Results of ANOVA of the data [Fig. 1] showed planting dates had significant effects on most of the studied traits, and the 20 March planting date was superior to the 3 April planting date with respect to most of the traits. Results of comparison of the means also exhibited the clear superiority of the 20 March planting date over the 3 May planting date with respect to stem length, umble diameter, seed yield per umble, seed yield per plant, seed yield per plot, and seed yield per hectare [Fig. 2]. Contrary to planting dates, type of mulch had significant effects only on traits such as ripening of umbles, seed yield per hectare, and stem height, and the differences between the effects of the various treatments on the other traits were not significant [Fig. 1].

Comparison of the means also indicated the tallest stems (80.4 cm) belonged to the treatment of using black mulch, followed by the treatment of using wheat straw (80.3 cm), and the treatment of employing white plastic (80.2 cm), with the control treatment having the shortest stems (78 cm) [Fig. 1].

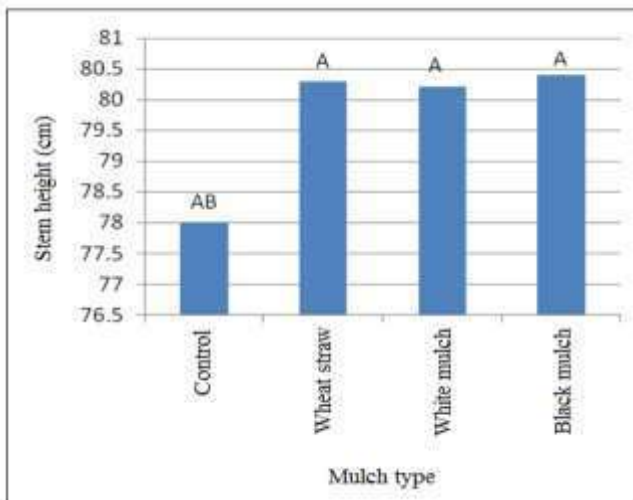


Fig. 1: The effects of type of mulch on height of flowering stems

The two planting dates and the types of mulch had significantly different effects on stem diameter at the 5 percent level, with the largest stem diameter (1.56 cm) belonging to the 20 March planting date and black mulch treatment, and the smallest (1.23 cm) to the 3 April planting date and the control treatment [Fig. 2].

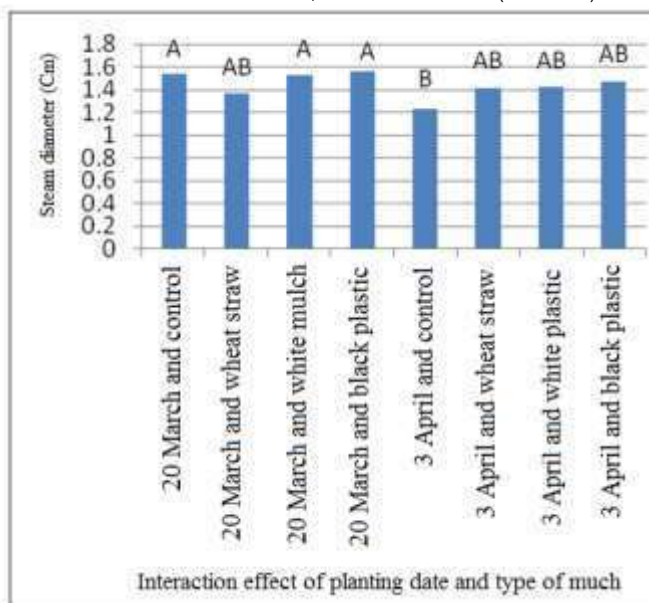
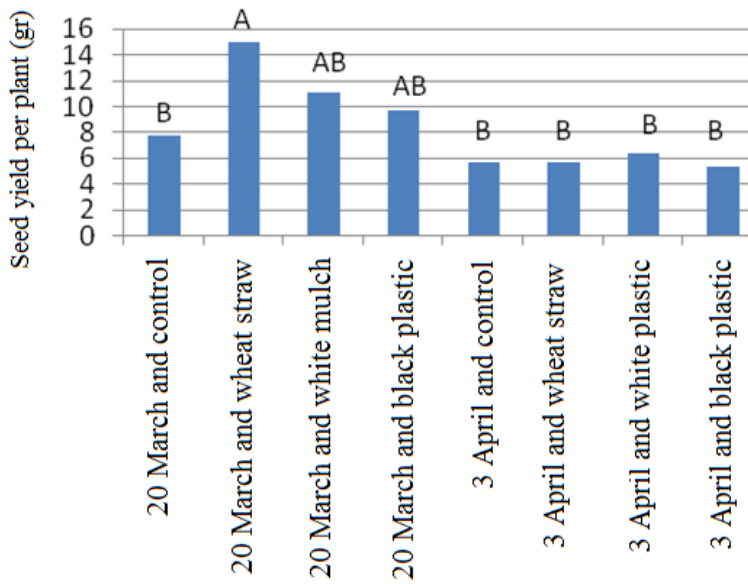


Fig. 2: The interaction effects of planting date and type of mulch on stem diameter

With respect to seed yield per plant, the highest yield was that of the 20 March planting date and wheat straw (15 gr), followed by the 20 March planting date and white plastic (11 gr) and 20 March and black

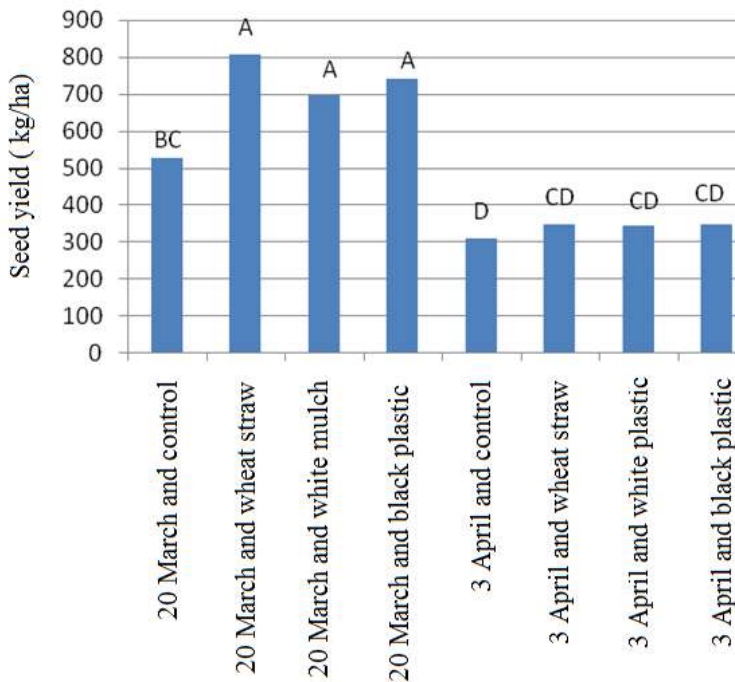
plastic (9.66 gr). The 3 April planting date and black plastic had the lowest seed yield per plant (5.33 gr) [Fig. 3].



Interaction effect of planting date and type of much

Fig. 3: Interaction effects of planting date and type of much on seed yield per plant

There were significant differences between the effects of the various planting dates and types of mulch on seed yield per hectare. Comparison of the means of the data [Fig. 4] indicated the maximum seed yield (807.7 kg/ha) was that of the 20 March planting date and wheat straw, followed by the treatment of the 20 March planting date and black plastic (739.7 kg/ha), and the 20 March planting date and white plastic (694.7 kg/ha). However, the differences between these three treatments were not statistically significant and they could be placed in the same statistical group. The minimum seed yield (309 kg/ha) belonged to the 3 April planting date and the control. In all, seed yields in the treatments with various types of mulch and the 20 March planting date were considerably lower [Fig. 4].



Interaction effect of planting date and type of much

Fig. 4: The interaction effects of planting date and type of mulch on seed yield per hectare

The interaction effects of planting date and type of mulch on 1000-seed weight were significant, but the differences between the treatments were not very considerable and most treatments could be placed in the same statistical group [Fig. 5]

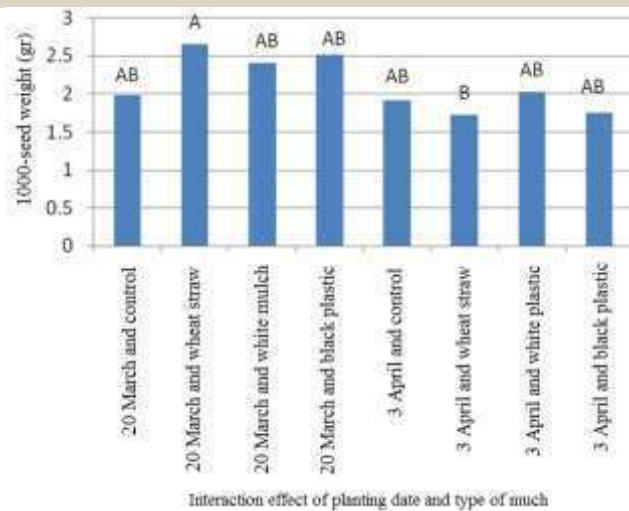


Fig. 5: The interaction effects of planting date and type of mulch on 1000-seed weight

The interaction effects of planting date and type of mulch on weed density were significant with the minimum weed density observed in the treatment with the planting date of 20 March and black plastic and the maximum in the treatment of the 3 April planting date and the control [Fig. 6].

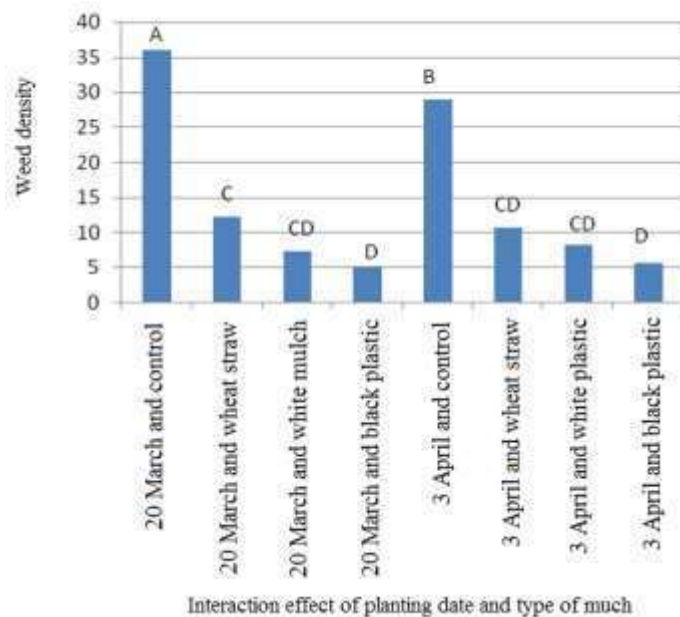


Fig. 6: The interaction effects of planting date and type of mulch on weed density

DISCUSSION

In this research, planting date had considerable and significant effects on most of the studied traits. These results agree with those found by many other researchers. Mirshekari and Mobashsher (2006) reported planting date significantly influenced plant height, 1000-seed weight, percentage of remaining plants, umble diameter, yield per plant, and seed yield per hectare, with the best growth characteristics and the maximum seed yield (712.5 kg/ha) belonging to the 20 March planting date and the minimum (406.2 kg/ha) to the 22 October planting date. Anisuzzaman et al. (2009) also observed significant differences between the effects of planting dates on traits such as number of suckers, plant height, days to reach 50 percent flowering, umble diameter, seed yield per plant, and seed yield per hectare, with the largest umble diameter, seed yield per plant, and seed yield per hectare (460.8 kg/ha) belonging to the 21 November planting date and the smallest (335.7 kg/ha) to the 30 October planting date. In the present research, 1000-seed weight was also affected by the planting date and seeds planted on 20 March had higher mean 1000-seed weight (2.397 gr) compared to those planted on 3 April (1.887 gr) (Diagram 5). Mirshekari and Mobashsher (2006) reported significant differences between the effects of various

planting dates on 1000-seed weight, with the maximum 1000-seed weight (2.83 gr) being that of the 6 October planting date and the minimum (2.51 gr) that of the 20 March planting date. They stated that comparison of the components of seed yield related to the planting dates of 5 March and 20 March also revealed that seeds planted on 20 March were superior in most of the studied traits, and attributed this superiority to the cold weather and frost in the region the seeds planted on 5 March faced. They also observed the maximum remaining plants belonged to the 20 March planting date and fewer plants remained in the plots when seeds were planted in the autumn. Anisuzzaman et al. (2009) compared the planting dates of 30 October, 10 November, and 21 November and reported the maximum 1000-seed weight (3.48 gr) belonged to the 21 November planting date and the minimum (3.07 gr) to the 30 October planting date.

In the present research, contrary to reports of many other studies, the individual effects of the type of mulch on many of the traits were not significant, and these individual effects were only significant on seed yield per hectare and weed density, but the interaction effects of type of mulch and planting date were completely positive and significant on most of the studied traits. The different effects of mulch in the present research probably resulted from environmental conditions (there was substantial rainfall during the experiment), soil type (clay), and careless irrigation practices. The interaction effects of planting date and type of mulch on traits such as stem height, seed yield per plant, weed density, and seed yield per hectare were significant, and they were completely significant on seed yield (Diagram 4). Many researchers have reported positive effects of applying mulch, and also the interaction effects of mulch and other factors on growth and development of onions, and on components of onion seed yield (Mirshakeri and Mobashsher, 2006; Anisuzzaman et al., 2009; Homa, 2013, and Rahman et al., 2013). Anisuzzaman et al. (2009) obtained the best components of seed yield such as stem height, number of suckers, number of umbles, seed yield per umble, per plant, and per plot, seed yield per hectare, and the least number of days to 50 percent flowering in the treatment of applying black plastic as mulch, and mulching treatments exhibited significant differences with the control. Rahman et al. (2013) reported mulching had significant effects on the studied traits such as plant height, number of leaves, leaf dry weight, number of false stems, and roots. Homa (2013) studied the effects of planting date and type of mulch on growth and development of onions in Nigeria and reported that mulching had significant effects on traits such as plant height, number of suckers, and days to 50 percent flowering, and the differences between the treatments and the control were completely significant. One of the positive effects of mulches, especially of dark mulches, is that they control weeds. Since onion plants are weak in the early stages of their growth, the effects of various types of mulches on weed control in this crop are very considerable. In the present research also, use of mulches had very significant effects ($P \leq 0.01$) on weed control, and the treatments had lower weed densities compared to the control, with the lowest weed density belonging to the black plastic treatment.

CONFLICT OF INTEREST

None

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FINANCIAL DISCLOSURE

None

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ARTICLE

EVALUATION OF LABORATORY TESTS IN DIAGNOSIS OF BILIARY ATRESIA IN THE PEDIATRIC WARDS OF HOSPITALS AFFILIATED TO SHIRAZ UNIVERSITY OF MEDICAL SCIENCES FROM 2007 TO 2013

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ABSTRACT

Background: Biliary atresia (BA) is a complex idiopathic disease with external hepatic bile duct obstruction. Surgical intervention is the only functional treatment available. For BA patients early diagnosis plays an important role in having a better outcome. Laboratory tests are easy and fast so we designed a study to see if there is a significant abnormality in the results of the patients with BA. **Methods and materials:** In this retrospective study we evaluate the medical records of all the patients with confirmed BA referring to hospitals affiliated to Shiraz University of medical sciences. Laboratory results were extracted and then sent to a biostatistician for further analyses. **Results:** At the end 73 cases were evaluated in the study. Fibrosis was present in 54(74%) patients. Twenty (27.4 %) patients were positive for cirrhosis, 39 patients had high INR. Patients affected by cirrhosis had significantly higher INR than the ones without cirrhosis ($P<0.05$). We recorded an increase in the blood concentration of amino transferases and alkaline phosphatase in almost all the patients. Total and direct bilirubin was higher than in our patients. **Conclusion:** BA directly and indirectly affects the results of the laboratory tests. Although we can predict the test results of the patients with BA, we still can't rely on these tests to establish a strong screening system.

INTRODUCTION

Biliary atresia (BA) is a gradual and mostly idiopathic disease with extra-hepatic bile duct obstruction and is exclusively seen in neonates [1].

This is not a common disease regarding an incidence rate of 1 in 10000 to 20000 births [2]. BA is known for causing jaundice which is persistent and won't respond to common medical treatments. Most of the liver transplantations performed during childhood are due to BA. Up to 85% of the infants affected, have BA without any other malformations or anomalies. This type is also called perinat al BA. Clay-color stool and jaundice is observed in the first two months' of their life [3]. About 10 to 15 percent of the cases have BA in association with laterality malformations. These may include asplenia, polysplenia, malrotation, situs inversus and other anomalies. Infants with this type of BA have poorer outcome [4]. The last type of BA is associated with other congenital malformations like cardiac and renal malformations [5].

Etiological definition of BA is complex. The exact cause of BA is still unknown. However, many mechanisms are thought to play an important role in formation of BA, in other words it is an anatomical abnormality which may be the phenotype of many different congenital or acquired problems. One theory points to some viruses as the cause of BA which isn't proved yet [6, 7]. Genetics may have an impact on the onset of this disease. Some genes may cause the carrying person to be more prone to developing BA [8]. Other hypotheses suggest immunologic and toxic causes but they are still under investigations[9].

Jaundice, which is nonresponsive to common treatments and phototherapy, pale stool and dark urine are other important signs of BA which can be identified by the parents with appropriate information[10]. Conjugated bilirubin's level is usually raised in BA [11]. The mean serum level of aminotransferases and gamma-glut amyl transpeptidase is mildly elevated in BA patients. Although these may indicate BA they aren't cost-effective and aren't constant enough to use them as the screening tool of BA.

It is very important to diagnose BA as fast as possible because late diagnosis has poorer outcomes [12]. There is a list of diseases with similar signs and symptoms which will make fast diagnosis of BA a challenge. Diseases like Alagille Syndrome or alpha-1-antitrypsin deficiency are included in that list.

After observing the signs, first line diagnosis is to use ultrasound imaging to investigate the anatomical structure of the liver and bile ducts. It is beneficial to omit other anatomical anomalies that cause similar signs. Radiologists look for certain signs in the images to confirm BA [13]. After sonography liver biopsy is done to study the liver tissue for further decision.

As mentioned there isn't a fast way to diagnose BA, so we designed this study to examine and evaluate the laboratory test results of the patients with BA to see if these tests can be used as screening tests?

KEY WORDS

Biliary atresia,
laboratory tests,
bilirubin,
aminotransferases,
alkaline phosphatase

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METHODS AND MATERIALS

It was a retrospective cross sectional study which was conducted between March 2007 and March 2013. This study was reviewed by the ethical committee of Shiraz University of Medical sciences. After the approval of all the related health authorities we started to study the cases. Our primitive population was defined as all the patients diagnosed with BA in pediatric wards of the hospitals affiliated to Shiraz University of Medical Sciences. Only the patients who were hospitalized in the wards and the diagnosis of BA was claimed by pathologists were included. Then we retained all their medical records and sheets from the medical records library of Shiraz university of Medical Sciences. Then the patients with insufficient information in their sheets were excluded from the study. BA was confirmed for all the patients with ultrasound and liver biopsy. At the end after all the exclusions 73 cases remained in the study aged 1 week to 12 yrs. With this amount of cases we could achieve a study power of around 80%. The laboratory and pathology test results of the patients were extracted and then evaluated closely. The test results which we collected included international normalized ratio [INR] , Hemoglobin [HB] , Platelet Count (PLT) , alkaline phosphatase (ALK.PH) , Pro-thrombin Time (PT) , AST , ALT , Albumin (ALB) , Total bilirubin (TB) and Direct bilirubin (DB) .From the pathology reports we collected the presence of cirrhosis and fibrosis .

For statistical analyses SPSS 15.0 was used. Independent t-test was used and P value under 0.05 was defined meaningful.

RESULTS

At the bottom line, 73 cases remained in the study. Regarding pathological reports of the cases, Fibrosis was present in 54(74%) patients, 20(27.4 %) patients were positive for cirrhosis, 21 (28.8%) patients had received liver transplantation.

Mean international normalized ratio (INR) was 1.89 ± 1.95 , 34 patients had normal INR and 39 had high INR. Patients affected by cirrhosis had significantly higher INR than the ones without cirrhosis ($P < 0.05$); 69(94.5 %) of the patients had haemoglobin below the healthy range. The mean HB level was 9.86 ± 2.01 g/dl; 66(90.4%) patients had elevated ALK.PH level and the remaining 9.6% had ALK.PH below healthy range. The mean ALK.PH was 1367.36 ± 819.70 IU/L.

AST levels were high in the patients with the mean of 218.14 ± 245 U/L; 63(86.3%) patients had high AST levels; ALT was very high in the patients too with the mean of 150.45 ± 174.91 U/L; 60 (82.1%) patients had high ALT levels; 59 (80.8%) patients had abnormal AST, ALT, and ALK.PH results. Mean albumin level was 3.72 ± 2.24 g/dL and most of the patients were in normal albumin range.

Total bilirubin was abnormally high in 69(94.5%) patients. The mean TB was 12.59 ± 7.46 mg/dL. Almost all the patients had high level of direct bilirubin (unconjugated bilirubin); the mean DB was 5.91 ± 4.28 mg/dL .

Table 1: Laboratory findings of the patients affected by biliary atresia

Test type	Mean	Normal range
INR	1.89 ± 1.95 IU/L	0.8-1.2 IU/L
AST	218.14 ± 245 U/L	8 - 48 U/L
ALT	150.45 ± 174.91 U/L	7 - 55 U/L
ALK.PH	1367.36 ± 819.70 IU/L	45- 115 U/L
ALB	3.72 ± 2.24 g/dL	3.5 - 5.0 g/dL
HB	9.86 ± 2.01 g/dl	11-13 g/dl
TB	12.59 ± 7.46 mg/dL	0.3-1.9 mg/dL
DB	5.91 ± 4.28 mg/dL	0 - 0.3 mg/dL

Table 2: Pathological findings of the patients affected by biliary atresia

Pathology	Positive (%)
Cirrhosis	27.40%
Fibrosis	74%

DISCUSSION

Laboratory tests that evaluate the functions of liver show abnormal results in the patients with BA. This is mostly due to the liver trauma caused by cholestasis and excess bile in the liver. Based on our results 74% of the patients had fibrosis in their liver which is the onset for liver cirrhosis. Although surgical procedure can help those with BA, Hepatic fibro genesis will continue and the cause of this is still unknown [14]. Fibrosis is the main reason that we should diagnose BA fast because if BA remains undiagnosed, fibrosis will extend to a dangerous level and then liver transplantation may be the only choice [15]. Balistreri *et al.* investigated the responsible cells for this excessive fibrosis. They concluded that hepatic stellate cells play the main role there with creating excessive collagen. They also found that bile duct epithelial cells, hepatic stellate cells, and hepatocytes all produce cytokines that initiate and continue the fibrosis process [16]. Investigations on how to stop these cells and slow the fibrosis process is suggested.

This indicates that most of the BA patients suffer from severe liver, injury and this can easily be traced in blood tests. ALT and AST are the most important indications for the liver injury. Our patients had severely high levels of these enzymes in their blood. This indicates that most of our patients had been diagnosed slowly so they had already developed a great liver injury. This is very important and shows the urge to find faster ways to diagnose this disease as the current data suggest that we lack this required haste. Though we can't use these 2 factors as screening tests for BA for two reasons; the first is because they indicate many hepatic related diseases and the second reason is higher than normal levels of these enzymes are usually traced in the blood when the liver is already damaged so again we lose the precious time to help those suffering from BA.

We recorded a moderate elevation in alkaline phosphatase in the blood and this elevation was far more than AST and ALT. This is a great indication for biliary obstruction. In severe hepatic injuries like hepatitis C virus infection AST and ALT get elevated far more than ALK.PH [17]; but when we are talking about the obstruction it's completely vice versa and ALK.PH get elevated a lot more than AST and ALT [18].

BA will significantly affect the appetite and as a result some of the patients have lower levels of albumin but it is not a very consistent sign as we didn't observed any meaningful abnormality in our samples regarding albumin concentration. Lykavieris *et al.* followed 63 children with BA for 20 years. They also didn't find a huge abnormality in albumin concentration in this 20 years [19]. So based on what mentioned we can easily drop the albumin from our diagnostic tools.

We observed a mild decrease in HB count of our cases. This is due to the fibrosis and cirrhosis of the liver but yet not a great screening measure for BA. Our patients had higher INR than normal. Liver plays an important role in the vital mechanisms of the body like blood coagulation. Coagulation is a process which requires many different minerals, factors, vitamins and proteins and liver produces some of the key factors. Based on this when liver is damaged, body will experience a drought regarding those factors so the whole coagulation metabolism will be affected [20]; So it isn't a wonder that why we recorded higher INR.

One of the most significant things in the lab tests was the elevation of total and direct bilirubin. Harpavat *et al.* evaluated the birth time bilirubin of the neonates affected by BA and they found that all of them had higher amounts of direct bilirubin in comparison with the control group who were healthy neonates [11]. By using this we can obtain a blood sample from all the newborns and then follow the ones with elevated direct bilirubin as they are more susceptible to BA, but it isn't something functional due to the costs of the tests and the rare incidence of BA.

Overall, we found that some special characteristics can be found in the lab test results of the patients affected by BA. But yet these are not enough to create a good, fast and functional screening test for BA.

CONFLICT OF INTEREST

None

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FINANCIAL DISCLOSURE

None

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ARTICLE

ENHANCED OIL RECOVERY BY POLYMER FLOODING

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ABSTRACT

Chemical flooding relies on the addition of one or more chemical compounds to an injected fluid either to reduce interfacial tension between the reservoir oil and injected fluid or to improve the sweep efficiency of the mobility ratio. Both mechanisms are designed to increase the capillary number. In this article, the effect of polymer concentration in injection stream on some parameters such as: Polymer adsorption concentration, Polymer in solution, Water-Oil capillary pressure, Oil production total.

INTRODUCTION

The addition of large-molecular-weight molecules called polymers to an injected water can often increase the effectiveness of a conventional water flood. Polymers are usually added to the water in concentrations ranging from 250 to 2000 parts per million (ppm) (1). A polymer solution is more viscous than a brine without polymer. In a flooding application, the increased viscosity will alter the mobility ratio between the injected fluid and the reservoir oil. The improved mobility ratio will lead to better vertical and areal sweep efficiencies and thus higher oil recoveries (2). Polymers have also been used to alter gross permeability variations in some reservoirs. In this application, polymers form a gel-like material by cross-linking with other chemical species. The polymer gel sets up in large permeability streaks and diverts the flow of any injected fluid to a different location (3).

Polymer flooding has not been successful in high temperature reservoirs. Neither polymer type has exhibited sufficiently long-term stability above 160 °F in moderate-salinity or heavy-salinity brines (4).

Polymer flooding has the best application in moderately heterogeneous reservoirs and reservoirs oils with viscosities less than 100 centipoise (cp). In the United States, there has been a significant increase in the number of active polymer projects since 1978. The projects involve reservoirs having widely differing properties, that is, permeabilities ranging from 20 to 2000 millidarcies (md), in situ oil viscosities of up to 100 cp, and reservoir temperatures of up to 200°F (5).

Since the use of polymers does not affect the microscopic displacement efficiency, the improvement in oil recovery will be due to an improved sweep efficiency over what is obtained during a conventional water flood. Typical oil recoveries from polymer flooding applications are in the range of 1–5% of the initial oil in place. It has been found that operators are more likely to have a successful polymer flood if they start the process early in the producing life of the reservoir (6).

The main objective of polymer injection during water flooding of oil reservoirs is to decrease the mobility of the injected water. This decrease results in a more favorable fractional flow curve for the injected water, leading to a more efficient sweep pattern and reduced viscous fingering. Certain plugging effects within highly permeable layers may also occur and result in the diversion of the injected water into less permeable zones of the reservoir. [Fig. 1] and [Fig. 2] show the effect of rate velocity of water (7).

The mobility decrease of the injected water resulting from the addition of polymer is due to two effects. Firstly, the viscosity of the polymer solution is higher than that of pure water (the viscosity of the polymer solution increases as the concentration of the polymer in the water increases). Secondly, the rock permeability to water is reduced after the passage of a polymer solution through the rock material (the permeability to oil is, however, largely unaffected). Both effects combine to reduce the value of the water mobility while that for the oil is unaltered.

To achieve maximum efficiency, the polymer solution is often applied in the form of a tapered slug. At the front edge of the slug, the displacement is stable but the interface between the water and the polymer solution smears due to physical dispersion of the polymer. At the rear edge, the mobility ratio is unfavorable and is dominated by viscous fingering. Both effects cause deterioration of the slug.

Certain polymer solutions, such as those of the PA type, exhibit a strong sensitivity to the presence of certain salts. In particular, sodium chloride can influence the viscosity characteristics of PA solutions to such an extent that in highly saline reservoirs it is often necessary to preflush with fresh water to reduce the exposure of the polymer solution to the reservoir brine.

When a polymer solution is injected into the reservoir some of the long chain molecules constituting the polymer are adsorbed onto the rock surfaces. Mechanical entrapment of some of the large molecules at the entrance to small pore throats may also occur and account for an apparent loss of polymer from the invading solution. Experimentally, the reservoir rock material is believed to retain a specific capacity of polymer. The main effects of polymer loss occur at the leading edges of the polymer slug where a stripped water bank is created and the

KEY WORDS

Chemical Flooding,
Interfacial Tension, Sweep
Efficiency

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slug width is gradually reduced in time. Some desorption effects can occur as the trailing edge of the slug passes but these effects are usually small compared with the adsorption losses.

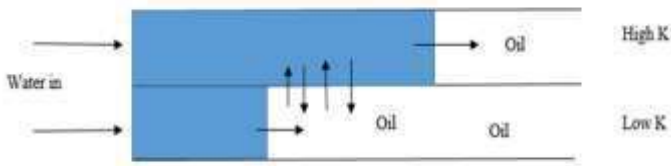


Fig . 1: High rate case – oil is expelled into nearly residual oil saturation part of reservoir and is therefore hardly mobile

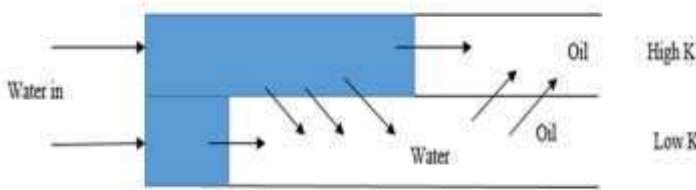


Fig. 2: Low rate case – oil is expelled into high oil saturation part of reservoir with good mobility

A further effect caused by the adsorption and entrapment processes is a reduction in the relative permeability of the polymer solution. The reduction results from an interaction between the aqueous solution and the polymer retained by the rock material. For modeling purposes it will be assumed that the reduction in permeability to the polymer solution is proportional to the quantity of polymer lost to the rock material. The permeability of the rock to water is thus permanently reduced after the passage of a polymer slug compared to its value before the passage.

In core flooding experiments, it is often observed that injected polymer slugs break through to producers earlier than tracer slugs (for example, NaCl). The polymer fluid velocity is higher than that of the tracer fluid within the porous medium and is due to the fact that only a fraction of the total pore space is available to the polymer fluid. As the inaccessible pore space to the polymer fluid increases, the effective polymer velocity through the rock increases and leads to a faster breakthrough of polymer.

The rheology of polymer solutions is not simple. At low flow rates the viscosity of the solution is approximately constant and depends only on the concentration of polymer in the solution. At higher flow rates the solution viscosity reduces in a reversible (elastic) manner. At even higher velocities the large polymer molecules begin to break up, and the viscosity reduction becomes irreversible (plastic). The effects tend to be greatest in the vicinity of injection wells where the fluid velocity is greatest, and so is the shear rate.

Method

The polymer flood simulation model

The flow of the polymer solution through the porous medium is assumed to have no influence on the flow of the hydrocarbon phases. The standard black- oil equations are therefore used to describe the hydrocarbon phases in the model .

Modification is required to the standard water equation and additional equations are needed to describe the flow of polymer and brine within the finite difference grid. The water, polymer and brine equations used in the model are as follows:

$$\frac{d}{dt} \left(\frac{VS_{WV}}{B_p B_w} \right) = \sum \left[\frac{TK_{rw}}{B_w \mu_w a_{eff} R_K} (\delta P_W - \rho_w g D_z) \right] + Q_W \tag{1}$$

$$\frac{d}{dt} \left(\frac{VS_{WP} C_p}{B_p B_w} \right) + \frac{d}{dt} \left(V \rho_p C_a \frac{1-\phi}{\rho} \right) = \sum \left[\frac{TK_{rp} C_p}{B_w \mu_p a_{eff} R_K} (\delta P_W - \rho_w g D_z) \right] + Q_W C_P \tag{2}$$

$$\frac{d}{dt} \left(\frac{VS_{WB} C_B}{B_p B_w} \right) = \sum \left[\frac{TK_{rw} C_B}{B_w \mu_w a_{eff} R_K} (\delta P_W - \rho_w g D_z) \right] + Q_W C_B \tag{3}$$

$$S_{WV}^* = S_{WV} - S_{dPV} \tag{4}$$

Where

S_{dPV} : Denotes the dead pore space within each grid cell .

C_a : Denotes the adsorption isotherm which is a function of the local polymer solution concentration .

ρ_r : Denotes the mass density of the rock formation .

ϕ : Denotes the porosity .

ρ_w : Denotes the water density .

R_R : Denotes the relative permeability reduction factor for the aqueous phase due to polymer retention .

C_m, C_p : Denote the local concentration of polymer and sodium chloride in the aqueous phase .

μ_{eff} : Denotes the effective viscosity of the water, polymer and salt components .

D_z : Is the cell center depth .

The model makes the assumption that the density and formation volume factor of the aqueous phase are independent of the local polymer and sodium chloride concentrations.

The principal effects of polymer and brine on the flow of the aqueous phase are represented by equations (1) to (4).

The fluid viscosities($\mu_{w, eff}$, $\mu_{p, eff}$, $\mu_{s, eff}$) are dependent on the local concentrations of salt and polymer in the solution. Polymer adsorption is represented by the additional mass accumulation term on the left hand side of equation (2) .

Treatment of fluid viscosities

The viscosity terms used in the fluid flow equations contain the effects of a change in the viscosity of the aqueous phase due to the presence of polymer and salt in the solution. However, to incorporate the effects of physical dispersion at the leading edge of the slug and also the fingering effects at the rear edge of the slug the fluid components are allocated effective viscosity values that are calculated using the Todd Longstaff technique. The effective polymer viscosity is taken to be :

$$\mu_{p, eff} = \mu_m(C_p)^\omega \cdot \mu_p^{1-\omega} \quad (5)$$

ω : is the Todd-Longstaff mixing parameter.

The mixing parameter is useful in modeling the degree of segregation between the water and the injected polymer solution. If $\omega = 1$ then the polymer solution and water are fully mixed in each block. If $\omega = 0$ the polymer solution is completely segregated from the water.

The partially mixed water viscosity is calculated in an analogous manner using the fully mixed polymer viscosity and the pure water viscosity (μ_w) ,

$$\mu_{w, eff} = \mu_m(C_p)^\omega \cdot \mu_w^{1-\omega} \quad (6)$$

Treatment of polymer adsorption

Adsorption is treated as an instantaneous effect in the model. The effect of polymer adsorption is to create a stripped water bank at the leading edge of the slug. Desorption effects may occur as the slug passes. The adsorption model can handle both stripping and desorption effects.

Treatment of permeabilities reductions and dead pore volume

The adsorption process causes a reduction in the permeability of the rock to the passage of the aqueous phase and is directly correlated with the adsorbed polymer concentration. In order to compute the reduction in rock permeability, the user is required to specify the residual resistance factor (RRF) for each rock type. The actual resistance factor can then be calculated:

$$R_R = 1 + (RRF - 1) \frac{C_a}{C_{a, max}} \quad (7)$$

The value of the maximum adsorbed concentration , $C_{a, max}$, depends on the rock type and needs to be specified by the user .

Treatment of shear thinning effect

The shear thinning of polymer has the effect of reducing the polymer viscosity at higher flow rates . The flow velocity is calculated as :

$$V = B_{lv} \frac{F_w}{\phi A} \quad (8)$$

Where

F_w : is the water flow rate in surface units .

B_{1W} : is the water formation volume factor .

ϕ : is the average porosity of the two cells .

A : is the flow area between two cells .

The reduction in the polymer viscosity is assumed to be reversible, and is given by :

$$\mu = \mu_w [(P - 1)M + 1] \tag{9}$$

μ_w : is the viscosity of water with no polymer present .

P : is the viscosity multiplier assuming no shear effect (entered using the PLYVISC or PLYVISCS keywords in Eclipse)

M : is the shear thinning multiplier supplied in the PLYSHEAR keyword in Eclipse .

Simulation

Introducing the reservoir (fig3) :

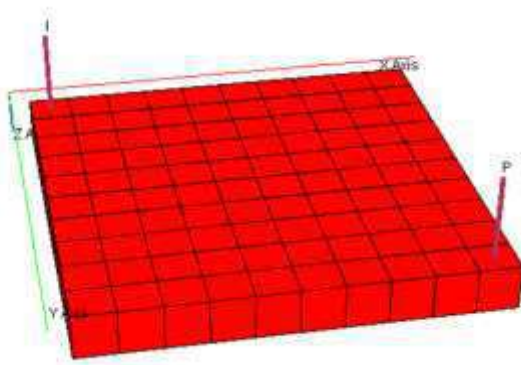


Fig. 3: 3D view of the reservoir

In this simulation investigated some parameters such as :

- The concentration of polymer in the injection stream for the well .
- Polymer adsorption concentration .
- Polymer in solution .
- Water-Oil capillary pressure .
- Oil production total .

RESULTS

Fig 4 to fig 7 show the Sensitivity analysis on “concentration of polymer in the injection stream for injection well” , 50 lb/STB and 60 lb/STB .

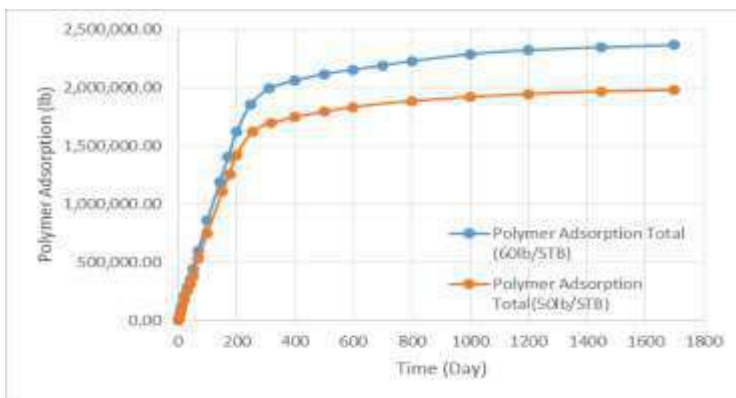


Fig. 4: Effect of concentration of polymer in the injection stream on polymer adsorption

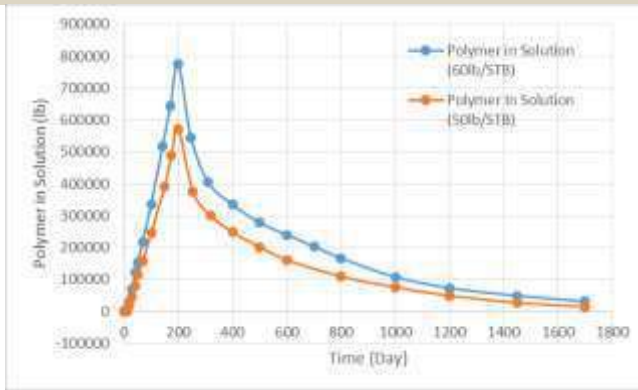


Fig. 5: Effect of concentration of polymer in the injection stream on polymer in solution

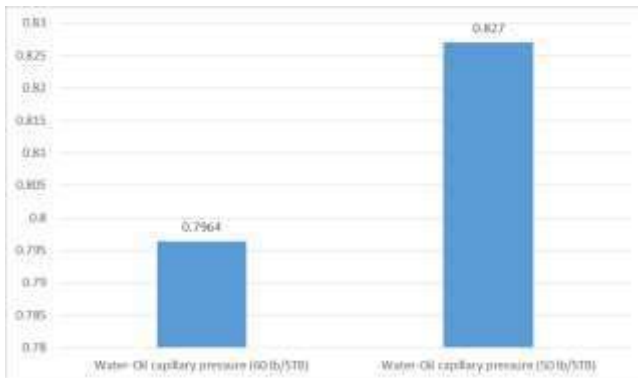


Fig. 6: Effect of concentration of polymer in the injection stream on water-oil Capillary pressure after 1700 days

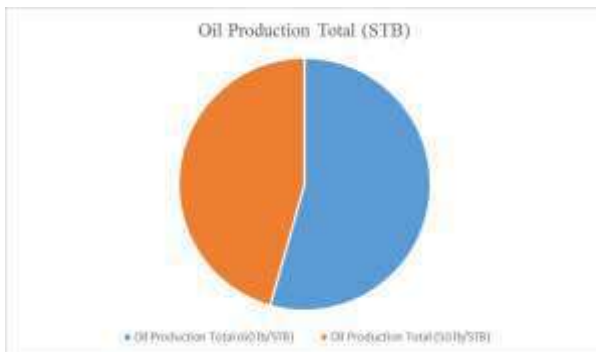


Fig. 7: Effect of concentration of polymer in the injection stream on oil production total (STB)

CONCLUSION

Use of polymer is basically improve the relative mobility ratio of oil-water front or augment water flooding . Polymer gels are used to alter water flow to the portion of oil zone that have not been swept properly . According to the simulation results, increasing the concentration of polymer in the injection stream (50 to 60 lb/STB) lead to improve oil recovery due to :

- Increasing adsorption of polymer that lead to block water channels and alter the water flow to the unsweep oil zone .
- Increasing the polymer in solution that helps to decrease IFT between oil and water , therefore enhances capillary number .

CONFLICT OF INTEREST
None

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FINANCIAL DISCLOSURE

None

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ARTICLE

THE IMPACT OF GREEN INNOVATION TYPES ON ORGANIZATION PERFORMANCE IN THE CONSTRUCTION INDUSTRY

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ABSTRACT

Today, product development for companies that want to compete in existing markets as well as in new markets, is critical. Therefore, companies can improve environmental performance, green image of your company to develop which in turn will create new business opportunities and helps improve competitive advantage. The purpose of this paper is to explore the relationship of green innovation to improve the performance of organization in the construction industry and they tried to measure the impacts of each green innovation elements to explain organizational performance. The study was a descriptive and objective survey. The population of this study consisted of experts and managers of construction companies registered at construction companies in Tehran which has been chosen by simple random sampling method based on Cochran formula. The criterion validity of the study was to test the Content Validity Ratio (CVR) and reliability with Cronbach's alpha coefficient was measured. Research findings show that there was a significant meaning between green innovation components and organizational performance. It also found that respectively, green marketing innovation (the highest), green process innovation, green product innovation and green management innovation (the lowest) has a direct and positive impact on improving organizational performance. Therefore, this results which clears the importance of different green innovation types on organizational performance, can be effective to provide competition advantages for innovator companies.

INTRODUCTION

KEY WORDS
 Green marketing innovation; green management innovation; green Product innovation;

The rapid of environmental issues throughout the world have increasing much concern from customers, buyers, communities and also government. For instance, both the local or international customers and buyers are now requiring their suppliers to make environmental friendly products [1]. The increasing awareness from communities on the environmental problems also has created this matter become more critical to companies. Nowadays, organizations are increasingly faced with dynamic and changing environments. When everything is changing and competitors are looking to increase market share through the acquisition of competitive advantage, organizations can be successful which have the ability to cope with changes that are due to the continuous innovation of new thoughts and ideas of their applications [2]. Since that today the environmental performance of firms and environmental compliance is as a competitive advantage for enterprises [3]. Therefore, being consistent for any innovation with environmental considerations is very important. Therefore, given the importance of this matter, a new concept emerged as green innovation with the statement that any innovation in production processes that save energy and natural resources and environmental pollution are reduced [4]. As a result, managers should provide conditions to support this scenario [5], the industry must be restructured and existing technologies to create a green and sustainable growth, must be applied more innovative [6]. So no manager can not be ignored in relation to this key resource, because in order to achieve competitive advantage and their survival in the future, is essential and should seriously consider green innovation and the obstacles in the way of its establishment to be studied. This attitude is also important in the construction industry and to the creation of new knowledge in architecture as the green architecture. It aims to reduce or minimize negative environmental impact such as pollution, waste of resources, and product dump [7]. Environmental degradation has been widely addressed as a worldwide issue. Construction industry is considered as making a major contribution to environmental pollution [8]. Given the importance of these assets for organizational survival, Understanding that how organizations are using different types of green innovation in improving organizational performance and what is the relationship between green innovations and its components with improved organizational performance, are key questions in the current study. In general, this article attempts to provide a model to examine the relationship between green innovation and organizational performance review and the relative contribution of each dimension of green innovation and impact on organizational performance. Accordingly, firstly, theoretical research was conducted. Theoretical foundations of green innovation and organizational performance that analysis was performed to extract components of research have been done. In the present study conceptual model, research methods and effective components were identified. Then, various statistical analysis has been done. Finally, conclusions and recommendation has been discussed.

Today, investment in the field of sustainability and environmental protection are becoming an issue for business is a competitive advantage and profitability. The concept of green innovation in action is widely used. Seman (2012) defined green innovation as a new environmental approach, idea, product, process or services that concern on minimizing negative environmental impact and also create differentiation of developed product among competitors [9]. Chen (2006) defined green innovation as hardware or software innovation in technology that is related to green products or process, consists of the innovation in technology like energy-saving, waste recycling, green product designs or corporate environmental [10]. Green innovation are categorized into four types of innovations including product innovation, process innovation, managerial innovation, and marketing innovation [11].

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Chen (2010) introduced the concept of green core competencies as the collective learning and capabilities about green innovation and environmental management has a positive influence on a firm's ability to develop green product and process innovations [12]. Kemp and Pearson (2007) defined green innovation as new process for the production of a product or service, a method or a new policy or a new approach to business management that reduce environmental hazards, pollution and negative impacts of energy consumption [13]. Green innovation concept can support the implementation of GSCM by providing the new idea, approach or technology to manufacturers in developing new products.

Green innovation is believed to provide continuous seeking ways to innovate each stage of supply chain in order to gain competitive advantage and decrease the environmental problems in industry [14].

Green innovation in terms of product life cycle assessment includes the modification of an existing product design process to reduce the negative environmental impacts described and its factors in four categories: management, product development and aspects of the production process is classified [3]. Green innovation can be classified into four main categories: green managerial innovation; green product innovation; green process innovation; and green technological innovation [3].

Thus, the study of green marketing innovation, green management innovation, green Product innovation based on Seman, et al (2012) and Tseng (2012) because of the comprehensiveness of the model, were used as the basis for study) [3], [9] were chosen to measure green innovation. In the following brief definition of pay.

Green management innovation

Management Innovation is presented that the firm should be oriented towards continual improvement. For this, the management should be clearly defined an innovation strategy for the firm. The formulation of green objectives and strategies for achieving green innovation should be aligned with daily operations and a specific budget for green innovative thinking [3].

The management is guided by process design and innovation and enhances R&D functions. The management should go beyond the analysis of recycle, reuse material and life cycle assessments. Management innovation is signifying a firm's ability to formulate green projects and all the green projects with suitable programming and resources of budget allocation such as redefine operation and production processes to ensure internal efficiency that can help to implement green supply chain management and redesigning and improving product or service to obtain new environmental criteria or directives. Hence, the firm must be able to evaluate and install environmental management system and ISO 14000 series, Redefine operation and production processes to ensure internal efficiency that can help to implement green supply chain management, Redesigning and improving product or service to obtain new, environmental criteria or directives, Install environmental management system and ISO 14000 series, Providing environmental awareness seminars and training for stakeholders [15].

Moreover, the planning of technical knowledge, skills, operations and commercial feasibility of green innovation is to reduce the risk of innovation [3], [12], [16].

Green Product innovation

Green product innovation understood as a strategic weapon for obtaining competitive advantages and as something more complex than a green product alone [3]. The research and development unit should always evaluate the degree of new green product competitiveness and understand customer needs. Moreover, the evaluation of technical economic and commercial feasibility of green products should be addressed. Recovery of company's end-of-life products and recycling presented the accumulation of knowledge and the improvement of product knowledge is required. The product knowledge and information is always team solving becomes transparent in the organization. An interdisciplinary approach to cope with Innovation of green products and design measures and knowledge should be fostered. However, if a firm only focuses on green innovation without Using eco-labeling, environment management system and ISO 14000, the action and plan might be miss alignment [10].

Green process innovation

The green process innovation is significance to green practice firm. Improving existing processes and developing new processes can be understood in terms of the level of knowledge and uncertainties regarding the reward-to-risk ratios [3]. The consolidation of green know how guides the process innovation activities [17]. The product knowledge and information is always team solving becomes transparent in the organization. An interdisciplinary approach to cope with Innovation of green products and design measures and knowledge should be fostered. However, if a firm only focuses on green innovation without Using eco-labeling, environment management system and ISO 14000, the action and plan might be miss alignment [10].

Green marketing innovation

Green marketing innovation is one of the concepts (theories) is emerging in the field of marketing and what it means in action is widely used. Green marketing is a broad concept that all marketing activities to

stimulate and reinforce attitudes and behaviors favorable to the consumer's environment [12]. Green Marketing includes all activities designed to create and facilitate the exchange, in order to satisfy human needs and desires, which satisfies the needs and desires with the least damage and harm done to the environment. The first attempts to determine the relationship between marketing and its environment was Marketing at the start of the first stage, various forms of green marketing into practice and to follow their green marketing activities, consumers expect a positive response and the subsequent increase in the commercial reputation, market share and the company had sales [18].

Organizational Performance

Performance measurement is one of the critical issues that were affecting a wide range of disciplines and experts on the various articles and a report on different aspects is written.

Performance measurement is tool that can help to organizations for better understand the situation and coordinate with the organization situation. Historical perspective, without the use of performance measurement can not be realized that program design and implementation in the specified period has been a success or a failure to fully. Accordingly, in this paper we consider performance as the dependent variable that is shown as a result of efforts to improve and develop due to the various aspects of the innovation process, product, structure, etc. Most of the research that has been done in the field of organizational performance measures more focused on financial outcomes such as cost and profit and Ignored Soft non-financial outcomes such as non-operating costs, reduce time to do the work, creating new products, the ability to attract, train, develop and preserving the resources talented people [18]. Accordingly, in this study a combination of financial and non-financial metrics for measuring the performance-based model of Sher&Lee (2004), is used, and that these three dimensions are:

Financial Performance: this includes market performance, such as profitability, growth and customer satisfaction.

Process performance: this includes the quality and effectiveness of the process is doing.

Internal performance: this related to individuals skills such as ability, satisfaction and employee creativity.

Research Background

Several researchers investigated green innovation on organizational performance using various methods and statistics in different communities (various organizations). In this section, different ideas and theories of internal and external theorists are examined in the field of green innovation on organizational performance:

Chiou et al (2011) in their study in Taiwan presented an empirical evidence to promote manufacturers to implement green supply chain and green innovation in order to improve environmental performance and increase their competitive advantage in the market. This study found that GSCM practices in term of greening the suppliers have the positive influence on green product innovation, green process innovation, and green managerial innovation. This study also suggested to extend to other GSCM practices in examining more detail about the effect on green innovation [1].

Triguero et al (2013) studied " Drivers of different types of eco-innovation in European SMEs" in 27 European countries and showed that those entrepreneurs who give importance to collaboration with research institutes, agencies and universities, and to the increase of market demand for green products are more active in all types of eco-innovations. Supply-side factors seem to be a more important driver for environmental processes and organizational innovations than for environmental product innovations. also shown that market share only has a significant positive influence on eco-product and eco-organizational innovations, while cost-savings are solely significant for eco-process innovations[19].

Tseng, et al (2013) studied "Performance drivers of green innovation under incomplete information" to evaluate the green innovation for environment management, with a particular focus on managerial, process, product and technological aspects in Taiwanese printed circuit board manufacturing firm's. This study shown theoretical and empirical evidence of green innovation drivers in the domains of environmental management and had interesting implications for operations management research and practices [3].

Costantini & Mazzanti (2012) studied " On the green and innovative side of trade competitiveness? The impact of environmental policies and innovation on EU exports". These results shown that public policies and private innovation patterns both trigger higher efficiency in the production process through various complementarity mechanisms, thus turning the perception of environmental protection actions as a production cost into a net benefit. According to theoretical and empirical studies conducted in the field and examine them and refer to expert opinions, it became clear conceptual framework According to the conducted theoretical and experimental studies in the related field and examining different models, the framework of the conceptual model of research was determined[20].

Finally, based on four variables including organizational, green process, green product, green marketing and green management innovations, the conceptual model [Fig. 1] is designed. After designing the conceptual model about the generality of the model components, relevant professionals and experts from academia, professional and experienced people with at least 15years experience in the relevant fields have been surveyed and any needed corrections have been applied based on these ideas. After applying experts' ideas and approving the conceptual model, survey questionnaire had been formulated from the community (sample) for the purposes of statistical research, hypotheses and research questions. Then,

managers and experts of organizations in the field of scientific communication between these variables are surveyed.

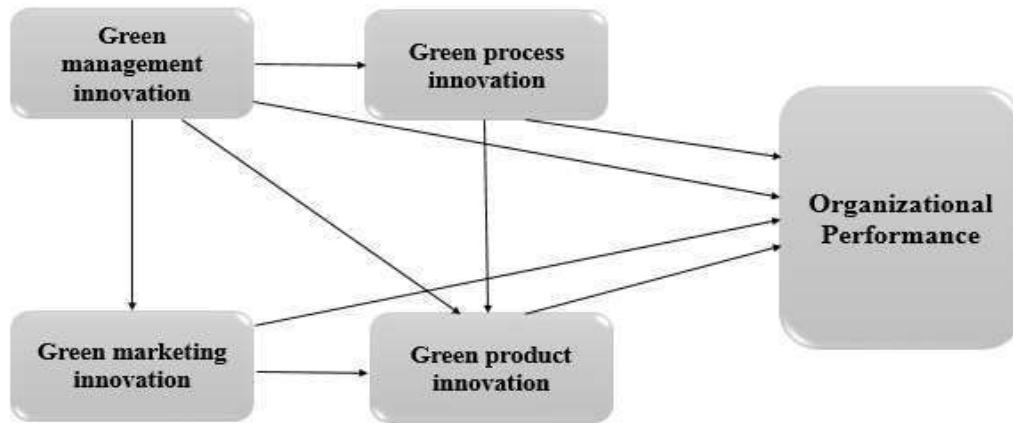


Fig. 1: Conceptual model of research.

MATERIALS AND METHODS

In the present study, given the circumstances of this study, the research method is survey research and because of its application in the field of organization innovation, it is an applied research component. Questionnaire was used to collect data. In this study, likert scale method is the main factor influencing knowledge management and questions contains grades of five-choice response (1- very low, 2- low, 3- medium, 4- high, 5- very high). In addition to the above questions, the respondents' demographic data, including age, education, organizational position and work experience is also asked in the designed questionnaire.

Since Cronbach's alpha is usually an appropriate indicator for assessing the reliability of measuring instruments and internal consistency among its elements, the reliability of the questionnaire used in this study is evaluated using Cronbach's alpha which is shown in [Table 1]

Table 1: Reliability variables

Reliability		Indicators	Variables
Alpha General	alpha		
0.71	0.72	Green product Innovation	Green Innovation
	0.67	Green process Innovation	
	0.74	Green management Innovation	
	0.71	Green marketing Innovation	
	0.71	Marketing Innovation	
0.75	0.67	Financial performance	Organization Performance
	0.73	internal performance	
	0.75	Process performance	

Since the variables of this study have had Cronbach's alpha above 0.7, they have necessary assessment of reliability. To assess the validity or reliability of the questionnaire in this study, the content validity of CVR method is used according to Lawshe's model in order that whether the questions and instruments contained in it measures the subject of the study and variables precisely.

Before the final adjustment and duplication of the questionnaire to evaluate the reliability and validity of the questionnaires, the initial questionnaire is tested over 15 experts in the statistical sample and the overall average obtained for research components respectively 0.71, 0.75 (Table 2) the, which is an acceptable level since the amount of CVR for expert assessment and evaluation is 0.49 based on the table of Lawshe (1975).

The statistical population of the study is consists of 583 senior, middle managers, and experts in construction companies registered in the association of construction companies and facilities in Tehran which has Sales Engineering Management (The most important element of competitive advantage and the missing link in all building construction projects). Using with a sample of over 200 experts and managers of construction companies registered in Tehran's construction companies and building mass which has been chosen by simple random sampling method based on Cochran formula. The collected data using regression analysis were analyzed.

Analysis of Data

Descriptive analysis (one variable) population characteristics:

The age distribution of the study population reflects the fact that the average age is in the age group of 40 to 49 years. Also the highest accumulation of respondents is seen in the age group of 40 to 49 years and the lowest accumulation is seen in the age group of 50 years and older.

Of the respondents under investigation in this study, respectively; 81/6 percent were male and 14/2 percent was female which were selected using a stratified sampling method.

In relation to the education level of the respondents, respectively; 1/8 percent has Associate degree, 56/1 has bachelor degree, 30/2 percent has master degree, and 10/6 percent has PHD degree. Distribution of The educational level of statistical society reflects the fact that each respondent on average for has a bachelor's degree. From the respondents under investigation in this study, respectively; 63/9 percent was middle managers and experts and 36/1 percent was supervisor, chairman and senior manager. From the respondents of this study most of the respondents have working experience between 11 to 20 (56 percent), and the lowest accumulation of respondents had working experience between 21 to 25 (3 percent).

Deductive analysis (variables Analysis)

In two variables analysis, Kendall tau coefficient of correlation is used in order to generalize to the larger statistical population. Also, in order to examining the correlation, Somers d coefficient is used. [Table 1] shows Distribution coefficients, the value and significance of various aspects of green innovation and organizational performance:

Table 2: Distribution of coefficients, the value and significance of various types of green innovation and organizational performance

variable	Coefficient	Amount of Coefficients	Significance level
There is significance relationship between green innovation and organizational performance in construction companies	Kendall's tau	0.79	0.000
	Somers d	0.67	0.000
There is significance relationship between green management innovation and product innovation in construction companies	Kendall's tau	0.56	0.000
	Somers d	0.43	0.000
There is significance relationship between green management innovation and process innovation in construction companies.	Kendall's tau	0.45	0.000
	Somers d	0.41	0.000
There is significance relationship between management innovation and marketing innovation in construction companies	Kendall's tau	0.43	0.000
	Somers d	0.37	0.000
There is significance relationship between process innovation and product innovation in construction companies	Kendall's tau	0.39	0.000
	Somers d	0.31	0.000
There is significance relationship between marketing innovation and product innovation in construction companies	Kendall's tau	0.41	0.000
	Somers d	0.35	0.000
There is significance relationship between green innovation and product innovation in construction companies	Kendall's tau	0.31	0.000
	Somers d	0.30	0.000
There is significance relationship between green innovation and process innovation in construction companies	Kendall's tau	0.45	0.000
	Somers d	0.31	0.000
There is significance relationship between green innovation and marketing innovation in construction companies	Kendall's tau	0.34	0.000
	Somers d	0.33	0.000
There is significance relationship between green innovation and management innovation in construction companies	Kendall's tau	0.41	0.000
	Somers d	0.35	0.000

According to the findings of [Table 2] there is a significant relationship between organizational innovation and organizational performance in Statistical population under study with error level of 0/01. Kendall's tau coefficient with the amount of 0/79 represents the Strong correlation between two mentioned variables. Also degree and intensity of this relationship according to Samers d coefficient was 0/67 that shows direct and relatively Strong relationship. In the other hypothesis the relationship between the variables Due to the coefficient d au-Kendall Summers and the coefficients to represent direct and relatively moderate relationship.

Therefore, according to the two variables analysis and test of the research hypothesis in the first step, all of the research hypotheses are confirmed.

Inferential analysis (Multivariate Analysis: Regression analysis)

[Table 3] represent Multivariate regression model of organizational performance. In addition [Table 4] determines Indicators and statistics of regression analysis.

Table 3: Multivariate Regression Model For organizational performance

Variables were entered into the equation					
Variables	Non- standardized coefficients		Standardized coefficients	The amount of t	Significant level of t
	B	Standard error	Beta		
Green product Innovation	1.460	0.166	0.087	24.296	<u>0.000</u>
Green marketing Innovation	3.000	0.184	0.667	9.177	<u>0.000</u>
Green management Innovation	3.287	1.215	0.066	2.713	0.007
Green process Innovation	3.223	0.121	0.275	2.524	0.012

Table 4: Indicators And Statistics of Regression Analysis of organizational performance

Entry method variables	Method : Enter
Individual correlation coefficients	M.R = 0/911
The coefficient of determination	R ² = 0/89
The coefficient of Real determining	R ² <u>adj</u> = 0/88
Deviation or standard error	S.E = 9/356
Analysis of Variance	ANOVA = 325/040
Significance level of F	Sig = 0/000

As can be seen In [Table 4], the coefficient of multiple correlation is M.R=0/911, The coefficient of determination is equal to R2=0/89, and The real coefficient of determination equal to 0/87 and This indicates that almost 88% of the variance and changes of the variable in implementation of organizational performance By components exist in the equation, i.e., green product Innovation, green marketing Innovation, green management Innovation, green process Innovation and green innovation can be explained and predicted. 12% of the changes of dependent variable linked to remaining variance is due to the influence of external variables and unknown factors emerged.

The data in Table 4 indicates the fact that the component of green marketing innovation with the foundation of 0/67 most impact and green management innovation with the foundation of 0/07 have the least amount of affection in variable on improving organization performance. System in organization.

The results of multiple regression analysis of the above variables can be written in standardized mathematical form as follows

Formula (1)

$$Y = \beta_1 Z_{1i} + \beta_2 Z_{2i} + \dots + \beta_k Z_{ki} + E_i$$

Y= 0.67 (green marketing Inn : Innovation)
+ 0.07 (green management Innovation) + 0.07(green Innovation) + 0.12E

Therefore, according to multivariate regression, all assumptions are approved.

CONCLUSION

With the growing importance of green innovations, green collaboration, green performance and firm competitiveness over the past decade, it is essential to improve our understanding of these matters and their associated interrelationships.

Based on this study, due to the strategic importance of green innovation for companies and the lack of a comprehensive model of green innovation that is tested empirically in this corporate, a model is presented for improve organizational performance in the construction companies.

Therefore, this paper investigates the relationship between different types of green innovation with organizational performance and Extraction of the relative impact of each of these components in improving of organizational performance based on regression analysis have been studied. The following results are obtained:

Improvement in the green management innovation on the green product innovation has significant and direct effect (confirm the first hypothesis)

Improvement in the green management innovation on the green process innovation has significant and direct effect (confirm the second hypothesis)

Improvement in the green management innovation on the green marketing innovation has significant and direct effect (third the first hypothesis)
 Improvement in the green process innovation on the green product innovation has significant and direct effect (confirm the fourth hypothesis)
 Improvement in the green marketing innovation on the green product innovation has significant and direct effect (confirm the fifth hypothesis)
 Improvement in the green product innovation on the improving of organizational performance has significant and direct effect (confirm the sixth hypothesis)
 Improvement in the green marketing innovation on the improving of organizational performance has significant and direct effect (confirm the seventh hypothesis).
 Improvement in the green management innovation on the improving of organizational performance has significant and direct effect (confirm the eighth hypothesis)
 Improvement in the green process innovation on the improving of organizational performance has significant and direct effect (confirm the Ninth hypothesis).
 In addition, in determining the relative contribution of each green innovation component in explaining and predicting of organizational performance logically, organizational performance respectively affected by "green marketing innovation", "green process innovation", "green product innovation" and "green management innovation". Therefore, green marketing innovation and green management innovation respectively have the highest and the lowest impact on organizational performance.
 The results obtained from the study of the relationship between different types of green innovation and organizational performance in this article are consistent with previous research findings and empirically reinforce them.

The main limitation of this research that the researcher encountered in this study can be mentioned as unconcern of respondents in providing information to complete the questionnaire and the a lack of time and lack of easy access to all members of population which pursued diligently and overcome through using behavioral techniques. According to the findings suggested that Accordingly, it is recommended that the more managers take care of organizational infrastructure in order to enabling the types of green innovation specially green marketing innovation (according to the findings of the study has the most effect in improving of organizational performance) and also all the basic infrastructure provided in the study scrutinize and review by the managers and applied in the organization. In addition, since the present study in construction companies which are private companies that have been conducted, it is suggested that in future research by doing research on public companies and comparative study between the results obtained from public and private companies reach to different results. Since the results of the research show that green management innovations have the low effects on organizational performance, it is suggested:

In a study, the impact of green management innovation on organizational performance in organization using another model should be investigated. Moreover, according to the importance of green innovation types in organizational performance improvement, the managers be suggested:

In relation to green product innovation: the findings indicated that green product innovation third priority is the impact on organizational performance. The reason to impose short-term costs to the organization by purchasing green equipment, employee training and more rigorous monitoring for the development of green products noted. However, according to research findings green product innovation can long-term through reduced consumption of energy and raw materials, increases the overall performance of the organization. In relation to green process innovation: this dimension of green innovation, can also improve overall organizational performance. Since the green process innovation after green marketing innovation has the greatest impact on organizational, therefore the implementation and development it's in Construction companies should be considered. For this purpose the following practical recommendations: definition and process re-engineering

To ensure the effectiveness of internal production, Recycle, reuse and remanufacture material, use of cleaner technology to make savings and prevent pollution (such as energy, water and waste), sending in-house auditor to appraise environmental performance of supplier, process design and innovation and enhances R&D functions. In relation to green marketing Innovation: Since the green marketing innovation has the greatest impact on organizational therefore, the following suggestions are offered: Change in advertising practices, changes in pricing practices of existing products, changes in activities of general marketing management. In relation to green management Innovation: According to the findings green management innovation has the least impact on organizational performance. Green management innovation in long-term can improve the overall performance of the organization. For this purpose the following practical recommendations are offered: redefine operation and production processes to ensure internal efficiency that can help to implement green supply chain management, install environmental management system and ISO 14000 series, providing environmental awareness seminars and training for stakeholders.

CONFLICT OF INTEREST

There is no conflict of interest.

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FINANCIAL DISCLOSURE

None

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ARTICLE

EFFECTS OF CALCIUM BOROGLUCONATE INJECTIONS ON HEALTH, PRODUCTION, AND REPRODUCTION CAPACITY OF NEWLY CALVED COWS

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ABSTRACT

Most metabolic abnormalities in dairy cows including milk fever, ketosis, retained placenta, and displaced abomasums occur during the first two weeks of lactation and cause the metabolic abnormalities that happen during the early part of the lactation period. This research was conducted on 48 head of Holstein dairy cows in the Govaver Dairy Complex in Kermanshah. It was the first calving of two, the second calving of 12, and the third calving of 22 of the cows. The cows in each group were randomly placed into two groups each with 24 members. The protocol was applied on the second group but not on the first group (the control). The cows in the control group did not receive any protocol after calving, but those in the second group received 250 cc of 40% calcium Borogluconate immediately after calving. The calcium Borogluconate solution was first warmed to reach 38-40 °C and then injected slowly into the jugular veins of the cows. Data related on production of dry matter, milk, milk products, and blood metabolites, and on metabolic abnormalities was analyzed, and comparison of the means of the treatments showed the injections had significant effects on dry matter and average milk production, fat content of milk, calcium concentration in blood serum, and on concentrations of phosphorous and magnesium.

INTRODUCTION

Most metabolic abnormalities including lameness reflect events that happen in the early part of the lactation period. Three physiological functions must be maintained in the periparturient period to prevent these metabolic abnormalities. These include having a strong immune system, keeping blood calcium content at its normal level, and increasing feed consumption in the days prior to and following parturition. Each of these three factors increases the risk for the development of most common abnormalities during the periparturient period [1]. Kimura et al. (1999) showed that activity of neutrophils in cows mastectomized after parturition returned more rapidly to the normal level compared to healthy cows. These results indicated that the start of the lactation period might result in changes in the composition and duties of peripheral blood mononuclear cells. One of the most important effects of mastectomy is the resolution of hypocalcemia, which is one of the main metabolic factors in the occurrence of metabolic abnormalities [2]. Moreover, hypocalcemia, as a stress, leads to a 5-7 fold increase in blood cortisol level; and the potential role played by cortisol in suppressing immune system is well-known [2]. Furthermore, calcium is necessary for muscle contraction, which decreases by a drop in blood calcium level. However, this drop is intensified before the downer cow complication is observed [3].

Daniel et al. (1983) proved that the speed and power of smooth muscle contractions in the intestinal system are directly proportional to blood calcium concentration, and low blood calcium levels led to reduced contraction of abomasum and, finally, to its filling up with gas and to abomasal displacement. Since hypocalcemia reduces feed consumption, it may result in greater tissue mobilization and, eventually, lead to increased risk for ketosis and fatty liver. These two abnormalities have potential effects on the immune system [4]. Therefore, keeping blood calcium in the range of 8.5-10 mg/dL can be an effective factor in improving the performance of the immune system during the periparturient period. Many studies have been carried out on reducing incidence of subclinical and clinical hypocalcemia. Clinical hypocalcemia has substantially decreased through reducing calcium content of feed prior to parturition, by using anionic salts in the ration rations of cows nearing parturition, and through utilizing feed complements and adding calcium to drinking water immediately after parturition. However, subclinical hypocalcemia continues to have a high incidence in herds of dairy cows [5].

Calcium concentrations in blood, milk, and colostrum are 8.5, 80-120, and 255-470 mg/dL, respectively, and, hence, calcium concentrations in milk and colostrum are at least 10 and 30 times greater compared to that in blood, respectively. A recently calved cow produces 2.7-26.6 kilograms of colostrum on the first milking day [6]. Calcium excretion via urine and feces will be equal to 21 g/day, and calcium received in the ration will be 100 grams, or 50 grams considering an absorption rate of 50% [5]. On parturition day, 15-20 grams of calcium is removed from the bones [7]. This research intended to study the effects of intravenous injection of 40% calcium borogluconate immediately after parturition on production capacity, metabolic abnormalities, and other health indices during the first 21 days of the lactation period.

KEY WORDS

Newly calved cow,
calcium Borogluconate,
metabolic abnormalities,
hypocalcaemia,
Govaver Dairy

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Cows in the transition period

Gromer (1995) defined transition period as three weeks before to three weeks after parturition. The closer cows get to parturition and start of the new lactation period, the greater stress they will experience. In this transition period, many biological changes happen during the various stages of parturition and start of lactation. Transition period is a very critical period for preventing the set of problems calving cows face [8]. Three weeks prior to parturition, dry matter intake of calving cows and heifers reaches about 1.7-1.9% of their body weights. Unfortunately, the appetite of cows declines when the feed they feed for fetal growth and preparation of the udder for the next lactation period increases. That is why it seems reasonable to recommend increases in dry matter (feed material) intake. Research in Illinois and Florida Universities has shown feed restriction during transition period is as effective as forced or free feeding, and incidence of fatty liver is lower in cows fed a restricted ration and their dry matter intake increases after parturition. Reexamination of the results of these studies has indicated there is a significant relationship between reduced feed intake during the last three weeks of pregnancy and the quantity of fat accumulated in the liver after parturition [9].

Calcium

Marked reduction in body calcium occurs during lactation because milk production is the main user of the calcium present in the body. When milk is synthesized in the body of a cow, all sources of calcium in its body are utilized. Moreover, calcium reserves in the bones are used and/or kidneys filter a part of the calcium reserve and thus prevent its excessive excretion [10]. It is not clear what percentage of calcium in the ration can be absorbed by ruminants, but reduced calcium concentration in the rumen can lead to decreased quantity of calcium absorption by the body. Parathyroid hormone indirectly stimulates calcium absorption by the digestive system because it regulates production of 1, 25-dihydroxyvitamin D [13]. In mature cows, calcium concentration is maintained at about 8.5-10 mg/dL and, in a cow weighing 600 kg, 3 grams of calcium are in the plasma and only 8-9 grams in all of the extracellular solutions (outside the bones). The liquid in the canal of cow bone may contain 6-15 grams of calcium. To prevent reduction in blood calcium that leads to paresis puerilis, cows must remove calcium from the bones or increase absorption of calcium in the ration to replace calcium that enters into milk [12]. Hypocalcemia (deficiency of calcium in the bloodstream) and milk fever happen when cows do not remove sufficient calcium from their bones, and calcium in the ration does not compensate for that removed via milk [11].

Hypocalcemia and milk fever

Hypocalcemia and milk fever are metabolic diseases that develop before or at parturition, and are characterized by rapid reduction in plasma calcium concentration resulting from the relatively quick loss of calcium in the production of colostrum. For example, a cow producing 10 liters of colostrum loses about 23 grams of calcium at each milking. This is 9 times the quantity of calcium in the plasma calcium reserve of the cow. The calcium removed from the plasma reserve must be replaced by increased intestinal absorption of calcium, by calcium released from the bones, or by both. At parturition, cows must put more than 30 grams of calcium per day into the calcium reserve and, hence, most cows show signs of hypocalcemia at parturition and from the first day after parturition until the time their intestines and bones get used to satisfying calcium demand for milk production. In some cows, calcium used in milk production causes extracellular plasma calcium concentrations to drop so severely that the nervous and muscular systems cannot function properly, and clinical signs of milk fever appear. Intravenous injection of calcium is used until cows get used to the mechanism of calcium transfer from the intestines and bones. If this treatment is not carried out, about 60-70% of cows die [15].

Strategies for preventing hypocalcemia

Rations containing high levels of sodium and potassium and low levels of chlorine and sulfur increase incidence of milk fever, while those that include low levels of sodium and potassium and high levels of chlorine and sulfur, or rations to which anionic salts are added, reduce incidence of milk fever [14]. When cows receive rations low in calcium, they will face a negative calcium balance that will cause a slight reduction in blood calcium concentration. This will stimulate PTH secretion that will in turn stimulate calcium removal from bone osteoclasts and production of 1, 25-dihydroxyvitamin D, which will increase calcium removal from bones and prepare the intestines to absorb calcium from the ration during lactation period. Calcium therapy and treatment with vitamin D are ineffective. Available data suggests blood magnesium concentrations lower than 1.6 mg/dL in cows during the periparturition period will increase their susceptibility to hypocalcemia and milk fever [19].

Abomasal displacement and retained placenta

Transition period is an important and risky period for left displacement of abomasum (LDA). Low and high intake levels of concentrates prior to parturition may increase the probability of LDA. Since the rumen is not filled due to lower levels of feed consumption, the chances for LDA increase [21]. Physiologically speaking, fetal membranes must usually be removed within 12 hours after parturition, and retention of allantochorion membranes remain inside the womb for a longer time than that will indicate a pathological

state. The period of this placental retention may be 4-8 days, or even longer, and signs of decay and infection will appear in the placenta. Therefore, if the placenta is not expelled two days after parturition, treatment operations must be carried out to remove it so that uterine infections and lesions do not ensue.

Fatty liver and negative energy balance

The fatty liver disease occurs more frequently in high yielding dairy cows, results in metabolic and reproductive disorders and infectious diseases, and may even cause death because the reduced number of white blood cells disrupts the immune system and lowers resistance to diseases and stresses [16]. Clinical symptoms in cows affected by fatty liver are accompanied by excessive obesity at parturition. Such a condition is followed by severe energy shortage and substantial loss of body weight (usually more than 1 kg/day). These complications cause many problems at parturition (such as milk fever, mastitis, uterine infections, etc.), reduce response to drug treatments, and slow down the trend of clinical improvement [17].

MATERIALS AND METHODS

This research was conducted at the Govaver Dairy Complex in Kermanshah from late October 2012 to late May 2013. This Complex keeps 2500 cows, 1100 of which are lactating Holstein cows, and has the required buildings and facilities including a milking parlor with four lines of bilateral milking totaling 48 units with three times of milking per day. The Complex has the record of 34 liters of milk per cow, is one of the farms for rearing and keeping Holstein cows, and serves as an important center of milk production in Kermanshah Province.

The experimental protocol

The group of cows close to calving was separated based on parturition signs (filling up of the udder, loosening of the uterine ligament, and mucus discharge from the uterus) and put in calving boxes. After parturition, 250 ml of 40% calcium borogluconate (which contained 340.1 mg/mL of calcium borogluconate and was warmed up to the body temperature of the calves) were slowly injected into each one. Temperatures of the cows were measured before the injections and cows with fever (body temperature higher than 39.4 °C) were not injected. Forty- eight Holstein cows were randomly divided into two equal groups: treatment 1: the control treatment not injected, and treatment 2: intravenously injected with 250 ml of 40% calcium borogluconate at parturition. The cows were monitored for 21 days.

Collecting samples and recording during the experiment

Dry matter intake

Dry matter consumption was measured collectively for each group, and unconsumed feed was collected from the feed bunks and weighed to calculate feed intake.

Recording milk production and sampling milk

Each week, milk production was recorded and milk samples were taken. Every time a cow was milked, a sample was taken after the milking with the help of a valve embedded in the bottom part of each milkometer (the milking machines were digital). Some milk was then poured into the sampling containers. To each container was added some potassium dichromate to prevent it from going bad, and the containers were kept at 4 °C while being transferred to the laboratory. A model CombiFoss 5000 (Foss Electric, Hillerød, Denmark) Milko Scan was used to analyze milk composition (percentages of fat and protein, and somatic cell count).

Body Condition Scoring (BCS)

At the start and end of the experiment, two weeks before calving, and at parturition, the body condition of each cow was given a score on the scale of 1 to 5, and the average score of body condition for each cow was used for statistical analysis of the data [18].

Taking blood samples

To determine blood composition, 10- ml blood samples were taken from the tail vein using vacuum tubes without anticoagulant agents. Blood samples were taken at 10-11 AM, and 3-5 hours after morning feeding on days 1, 2, and 21 after parturition, to determine blood calcium, magnesium, phosphorous, beta- hydroxybutyrate, non-esterified fatty acids, and urea nitrogen. The samples were immediately centrifuged (in a SIGMA 101 model centrifuge made in Germany) at 3000 rpm for 15 minute to separate the serums, which were kept frozen at - 20 °C until they were analyzed in the laboratory. After carrying out the stages on the farm, blood parameters such as calcium, phosphorous, and magnesium were measured in the laboratory using a Perkin Elmer 35 model spectrophotometer, and NEFA and beta-hydroxybutyrate (BHBA) were measured by using kits.

Measuring metabolic abnormalities

Metabolic abnormalities including milk fever, retained placenta, metritis, endometritis, hypocalcemia, abomasal displacement, and ketosis were carefully recorded during the experiment. Incidence of any metabolic abnormality was defined as the number of cows exhibiting the abnormality divided by the total number of the cows in each group. Cows that showed symptoms such as lethargy, signs of staggers, nervous signs, and various degrees of dizziness with cold ears within 72 hours after calving were considered cows suffering from milk fever. Retained placenta referred to cows in which fetal layers in the vulva, vagina, and uterus were visible within the first 12 hours after calving, and the placenta was not expelled from the body 12 hours after parturition. Moreover, the time of calving, the time of placenta expulsion, and the time taken for placenta expulsion in each cow were recorded, and the data related to the time of placenta expulsion was statistically analyzed. Abomasal displacement was defined as reduced milk production and decreased appetite, and hearing a metallic ring when the area between the ninth and twelfth thoracic vertebrae on the right and left sides of the abdominal cavity was tapped [20].

The experimental design

Since hypocalcemia and milk fever are related to the age and number of calving of cows, the randomized complete block design with more than one observation per block-treatment and with two treatments (treatment 1, without injection as the control, and treatment 2 injected immediately after calving) was used in this research. The data related to milk production and composition was analyzed employing the Mixed Procedure and using repeated measures ANOVA, and the milking week was entered into the statistical analysis as the repeated measures. Data related to blood parameters (calcium, magnesium, phosphorous, beta-hydroxybutyrate, non-esterified fatty acids, and urea nitrogen) was analyzed employing Proc Mixed

And using repeated measures ANOVA, and the sampling days were entered into the statistical analysis as the repeated measures.

$$y_{ijk} = \mu + T_i + \text{cow}(T_i) + \text{Day}_k + P_j + (p * T)_{ij} + (\text{Day} * T)_{ki} + e_{ijkl}$$

In the above equation, Y_{ijk} is the observation related to the i^{th} treatment in the j^{th} block, μ the mean, T_i the effect of the treatment, and $\text{cow}(T_i)$ the random effect of the cow in the treatment. Furthermore, Day_k is the effect of time, P_j the effect of block; $(p * T)_{ij}$ the mutual effect of treatment and block, $(\text{Day} * T)_{ki}$ the mutual effect of treatment and day, and e_{ijkl} the effect of random error. Incidence of metabolic abnormalities was analyzed using the logistic regression software SAS9.1 (2000), and Odd Ratio and Confidence Interval were calculated to determine the relationship between the abnormalities (the dependent variable) and the treatments (the independent variable).

Dry matter intake

As shown in [Fig. 1], dry matter consumption in the ration after calving in treatments 1 and 2 were 15.63 and 16.43 kg/day, respectively. Therefore, the treatment had a significant effect on dry matter consumption ($p < 0.05$). The effect of time on dry matter intake was also significant ($p < 0.05$). Results showed that when the cows were fed calcium and phosphorous rich rations, dry matter consumption was higher compared to when they were fed rations low in calcium and phosphorous. This difference does not seem to be related to DM digestion because DM percentage was different in both rations with low and high calcium and phosphorous content that had the same fiber content.

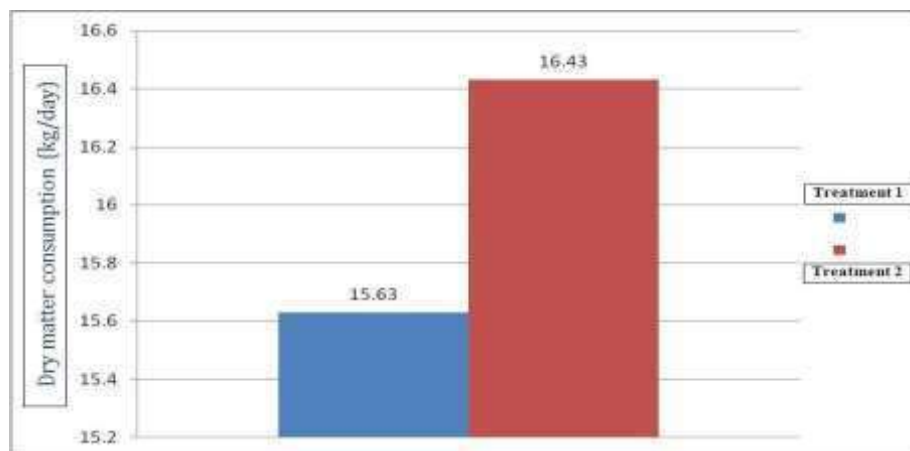


Fig. 1: Changes in dry matter intake in the experimental treatments 1 (not injected) and 2 (injected immediately after calving)

Milk Production

[Fig. 2] indicates daily milk production in the first 21 days of the lactation period in treatments 1 and 2 was 24.60 and 25.24 kg/day, and the treatments had significant effects on daily milk production. Treatment 2 had significantly higher milk production compared to treatment 1 ($p < 0.05$). The effects of blocks on milk production were significant ($p < 0.05$), so were the effects of time or weeks of lactation ($p < 0.05$). Pregnancy and lactation reduced blood calcium levels because they caused calcium to be transferred from blood to the time of calving. The most important time when calcium is at its lowest level in a cow's blood is the time of calving.

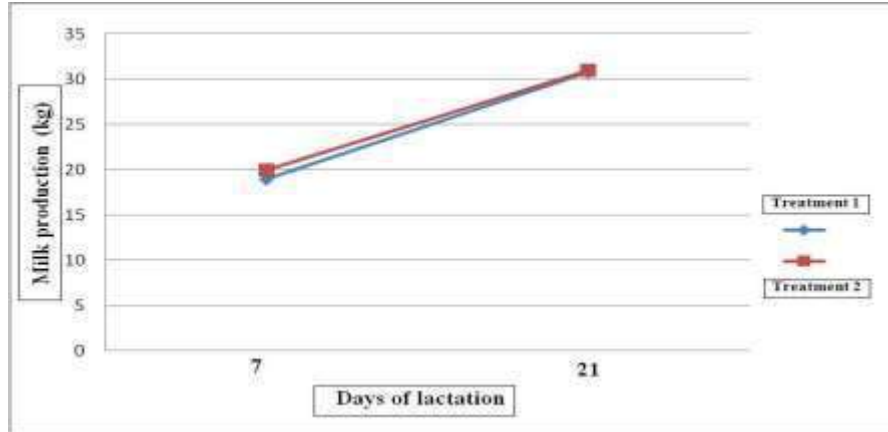


Fig. 2: Changes in milk production on lactation days in treatment 1 (not injected) and treatment 2 (injected immediately after calving)

Milk fat percentage

As shown in [Fig. 3], milk fat percentages in treatments 1 and 2 were 3.19 and 3.20 percent, respectively. ANOVA of the data and comparison of the means using Tukey's test indicated there were no significant differences between the two treatments in milk fat percentage ($p > 0.05$), but the effects of blocks on milk fat percentage were significant ($p < 0.05$). The mutual effects of treatment and block and treatment and time were not significant either ($p > 0.05$).

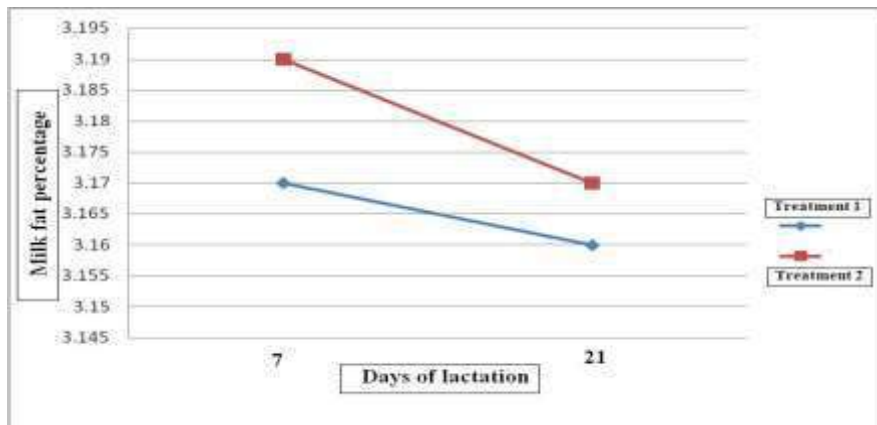


Fig. 3: Changes in milk fat percentage on days of lactation in treatments 1 (not injected) and 2 (injected immediately after calving)

Blood parameters

Serum calcium

Treatments 1 and 2 had serum calcium concentrations of 8.39 and 9.41 mg/dL, respectively [Fig. 4]; i.e., the effects of treatment on calcium concentration were significant ($p < 0.05$). So were those of block ($p < 0.05$), days of taking blood samples ($p < 0.05$), and the mutual effects of treatment and time ($p < 0.05$). However, the mutual effects of treatment and block were not significant ($p > 0.05$). The normal blood calcium level in cows is about 10 milligrams/dL. Use of commercial calcium chloride (54 grams of calcium) when there are signs of impending calving lowers milk fever and abomasal displacement 14-24 hours after parturition.

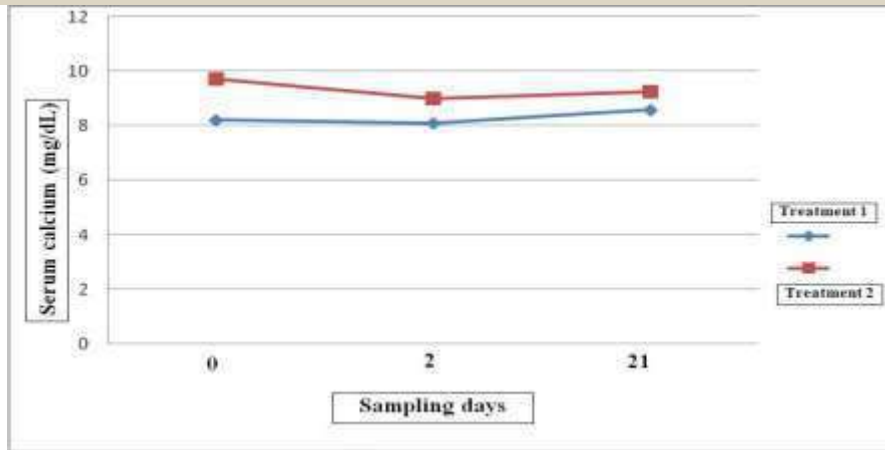


Fig. 4: Changes in blood serum calcium on days of lactation in treatments 1 (not injected) and treatment 2 (injected immediately after calving)

Serum phosphorous

[Fig. 5] shows serum phosphorous concentrations were 4.6 and 4.75 mg/dL in treatments 1 and 2, respectively. The treatments had significant effects on phosphorous concentration ($p < 0.05$), so did block ($p < 0.05$) and time ($p < 0.05$). However, the mutual effects of treatment and time and treatment and block were not significant ($p > 0.05$). Mineral phosphorous in blood is almost completely distributed in blood plasma and in the fluid within the external tissues of blood vessels. Low phosphorous rations may increase renal activity of 1-alpha-hydroxylase, while high phosphorus rations can promote hypophosphite formation.

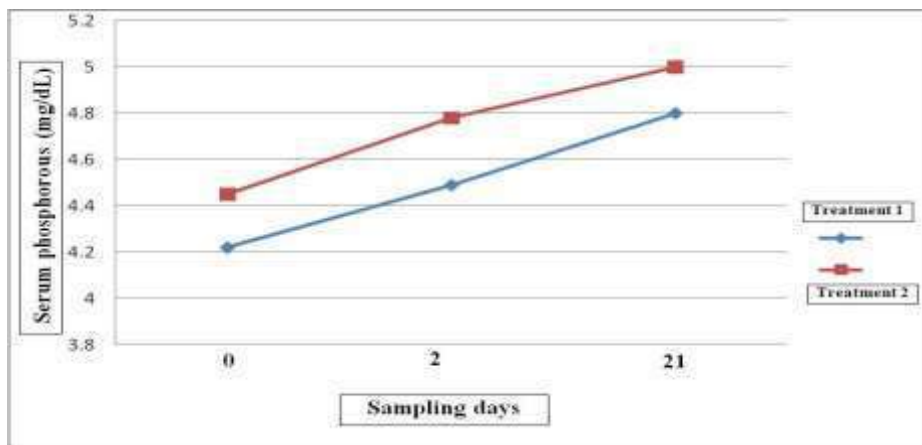


Fig. 5: Changes in blood serum phosphorous on days of lactation in treatments 1 (not injected) and 2 (injected immediately after calving)

Serum magnesium

[Fig. 6] shows Serum magnesium concentration in treatments 1 and 2 were 2.2 and 2.39 mg/dL, respectively. ANOVA of the data and comparison of the means of the treatments showed that the treatments had significant effects on serum magnesium concentration ($p < 0.05$), but block had no significant effect on magnesium concentration ($p > 0.05$). Moreover, the effects of time on serum magnesium concentration were significant ($p < 0.05$) and so were the mutual effects of treatment and time ($p < 0.05$), while the mutual effects of treatment and block on serum magnesium concentration were not significant ($p > 0.05$). Therefore, we can say that calcium absorption inversely affected magnesium absorption. Furthermore, if plasma magnesium concentration drops below 0.74 mM/L, stock becomes susceptible to hypomagnesaemia.

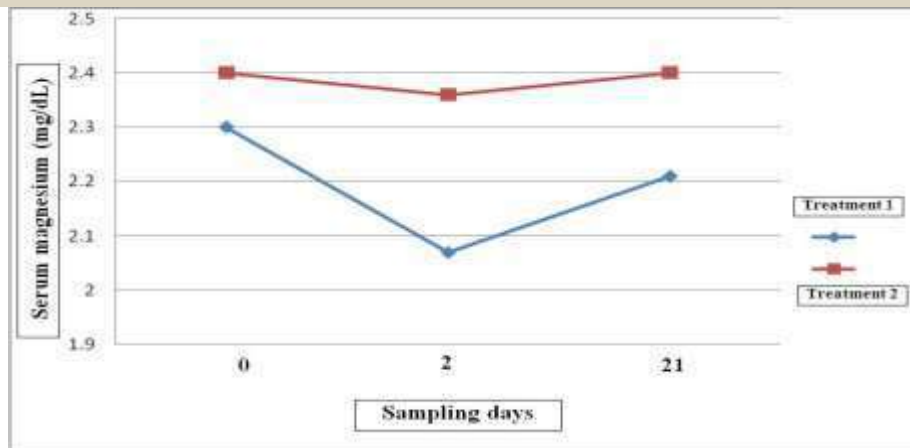


Fig. 6: Changes in serum magnesium on days of lactation in treatments 1 (not injected) and 2 (injected immediately after calving)

Metabolic abnormalities Clinical hypocalcemia (milk fever)

During the experiment, no case of milk fever was observed in either of the treatments. This could indicate desirable management of the difference in the anion-cation of the ration prior to calving using anionic salts. Milk fever may be caused by incomplete absorption of calcium from the intestines or by excessive excretion of calcium via feces. About 85% of the cows that exhibited symptoms of milk fever, and were immediately injected with intravenous calcium, responded to calcium treatment. Milk fever is muscle weakness or hypocalcemia at parturition. Hypocalcemia is a metabolic disorder in dairy cows that happens after calving. Incidence of milk fever varies among different breeds, and has been estimated to be 12.4 to 30% in the Jersey breed but about 3.9% in other breeds. Milk fever may affect 50 to 80 percent of the herd, and it varies depending on the breed, age, and rations of cows. At calving and following parturition, the demand for calcium suddenly rises sharply. Stimulation of transport and absorption of calcium by the intestines must take place about 15 to 24 hours before the absorption process begins so that it can sufficiently prevent development of milk fever.

Subclinical hypocalcemia

Logistic regression analysis of the data related to calcium concentrations lower than 8 mg/dL after calving indicated that 29.16 and 12.5% of the cows in treatments 1 and 2, respectively, had calcium concentrations lower than 8 mg/dL, and that there were no significant differences between the two treatments ($p > 0.05$). However, incidence of hypocalcemia in treatment 1 was twice that in treatment 2. Data revealed susceptibility to hypocalcemia was less in treatment 2 as compared to treatment 1. Hypocalcemia and milk fever occur when cows are unable to remove calcium from their bones or absorb it through the intestines. The normal calcium concentration in a mature cow is maintained at 8.5 to 10 mg/dl.

Abomasal displacement

Logistic regression analysis of the data related to abomasal displacement showed that this abnormality happened in 4.16 and 3.7% of the cows in treatments 1 and 2, respectively. This difference was not statistically significant ($p > 0.05$). Abomasal displacement, also called twisted stomach, happens when the actual stomach loses its normal position, and is twisted to the left or to the right. About 90% of abomasal displacement is to the left and happens between 5 to 6 weeks after calving. If feed intake is low in a freshly calved cow, its rumen may not be filled and, hence, the abomasum will have a larger space for displacement. However, in this research, the rumen was rapidly filled because of the increase in the quantity of dry matter consumption, which prevented abomasal displacement.

Percentage of retained placenta

The mean percentages of retained placenta in treatments 1 and 2 were 20.83 and 8.33%, respectively, and the treatments were not significantly different in this respect ($p > 0.05$). However, incidence of retained placenta tended to be lower in treatment 2. Normally, placenta expulsion should take place one to several hours after calving, and if it does not happen after 12 hours, the abnormality is called retained placenta

CONCLUSION AND SUGGESTIONS

Decreased appetite is a problem frequently observed in freshly calved cows, and one of the reasons for this reduced feed intake is the drop in blood calcium levels and malfunction of masseter muscles and of

the digestive system. The most rapid way of improving the negative calcium balance can be the use of injected calcium solutions before and immediately after calving. In this research, this injection led to increased dry matter consumption during the first 24 hours after parturition. Calcium injection led to significant increases in dry matter intake following which daily milk production increased and there were improvements in the immune system including a drop in somatic cell count and improved condition of the uterus after parturition (improved metritis and endometritis). Calcium injection led to significant reductions in metabolic abnormalities including hypocalcemia and ketosis.

Results of this research indicate that cows experience severe negative calcium balance on calving day despite the use of anionic salts, especially cows that have calved several times because they produce large quantity of colostrum. Considering the relationship between hypocalcemia and reduced feed intake (which is an important factor in the development of other abnormalities including ketosis and fatty liver), injection of calcium solutions can be recommended for all cows immediately after calving. This will help improve the negative calcium balance and will be beneficial as there is high incidence of hypocalcemia, which affects production and reproduction capacity in stock. Moreover, injection of calcium is an easy and low-cost management practice compared to supplying it via drinking water.

CONFLICT OF INTEREST

There is no conflict of interest.

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FINANCIAL DISCLOSURE

None

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ARTICLE

EFFECT OF ACOUSTIC PRESSURE ON THE PROPERTIES OF SINGLE BUBBLE SONOLUMINESCENCE

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ABSTRACT

By using two computer simulations (quasi-adiabatic and hydro-chemical simulations), the relative radius, the bubble interior temperature and the emitted intensity inside a single bubble sonoluminescence in water due to different acoustic pressures were measured and compared. It was found that with increasing the acoustic pressure, the bubble relative radius and the bubble interior temperature rises, and thus increases the intensity of the emitted light. By changing the acoustic pressure in the quasi-adiabatic simulations of 1.313 to 2.02 bar, the bubble interior temperature changed about 4×10^3 to 34×10^3 K and the emitted intensity changed about of 1.52×10^{-5} to 2.21 W/m². And by changing the acoustic pressure in the hydro-chemical simulations of 1.111 to 1.616 bar, the bubble interior temperature changed about 8.01×10^3 to 38.18×10^3 K and the emitted intensity changed about of 6.73×10^{-3} to 3.096 W/m².

INTRODUCTION

For many years, a phenomenon known as sonoluminescence (SL) has attracted the attention of researchers. Identifying various aspects and parameters of this cavitation bubble has been an interest of SL scholars [1, 2]. Stabilizing an oscillating bubble and achieving extremely high pressures and temperatures during collapse has motivated scientists to perform numerous experimental and theoretical investigations [3, 4]. This tiny bubble actually became a very useful micro-device to test the features of various gases in extremely high temperatures which cannot be achieved with existing heaters and ovens [5, 6]. The SL bubble is investigated in two major categories: single bubble sonoluminescence (SBSL) and multi bubble sonoluminescence (MBSL) [7]. Effective forces acting on the MBSL bubbles, including interacting forces between bubbles are reported in various host liquids [8]. Various models have been proposed to explain the bubble radiation. At the early stages of studying SL radiation, it was believed that the black body radiation is the most dominant process to generate the light flashes [4, 9]. The shortcoming of the black body theory, due to the assumption of the whole bubble luminous object, was soon proved and further attempts were made to introduce other theories to explain the radiation intensity more precisely. The available models of SBSL are quasi-adiabatic, hydro-chemical ones. The quasi-adiabatic model (adiabatic behavior only near the minimum radius and isothermal for the rest of the cycle) is very simple, so many parameters of the bubble cannot be found and some parameters of the host fluid and the bubble parameters, such as chemical reactions, are ignored [10, 11]. Another one is hydro-chemical model which is used to study SBSL that is more complete [12]. In this work, changes of parameters of SBSL in water were studied for different acoustic pressures by the quasi-adiabatic and the hydro-chemical simulations.

MATERIALS AND METHODS

The The Rayleigh-Plesset equation in association with an appropriate boundary equation governs the radial oscillations of the bubble [13]:

$$\left(1 - \frac{\sigma}{R}\right) R \ddot{R} + \frac{2}{3} \left(1 - \frac{\sigma}{R}\right) \dot{R}^2 = \left(1 + \frac{\sigma}{R}\right) \left(\frac{P_1 - P_\infty}{\rho}\right) + \frac{\sigma}{\rho R} \quad (1)$$

Where $R, \dot{R}, \ddot{R}, \rho$ and C are the bubble radius, the bubble wall velocity, the bubble wall acceleration, the density of fluid and the speed of sound in the host fluid, respectively. P_1 is the fluid pressure at the bubble wall⁹ and P_∞ is the fluid pressure [14] far enough from the bubble:

$$P_1 = P_\infty - \frac{4\sigma}{R} - 4\mu \dot{R} \quad (2)$$

$$P_\infty = P_0 + P_a(t) \quad (3)$$

Where P_0, σ and μ in (2) are the gas pressure at the bubble wall, the surface tension, and the fluid shear viscosity, respectively.

In (3), $P_0 = 1 \text{ bar}$ is an ambient pressure and $P_a(t)$ is an acoustic driving pressure as follows [15]:

$$P_a(t) = -P_a \sin(\omega t) \left(1 - \frac{|\chi|}{R_0}\right) \quad (4)$$

In (4), P_a is the driving pressure amplitude, ω is the frequency, $|\chi|$ is the bubble distance from the center of the resonator and $R_0 = 3 \text{ cm}$ is the resonator radius. Interior gas pressure, P_g in quasi-adiabatic model, is defined as:

$$P_g[R(t)] = \left(P_0 + \frac{4\sigma}{R}\right) \left(\frac{R_0^3 - R_0^3}{R^3 - R_0^3}\right)^\gamma \quad (5)$$

Where R_0 is the bubble initial radius, $h = \frac{R_0^3}{R_0^3}$ is the Van der Waals hard core radius for Ar and γ is the effective polytrophic exponent [16]. To calculate the Van der Waals hard core radius for other gases, we have estimated this number by $\frac{h_{\text{Ar}} \times 8.86}{\text{molar mass ratio}} \times 8.86$ instead of 8.86 for Ar. The temperature changes due to the bubble dynamics and the thermal conduction are described through the definition of γ . If the

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acoustic pressure; hydro-chemical simulation; quasi-adiabatic simulation; sonoluminescence

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THE IIOAB JOURNAL

time it takes the bubble wall to oscillate is faster than the time scale of heat conduction through the bubble wall, the collapse will be (nearly) adiabatic and $\gamma \approx \Gamma$, where $\Gamma=5/3$ is the adiabatic exponent for mono-atomic gas. Away from collapse, the heat conduction is faster than the bubble wall motion, so that the bubble is (nearly) isothermal, with $\gamma=1$. For the strong collapses of SL bubbles, using a time-dependent, instantaneous Peclet number γ is a function of \dot{R}, R and the gas temperature [17] T :

$$\gamma(Pe) = 1 + (\Gamma - 1) \exp\left(-\frac{A}{Pe^B}\right) \tag{6}$$

$A \approx 5.8, B \approx 0.6$ and Pe is the instantaneous Peclet number:

$$Pe = Pe(t) = \frac{\alpha_{eff} N_A}{\delta_{eff}} \tag{7}$$

Where $\gamma(Pe \rightarrow 0) \rightarrow 1$ (isothermal behavior, where thermal diffusion is dominant) and $\gamma(Pe \rightarrow \infty) \rightarrow \Gamma = \frac{5}{3}$ (adiabatic behavior, where advection is dominant). In (7):

$$\alpha_{eff} = \alpha_g T \quad \delta_{eff} = \frac{2}{3} \Gamma^{-1} \left(\frac{12 \mu_{eff} \rho}{g} \right) \quad G(g) \tag{8}$$

$\alpha_{eff}, \alpha_g, T$ and δ_{eff} are gas effective atomic diameter, ideal gas constant, gas temperature and gas molecular weight, respectively. $G(g)$ is defined as:

$$G(g) = \frac{1}{2} \left[\frac{1}{\dots} + 1.2g + 0.755g^2(1 + c_1g + c_2g^2 + c_3g^3) \right] \tag{9}$$

In which $c_1 = 0.625, c_2 = 0.2869, c_3 = 0.115$ and:

$$g = \frac{N_A \mu_{eff} \rho}{\dots} \tag{10}$$

N_A is Avogadro number and τ_m is a gas specific molar volume.

The bubble temperature is obtained from an excluded volume van der Waals equation of state:

$$P_g \frac{4\pi}{3} (R^3 - h^3) = \frac{4\pi}{3} R_0^3 \tau_m \alpha T \tag{11}$$

And regarding the thermal cooling of the gas in the boundary layer, it is given by:

$$\dot{T} = -[\gamma(Pe) - 1] \frac{dR}{dt} T - \chi_{eff} \frac{T - T_\infty}{\delta_{eff}} \tag{12}$$

Where T_∞ holds for the fluid temperature at infinity.

The emitted intensity of the electron-ion and electron-atom Bremsstrahlung collisions can be presented as follows [18]:

$$P_{Br,ion} = 1.57 \times 10^{-40} q^2 N^2 T^{0.5} \pi R^3 \tag{13}$$

$$P_{Br,atom} = 4.6 \times 10^{-44} q N^2 T^{\frac{1}{2}} \pi R^3 \tag{14}$$

q, N and T are degree of ionization, the number density of atoms and interior temperature of the bubble, respectively. The degree of ionization, q , is:

$$\frac{q}{1-q} = 2.4 \times 10^{21} T^{3/2} e^{-\epsilon_{ion}/k_B T} \tag{15}$$

Where ϵ_{ion} and k_B are the ionization potential of gas and the Boltzmann constant, respectively. In (13) - (15), all of the quantities are expressed in SI units.

The emitted intensity yields:

$$I = \tau_e (\tau_r h_{nlank} \bar{\nu} + P_{Br,ion} + P_{Br,atom}) \tag{16}$$

In this equation $\tau_r, \tau_e, h_{nlank}, \bar{\nu}$ are the escape rate of emitted photon from SL bubble, the rate of radiative recombination and the mean energy of the photons emitted by radiative recombination, respectively.

And in the hydro-chemical model, the Rayleigh-Plesset equation is coupled with gas pressure. The gas pressure in this model is described by [12]:

$$P_g = \frac{N_{tot} k_B T}{V} \tag{17}$$

In this equation N_{tot}, B and V are the total number of particles inside the bubble, the hard core parameter and the bubble volume, respectively.

Also the boundary layer formalism is used to consider heat transfer between the bubble and its surrounding liquid. The heat loss is estimated to be:

$$\dot{Q} = 4\pi R^2 \kappa \frac{T - T_0}{l_{th}}, \quad l_{th} = \min\left\{\frac{R}{2}, \frac{\alpha_g}{\chi}\right\} \tag{18}$$

T_0 is the initial bubble temperature, and κ, χ are the thermal conductivity and thermal diffusivity for the gas mixture [12]. Chemical reactions in the bubble, particle diffusion from the bubble wall, evaporation and condensation of molecules, heat conduction, and the bubble stabilities are considered in this model.

RESULTS

At first, the quasi adiabatic simulation of the single bubble sonoluminescence was presented and compared for various acoustic pressures in water 20°C . The physical properties of water in 20°C are summarized in [Table 1]. The bubble relative radius as a function of time, the bubble interior temperature and the emitted intensity at the collapse time, were calculated and compared for the acoustic pressures from P1 to P5. The amounts of the acoustic pressures from P1 to P5 are given in [Table 2].

Table 1. The physical properties of water in 20 °C

	ρ (kg.m ⁻³)	ω (N.m ⁻³)	μ (Pa.s)	c (m.s ⁻¹)	γ (°C)
H ₂ O	1000	0.073	1.307×10^{-3}	1660	20

To ensure the required conditions for SBSL, the driving frequency is 30 KHz, and the bubble initial radius is 6 micron [19]. The calculated results are shown in [Fig. 1,2,3].

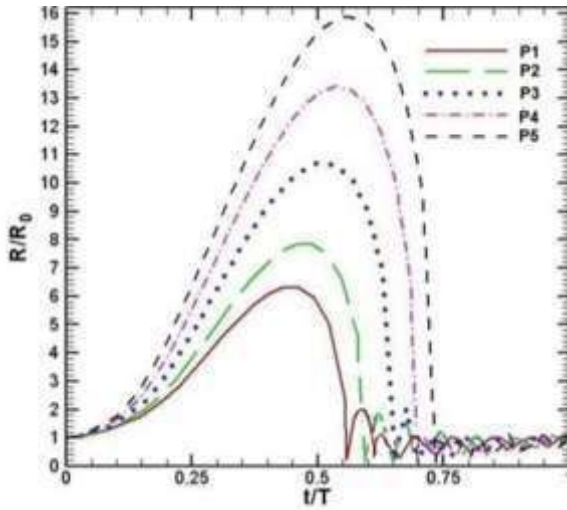


Fig: 1. Comparison of the bubble relative radius as a function of time for different acoustic pressures at the first cycle (in the quasi adiabatic simulation)

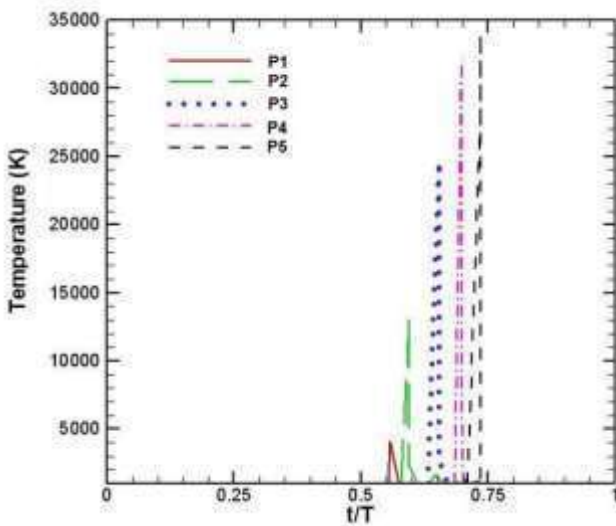


Fig: 2. comparison of the bubble interior temperature for different acoustic pressures at the collapse time (in the quasi adiabatic simulation)

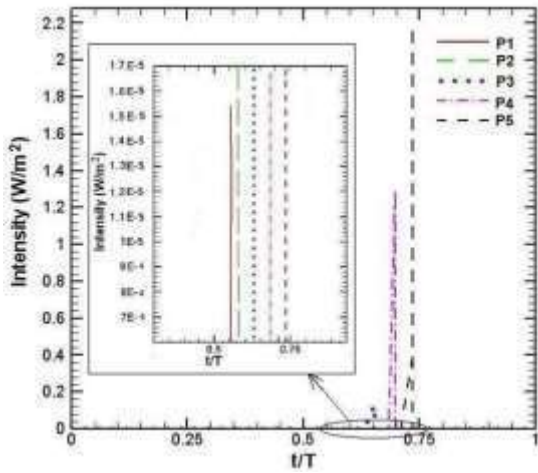


Fig. 3. Comparison of the emitted intensity for different acoustic pressures at the collapse time (in the quasi adiabatic simulation)

In [Fig. 1] the bubble relative radius as a function of time in one cycle (T is period of the acoustic pressure and t/T is no dimension time) was compared for various acoustic pressures. It is noticed that as the acoustic pressures increases the bubble relative radius increases. [Fig. 2] shows the bubble interior temperature of five different acoustic pressures. It is shown that the increment of the acoustic pressures induces an increment in the bubble interior temperature at the collapse time. A time variation of the emitted intensity in one cycle is compared in [Fig. 3]. It is shown that the increment of the acoustic pressures induces an increment in the emitted intensity at the collapse time. Maximum of the bubble interior temperature, the emitted intensity and the bubble relative radius in the quasi adiabatic simulation are given in [Table 2]. These results have been achieved from [Figs. 1,2,3].

Table 2: Results of SL in the quasi adiabatic simulation for different acoustic pressures

	P_1 (bar)	R/R_0	$(R/R_0)_{max}$	$(I_{max}/W/m^2)$
P1	1.313	6.43	4×10^{-2}	1.52×10^{-2}
P2	1.414	7.84	1.3×10^{-1}	3.50×10^{-1}
P3	1.616	10.84	2.4×10^{-1}	0.13
P4	1.818	13.56	3.2×10^{-1}	1.32
P5	2.020	16.06	3.4×10^{-1}	2.21

At next step, the hydro chemical simulation of SL was presented and compared for various acoustic pressures in water 20°C . The bubble relative radius as a function of time, the bubble interior temperature and the emitted intensity at the collapse time were calculated and compared for acoustic pressures from P6 to P10. The pressures from P6 to P10 are given in [Table 3]. Also the calculated results are shown in [Figs. 4,5,6].

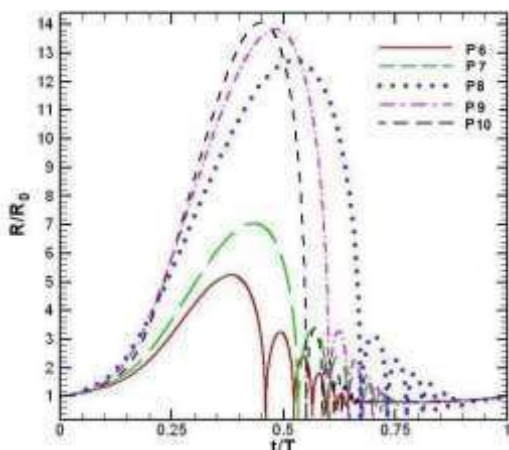


Fig. 4: Comparison of the bubble relative radius as a function of time for different acoustic pressures at the first cycle (in the hydro chemical simulation)

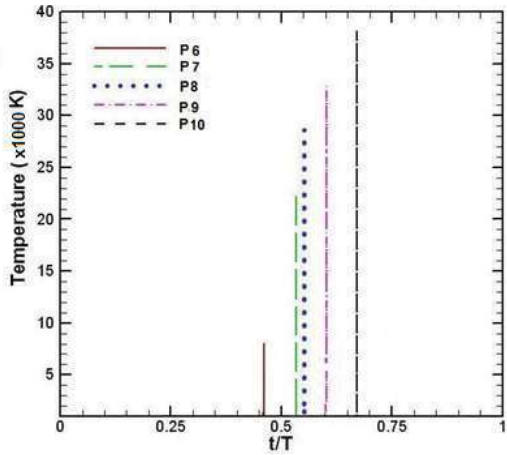


Fig. 5: Comparison of the bubble interior temperc (in the hydro chemical simulation)

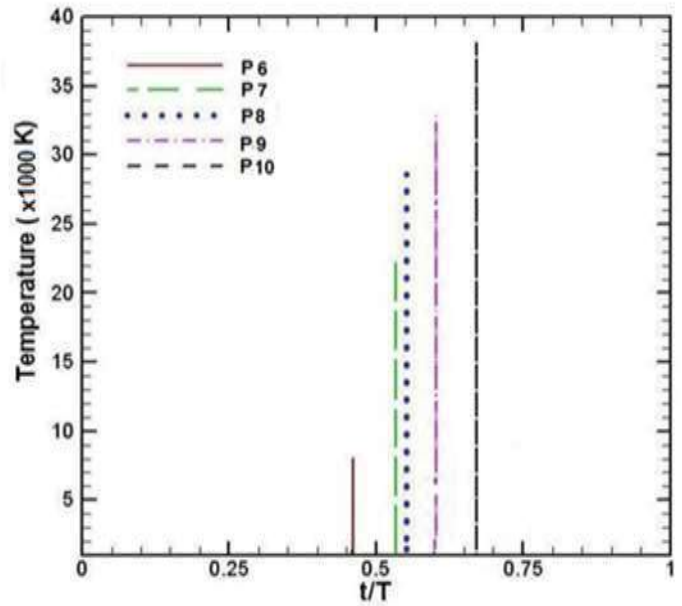
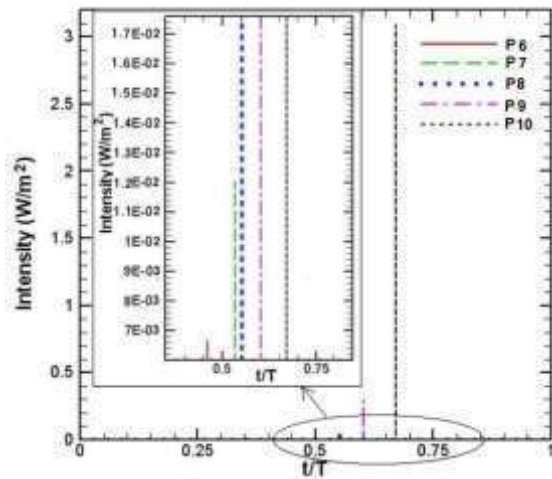


Fig. 6: Comparison the emitted intensity of the SL bubble for different acoustic pressures at the collapse time (in the hydro chemical simulation)



[Fig. 4,5,6] are same [Fig. 1,2,3] except that type of simulation has been changed. Maximum of the bubble interior temperature, the emitted intensity and the bubble relative radius in the hydro chemical simulation are given in **Table-3**. These results have been achieved from [Fig. 4,5, 6].

Table 3: Results of SL in the hydro chemical simulation for different acoustic pressures

	$R_0(\mu m)$	$P_a(\text{bar})$	R/R_0	(T)	(W/m^2)
P6	3.5	1.111	5.24	8.07×10^2	6.73×10^{-2}
P7	4.5	1.212	7.05	22.23×10^2	0.012
P8	2.45	1.313	12.77	28.73×10^2	0.033
P9	3.45	1.414	13.83	33.07×10^2	0.295
P10	5.5	1.616	14.07	38.18×10^2	3.096

at the [Table 3], in the hydro chemical simulation, the initial radius was not same for each simulation by changing the acoustic pressures. The initial radius should be chosen such that bubble stability is maintained. The initial radius and the acoustic pressure of a stable bubble, at diagram phase is selected. That this issue is fully discussed in other articles [20]. [Fig. 7,8,9] that are obtained from [Tables 2 and 3], show the relative radius, the interior temperature and the emitted intensity changes in terms of the acoustic pressure respectively, in the quasi adiabatic and hydro chemical simulations.

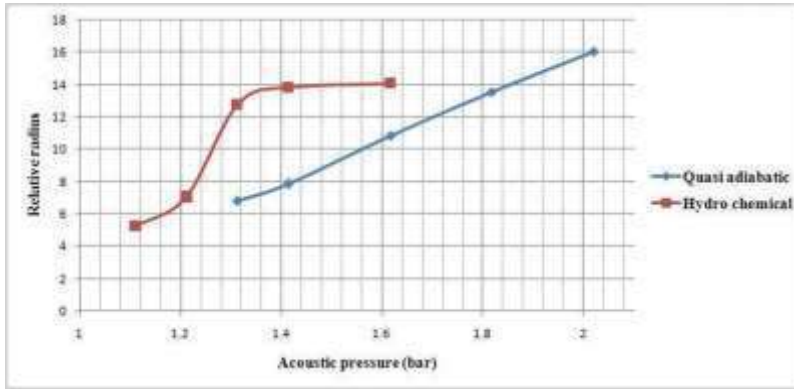


Fig. 7: The relative radius changes in terms of the acoustic pressure

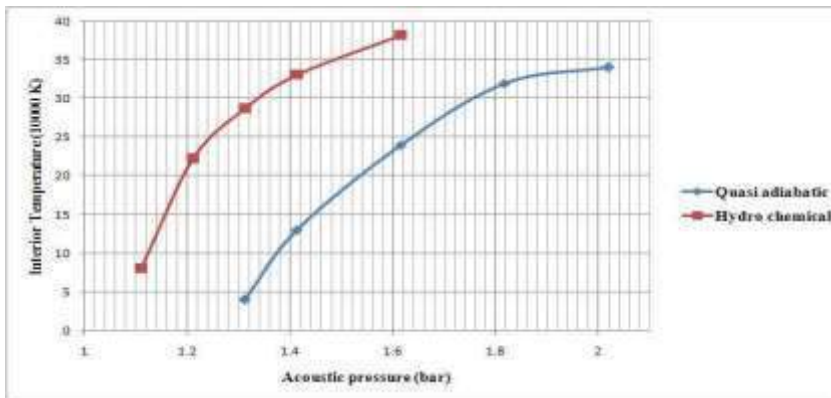


Fig. 8: The interior temperature changes in terms of the acoustic pressure.

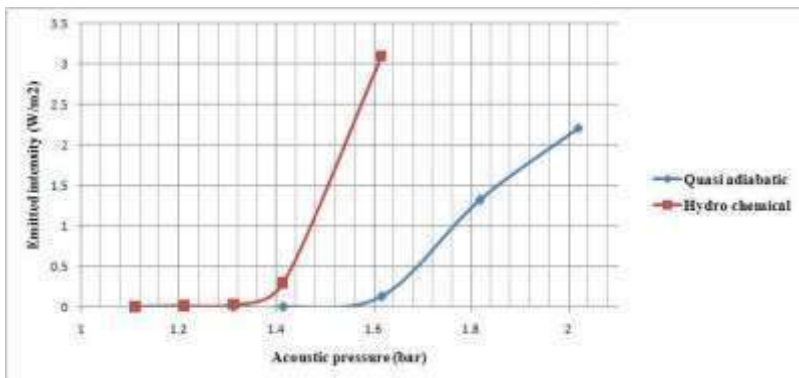


Fig. 9: The emitted intensity changes in terms of the acoustic pressure.

DISCUSSION

By studying of above results, it was found that parameters of SBSL such as the relative radius, the interior temperature and the emitted intensity, in the hydro chemical simulation are higher than ones in the quasi adiabatic simulation. Also the mentioned parameters increase with increasing the acoustic pressure. 54 percent increase in acoustic pressure leads to 149, 750 and 1454 percent increase in the relative radius, the interior temperature and the emitted intensity respectively at the quasi adiabatic simulation. And 45 percent increase in acoustic pressure leads to 168, 373 and 42902 percent increase in the relative radius, the interior temperature and the emitted intensity respectively at the hydro chemical simulation.

CONCLUSION

The effect of the acoustic pressures on the bubble properties for SBSL in water is investigated. It is shown that for SBSL in water 20°C, by increasing the acoustic pressures, the bubble relative radius and the

interior temperature and consequently the emitted intensity increase. Although, the increment of the acoustic pressures is small, it can induce a great difference in the emitted intensity profile. This is in agreement with the reported experimental measurements.

CONFLICT OF INTEREST

There is no conflict of interest.

ACKNOWLEDGEMENTS

None

FINANCIAL DISCLOSURE

None

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ARTICLE

STUDY THE EFFECT OF PLANTING DATE ON IRANIAN MASSES OF LETTUCE TRAITS IN GREENHOUSE CONDITIONS

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ABSTRACT

Sustainable agricultural development is a system of production, which relies on modern agricultural practices and by using these practices, and consideration of environmental issues, the economic and production, efficiency gets enough attention. The importance of the agricultural sector, in the areas of economic, social, political, etc. in our country, and the sensitive role of natural and base resource in this sector, to achieve sustainable agricultural development, have put considerations before us. In this paper, we review the planting lettuce in the greenhouse, and study the planting date effects on some agronomic characteristics and Iranian lettuce growth parameters under greenhouse conditions. After preparing seed of four Iranian lettuce Masses from endemic areas of Ardebil, Fasa, Borazjan and Shadegan, seeds were planted in three planting dates at intervals of 20 days in a greenhouse, the planting seedling date was prepared in greenhouse plots, at four-leaf stage, about 25 days after transplanting date. The number of row crop grown in each period, for each of the Masses, were planted in three rows of length 1.8 m, row spacing of 50 cm and plant spacing apart in the rows 25cm, the experiment was done in factorial in the form of a completely randomized design. Factors measured included quantitative traits of performance, head weight, head length and width, number of leaves per head, head congestion, leaf length and width and thickness of the leaves. According to the results obtained in this study, it was concluded that time and Masses and interaction between time and Masses have different effects on quantitative traits of lettuce in greenhouse conditions.

INTRODUCTION

Today, the growing population and increased demand for agricultural products, including vegetables and Saifi in the world has led to the severe restriction of water and arable soil, but by using science and research experiences, strategies to increase performance, and reducing the cost per unit area can be offered. Tehran, for its proximity to the consumer market, home to 20 percent of the population, supply and distribution centers of greenhouse products in the whole country and other neighboring countries is the benefits of greenhouse production, in Tehran province. To achieve the best conditions for plant growth is the significant issues in the scientific and research centers and finding the best planting date can be as practical scientific achievements, to achieve maximum performance, in relation to cultivate plants in greenhouses.

Lettuce plants and its history of culture are dating back over 4,500 years and BC in ancient Egypt. [12] Lettuce is a native product from the Mediterranean and Siberia Sea, despite its use in almost all parts of the world; it is one of the world's oldest vegetables. Birthplace of lettuce is Asia and most likely, Iran and Turkestan. Lettuce is planted as the Food and Drug more than 2,500 years and is used more. Some writings indicate that, in the year 550 BC, Persian kings have ordered to cultivate it and have used it. Historical background of lettuce suggests that, in Europe, in 1494, people have planted on their land, have recognized it and have used it as a food. [3]

Mr. McMahon (1806) has mentioned 16 varieties of lettuce; Columbus brought these to America for the first time and they were including plants that have been planted there after the discovery of America. In 1880, there were more than 20 varieties of lettuce in America and agricultural research station in New York in 1885 has listed 873 varieties of lettuce, that each of which have certain specific name. Since the beginning of agriculture in Egypt, they have discovered its beneficial properties. Christopher Columbus as brought the lettuce seeds to the New World, so that from the early fifteenth century AD, lettuce was planted in Haiti and the Bahamas. Altogether, there are two types of lettuce: 1. Farming and domestication lettuce that is used in salad and the round lettuce and Iranian lettuce are the most important form of it. 2. Wild or self-propelled lettuce. Iran's lettuce is better than round lettuce in terms of food. Round lettuce has no nutritional value. [6]

A group of researchers has considered India as the origin place of lettuce that requires different lighting, the most suitable soil, loamy light soil with humus and organic materials, sensitive to drought and salinity, pH 5.5 to 7.5, narrow seed with bumps, viability 4 years, soil temperature for germination at least 2

KEY WORDS

Lettuce, Date of Planting, Greenhouse, Iranian Masses and Performance

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degrees, the ideal temperature of production 15-19 degrees, as well as super cold nature and its healing properties. [11].

Yield of the crop depends on the terrain and the type of lettuce and care, but, on average, the amount is between 25 to 35 tons per hectare, which is among the factors, the planted lettuce, how to plant, weather (minimum-maximum temperature and precipitation), the structure and the soil type and so on can be named. [12]

In this study, greenhouse environment has been suggested as a scientific tool for growing lettuce that in addition to providing suitable environmental conditions for growth provides conditions for the farmers to produce a production in certain seasons or a certain area that, in normal circumstances, it will be impossible or uneconomical. Due to the advantages for Tehran province, the use of scientific research to achieve maximum performance, in susceptible planting and production crops in greenhouse conditions, we can create profitability and provide the consumer market and focus on exporting, while preventing irregular imports of agricultural products, prevent the outflow of currency from the country and build self-esteem and provide employment among the graduates in agriculture. In this study, at first, we assume that there are differences between the Iranian lettuce masses in the greenhouse cultivation, as well as, performance differences in different planting dates of lettuce in the greenhouse. It has been tried to examine the most suitable date for cultivation in greenhouses and introduce the best Iranian lettuce masses appropriate for cultivation in the greenhouse and in addition to adequate profitability for the manufacturer, students will exploit the results of scientific research and scientific centers.

Literature, frameworks and theoretical foundations of research

Lettuce families: Compositae (family: Asteraceae), its scientific name is *Lactuca sativa* L., the English name: Lettuce, Persian name: lettuce, Arabic name: Khas, yearling, a smooth and hairless drawn leaf. They know its origin *serriola* that today was created in the course of mutation types. Farm Lettuce derived from *Lactuca serriola* and easily allows crossing between them [6]. Lettuce Farm, derived from *Lactuca serriola*, and easily allows crossing between them [6]. Given the importance and the extent of greenhouse horticultural crops in the world, about 307 thousand hectares in 2007 and accounting 65% of it to the vegetable and the irrefutable issue of Iran percent of total greenhouse considering the world is about 2.36 percent. Iran greenhouses level in 2009 was more than 7 thousand 710 hectares. Tehran province with the level of cultivation in 2503 hectares, Kerman with 1,100 hectares, Isfahan with 983.8 hectares and Yazd province with 935.3 hectares respectively ranked first to fourth acreage of greenhouses in the country. Interestingly greenhouse vegetable cultivation in 2009 years was about 5258 ha, and the provinces of Tehran with 1361 ha, Kerman with 1043 ha and Yazd province with 922 ha, respectively ranked first to third greenhouse vegetable cultivation.

According to the sedative and blood-making of lettuce and lettuce properties in the treatment of rheumatism, bronchitis, convulsions, heart, spleen tract obstruction, ulcer, urinary tract and bladder, strengthen the stomach, prevent constipation, increase milk in lactating women, the presence of iron minerals, calcium, potassium, phosphorus, iodine, magnesium, zinc, manganese, copper, protein, vitamins C, A, and B and the importance of maintaining and developing indigenous mass in Iran, have attracted academics and students to this plant. So study the best conditions and planting date are recommended in a scientific study. Today, the cultivation of lettuce is done with two goals of extracting the oil from seeds and consuming fresh. [11]

Lettuce has different types, but three kinds of lettuce (leaf, head and cos or romaine) are the most common. Lettuce is divided into seven main groups, that each of which has many species. Lettuce has great varieties that these varieties are divided into specific categories. One of these divisions is as follows.

- 1 - Criapnead Leuce: this type of head lettuce is strong and breaks easily.
- 2 - Butterneadluce: lettuce that is very narrow and their heads are soft and have reactionary.
- 3 - (Cosor Romain lettufe) Chicory or Romain lettuce: This type of head lettuce has long narrow leaves.
- 4 - (Looselefunchiny lettlice) paty seat lettuce: The head lettuce is free and open.
- 5 - (Stemlettuce) shoot Dole lettuce: This type of lettuce has long flowers, and its edible stems (seed stalks) are cookable. [2]

• Another division of the lettuce

1. Round Lettuce, 2. Normal lettuce, 3. Leaf or leaves lettuce and 4. Stems lettuce. In round lettuce, this type of lettuce leaves is fairly compact on each other. The inner leaves are white and the outer leaves are green. One of the best varieties of lettuce to transfer to the regions is the normal Lettuce, this type of lettuce is standing and perhaps the plant height reaches 40-30 cm. The outer leaves are green and soft and the inner leaves are green-white that are soft and fragile. In leaf lettuce or leaf lettuce, the leaves are not overlapping and are separated. Leaves are not fragile and edges have tooth. Iran is not in favor of this lettuce and it is called soft leaf lettuce, and bright green leaves. In stem lettuce, its stem is usable and sometimes subtle and small leaves are also used. Iran does not use this type of lettuce [2].

Performance and lettuce production in Iran and the world

Lettuce is the only plant of lettuce family that is grown commercially. FAO reported that production of lettuce and chicory in 2010 was 23,622,366 tons, of which 53% was produced in China, 17% in the United States and 4% in India. Although China is the largest producer of lettuce around the world, most of

this amount is consumed within the country. Spain is the largest exporter of lettuce around the world and the United States is in second place instead.

Table 1: Ten largest producer of lettuce and chicory 2011

Country	Production amount (Tons)	Source
China	12574500	FAO's estimation
United States of america	3954800	Officially
India	998600	FAO's estimation
Italy	843344	Officially
Spain	809200	Officially
Japan	537800	Officially
Iran	402800	FAO's estimation
France	398215	Officially
Turkey	358096	Officially
Mexico	340976	Officially
World	23622366	Total

Lettuce environmental requirement

Lettuce is a cool season plants. Therefore, in cold and partly humid temperate regions, the best result of planting this crop will be achieved. By planting seeds during seasons that the plant's growth would not encounter to extreme heat, it can be used in all areas. Lettuce is among the vegetables that can be cultivated all year round in case of favorable weather, planting and harvesting the lettuce takes about 150 days. If the lettuce harvesting happens in hot weather, before growth, flowering branches will appear and lettuce plant will give seed, at this time, the leaves will have a nasty bitter taste and will become unusable. The best area for the cultivation of lettuce is cold and wet areas. During winter crops, due to incessant rains, leaves lettuce will be produced that have soft and thin leaves. Lettuce sensitivity to light is different, today by using eugenic methods, lettuce are produced that are neutral day. Mild and wet weather is not suitable for all kinds of spring, while summer variety will result in this kind of weather. In areas that have freezing winter, lettuce will be planted in the spring and in areas with cool summer, it is planted as summer cultivation and in tropical areas, it is planted in autumn and winter. (Kargar, 2007)

• Climatic conditions for the cultivation of lettuce

Seeds of late and resistant to heat kinds can be planted until late April and its product can be used till late June and early July, fresh lettuce can be planted in all seasons. In areas with monthly mean temperature of 12 to 15 degrees Celsius, it is well bred; lettuce is very sensitive to high heat, and when there is high temperature, its leaves begin to tip burn. At 30 degrees, the seeds will not germinate and asleep. The lettuce farm needs a lot of watering, and it should not be completely dry. The best way watering approach is surface irrigation, if possible, it is sprinkler irrigated. Raising the ambient temperature should be between 16 and 18 in days and between 10 to 12 degrees Celsius in the nights. Lack of soil moisture and dryness of the air, reduces product and its quality declines and excessive moisture will lead to increased pest. The survey by the Research Institute of the Academy of Sciences of Cuba has done in terms of production, shows that lettuce cultivation under the cover of crop or under the shade, do not lead to accumulation of bitter materials in leaves. (Zeraei, 1995)

• Desirable soil-planting lettuce method

Lettuce can be grown in different soils, but a cultivation place of lettuce should be very smooth and with no major agglomeration. Spring lettuce will grow in light lands better and summer kind give a good result in areas with adequate water. The most suitable land for lettuce is light loamy soil (Limon) that has lots of organic matter. Medium-heavy soils with humus material that has good permeability and high water holding capacity (sandy loam or clay soils) are suitable for this plant. PH for lettuce is suitable 5.5 to 6.5. The amount of seed required for one square meter of treasury land is about 100. 2 g of modified and high value seeds are enough to provide 1000 seedlings of lettuce. Planting seedlings in the mainland in commercial planting will be done with olericulture machines and in cm 25 × 25 or 25 × 30. Usually for a variety of summer and autumn kinds, sowing is done in mainland and after seedling emergence; additional seedlings are sparse on the row. Planting depth is about 1.5 to 2 cm planting spacing cm 40 × 30 or cm 30 × 30, and the amount of consuming the seeds around 2 to 5.2 kg per hectare. In large cultures, seeding machines are seeding. (Zeraei, 1995)

This plant grows in two ways

1) Nursery 2) planting lettuce in the main ground: the root cause of a plant nursery is because lettuce is a demanding plant, in the smaller land, the food supply and crop care will be done cheaper and easier. However, if they want to grow in the main ground, weeding and thinning operation is expensive. The best method of planting in the main ground is the linear method (mower) and in wide culturing, this will be done by seeder machine. In a mechanical planter, a six-row Planter is used. After seedling emergence, the shrubs should be thinned as recommended. Today, the tapes containing the seed are marketed; that the

seed will be placed at appropriate intervals within the resolved bar, the bar germinates beneath the soil by tractor seeds at specified intervals. (Maleki et al., 2012)

METHODS

The public need and actions to plant a lot of leafy vegetables needs to review and research before planting, this research investigates the best physical and chemical soil conditions, light requirements, need fertilizer, crop water requirements, the tensions and eventually the important issue, the greenhouse conditions and the best planting date.

Specifications the location of the experiment

This plan was done in year 2012 at the center of floriculture and vegetables in greenhouses located in District 11 of Tehran in Razi Municipality Cultural Center.

- The introduction of treatments

Planting date and Masses were experimental Treatments. Planting date was on three levels (09.10.2012, 01.10.2012 and 21.10.2012), and a pile of Iranian lettuce were in four levels (Ardabil, Fars, Shadegan and Borazjan), respectively.

- Experiment design

Testing was done for factorial in randomized complete projects. The total number of experimental plots was 12 plots, and each plot was divided into three rows of cultivation and for each mass, in each planting date, a plot was randomly selected. Four Iranian lettuce seed mass has been prepared from its indigenous areas and the seeds were planted in a nursery with an interval of 20 days and after the plants had 4-3 leaves in the nursery, they were transferred to the mainland (plots of greenhouse with dimensions 1.5 * 1.8 m). They are cultivated at intervals cm 20 to 25 on rows cm 50 to 60. Factors for measurement included performance, head weight and length and width, number of leaves in the head, head congestion, leaf length and width, leaf thickness. Lettuce seeds related to the masses of Borazjan, Ardabil, Fasa and Shadegan first was done 20 days of each other (09.10.2012, 01.10.2012 and 21.10.2012) in 100 seedling trays without the use of soil and only by using transplanting Coco peat and then at four leaf stage, about 25 days after transplanting date, it was transferred to greenhouse soil for seedlings.

Data collection methods and statistical analysis

This study, after expressing the matter and in terms of the purpose is practical - developmental, and in terms of research methodology is experimental - analysis. In addition, to collect literature and theoretical concepts, the library method is used.

Using different methods, the data were examined in order to test questions and research hypotheses. Collected data should be processed scientifically. Research variables and their dimensions were analyzed through the comparison of the mean table and the variance analysis table and correlation coefficient table, in the simple correlation coefficient table of specification and variance analysis table, symbols ns, * and ** are respectively, insignificant, significant at the possibility level of 5 and 1%. In addition, in the mean comparison tables, numbers with similar letters do not have a significant difference at the possibility level of one percent. For charting, Excel and SPSS software were used and for data analysis, SAS 9.2 program was used and for comparing the means, Duncan test was used.

- Methods - cultural practices
- Preparing the ground

The total area of greenhouse is 50 square meters covered with polyethylene, that has 12 plots, with dimensions of 1.8 * 1.5 m, and air conditioning with fan and cooling system (air suction and entering and collision of outside air) coated with cellulose. In addition, in order to create the heat required, at the end of November and December, the electric fan heaters with thermostats had been used. Greenhouse height, at the sides was 3.5 and in the center of the greenhouse was 5.5m, at first, the surface greenhouse soil was up-and-down with shovels to a depth of about cm30, and the clods were crushes and were become flat and watered by using a trowel.

Table 2: Physical and chemical properties of soil in greenhouses plots

Physical and chemical properties of soil in greenhouses plot			
Depth cm	0-30	The electrical conductivity(ds/m)	2.1
Clay%	21	Total acidity saturation(PH)	7.00
Silt%	36	Saturation(S.P)%	36
Sand%	43	Percentage of organic carbon(O.C)%	0.50
Available potassium(ppm)	170	Available phosphorus(ppm)	9.5
Loamy soil			

Due to the physical and chemical properties of soil, about 150 pure nitrogen was sprayed, three times (each 50 g), with mixed watering and one time before planting, and twice during planting. The greenhouse is not shading problem with respect to the lighting and qualified workers controlled the temperature and humidity with minimum-maximum thermometer and hygrometer. Then, each plot was divided into three rows of planting, the row spacing was 50 cm from each other and the distance between holes in the rows

for planting ready seedlings was considered about cm 25, therefore, according to plot size, spacing between shrubs up to four sides of each plot was remained about cm25. Therefore, the number of shrubs for each mass in the period of sowing was 18 shrubs and the total of four masses shrubs, in a period of sowing was 72 shrubs and the total number of tested shrubs, in this test was a total of three periods planting of 216 shrubs.

- **plantin**

Initially, the seeds were planted in a nursery, on 100 planting trays without adding soil and fertilizer, simply by filling holes in the tray, with a mixture of perlite and Coco peat, according to the announced schedule, at a depth of about one cm. In addition, because of the sensitivity and preventing drought, planting trays were named after the names of the masses, with the label on each of the trays and were placed in another greenhouse that the moisture required was controlled by mechanical systems. In addition, after, the seedlings have 3-4 leaves, they were transferred into splitted plots of the greenhouse, and were planted in the prepared pits, by observing to avoid tensions and damage to roots, and immediately, and the first irrigation was done. In order to contact roots with the soil, the transplanting soil was slowly crushed by foot (seedlings, along with Coco peat, around the roots, were extracted from planting trays pits and were planted in the ready pits in the greenhouse. In addition, due to the possibility of a conflict, rather than transplanting transmitted, two seedlings were planted in the desired location, so that if needed, one of the seedlings will be thinned after a while.

Ripen

In order to achieve proper plant density in the 6-8 leaf stage, the thinning and removal of weeds were done. In addition, for fertilizing, the urea fertilizer, as much as a third 50 grams, was used according to the number of plants and dissolved plots in water. According to the greenhouse soil moisture, especially, the soil around, the bushes were irrigated on average, twice a week.

Harvest

The plots product was harvested to evaluate the ultimate performance of quantitative traits, about two months after the date of transplantation transfer, (12.15.2012, 01.04.2013 and 01.24.2013).

Estimating the growth parameters

In order to have a better evaluate of testing treatments, Growth analysis was performed. This requires accurate sampling. To calculate the growth characteristics, first, the tables with the name of mass and evaluated traits were designed and with simple equipment, such as kitchen scales, meters, digital caliper and PC, random sampling, and measurement and recording the desired traits were done.

How sampling and measurement of quantitative traits:

With regard to the four plots in each harvest period and due to the number of rows of each plot and the number of plants per row, two plants of each row, six plants of each plot were randomly harvested from a depth of 1 to 2 inches of soil. The harvested plant numbers were recorded in the table and by using the above equipment, the length and width of leaves, head height and width, head weight, head, leaf thickness and counting the number of leaf consumption was performed. In the end, according to the average weight of plants, yield was calculated per unit area.

Analysis of data

The analysis of the data, with standardized instruments is one of the key tenets of each study. To investigate the influence of planting dates, mass influence as well as the interaction between planting date in masses, analysis of variance test was used. In Table 3, the results of this test, for each of the traits, are presented. As indicated in Table 3, for the leaf length, the planting date was at 5% level and masses at the 1% level are effective on the leaves, but the interaction of the masses in planting date does not have a significant effect on the length of the leaf. On the leaf width, planting date and the masses at the 1% level is effective on the leaf width, but the interaction of the masses in planting date does not have a significant effect on the leaf width.

For the thickness of leaves, planting date at the 5% level and the masses at the 1% level are effective on the thickness of the leaves, but the interaction of the masses in planting date does not have a significant effect on the thickness of the leaves. Planting date has a significant effect at the 1% level on the weight of the head. However, the masses, and the mass interacts in planting date do not have a significant effect on the weight of the head. About the head height and width of the head, the planting date is effective at the 5% level and the masses, at the 1% level on the head height and the head width; however, an interaction of masses in the planting date does not have a significant effect on head height and width.

In the number of leaves, planting date at the 1% level has a significant effect on the number of leaves, but the masses are not significantly affected, however, the interaction between planting date in the mass at the 5% level has an impact on the number of leaves. Finally, according to Table 3, only time at the 1% level

has a significant effect on the performance and the masses as well as an interaction of mass in planting date does not have a significant effect on performance.

Table 3: Analysis of variance

Analysis of variance table average of squares									
Sources Change	Degrees of freedom	Leaf length	Leaf width	Leaf thickness	head weight	Head height	Head width	Number of leaves	Performance
planting date	2	67.23*	29.85**	0.0042*	78234.03**	124.29*	202.86*	91.76**	5006977.78**
Mass	3	304.77**	26.91**	0.0172**	16015.28 ^{ns}	305.14**	196.80**	37.67 ^{ns}	1024977.78 ^{ns}
Mass planting date	6	8.34 ^{ns}	7.20 ^{ns}	0.0020 ^{ns}	13313.19 ^{ns}	25.90 ^{ns}	25.60 ^{ns}	45.20*	852044.44 ^{ns}
Experimental error	24	12.88	5.13	0.0009	8257.99	27.60	37.72	12.61	541311.11
Coefficient of variation (%)	-	13.28	18.45	8.74	24.54	18.41	19.61	13.45	24.54

ns, * and ** are respectively, the absence of significant difference, a significant difference in the level of 5% and 1%

Now, due to the impact or the absence of impact of planting date, mass and mass interaction between planting date, for each of the variables under consideration, we will discuss in continue and in the following paragraphs, in detail, about the effects of which planting date (10/09/2012, 01.10.2012 and 21.10.2012) or which mass (Ardabil, Fasa, Borazjan or Shadegan) and which interaction.

The effect of planting date:

In [Table 4], the mean comparison of planting dates effect on the leaf length, plant width, leaf thickness, head weight, head height, head width, Number of leaves for consumption and performance per unit area is shown.

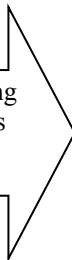
Table 4: Comparison of the average effect of planting date on the traits of lettuce

The mean comparison of planting dates effect on the traits in lettuce									
Trait	Time	Leaf length(cm)	Leaf width(cm)	Leaf thickness(mm)	head weight(gr)	Head height(cm)	Head width(cm)	Number of leaves	Performance(gr per m ²)
	10/09/2012	29.042 a	13.92 a	0.3560 a	416.25 a	30.31 a	34.52 a	27.54 a	3330.0 a
	01.10.2012	27.604 a	12.15 ab	0.3575 a	426.25 a	30.46 a	32.77 a	28.42 a	3410.0 a
	21.10.2012	24.417 b	10.77 b	0.3244 b	281.67 b	24.81 b	26.69 b	23.25 b	2253.3 b

The Column with the same letters are not significantly different.

In summary, the findings on the effect of planting date on the physical characteristics of lettuce are shown in[Fig. 1] and we continue the discussion:

Effect of planting date on the traits of lettuce



Leaf length

The effect of planting date on the length of the leaf is significant at the 5% level. After reviewing Comparing the date of planting, it found no significant difference between two dates during the first and second cultivation in leaf length, but on the third planting date, a significant difference between the leaf length and the two previous dates was created. In addition, the maximum length of the leaf was observed in the first planting date and the minimum length of the leaf was observed on the third planting date.

Leaf width

The effect of planting date on the width of the leaf is significant at the 1% level. After reviewing Comparing the date of planting, it found no significant difference between two dates during the first and second cultivation in leaf width, also there was no significant difference in the third and second planting date between the leaf width and there is a significant difference between the third and the first planting date in leaf width. In addition, the maximum width of the leaf was observed on the first planting date and the minimum was observed on the third planting date.

Leaf thickness

The effect of planting date on the thickness of the leaf is significant at the 5% level. After reviewing Comparing the date of planting, it found no significant difference between two dates of the first and second cultivation in leaf thickness, but on the third planting date, a significant difference between the leaf thickness and the two previous dates was created. In addition, the maximum thickness of the leaf was observed in the second planting date and the minimum was observed on the third planting date.

head weight

The effect of planting date on the weight of the head is significant at the 1% level. After reviewing Comparing the date of planting, it found no significant difference between two dates of the first and second cultivation in head weight, but a significant difference was created on the third planting date and the first and second dates between head weight and on the third date, the head weight was reduced significantly. The maximum weight of the head was observed in the second planting date.

<p>Head height</p> <p>The effect of planting date on the height of the head is significant at the 5% level. After reviewing Comparing the date of planting, it found no significant difference between two dates of the first and second cultivation in head height, but a significant difference was created on the third planting date between the head height and two previous dates and in the third planting date, the head height was reduced significantly. The maximum height of the head was observed in the second planting date.</p>
<p>Head width</p> <p>The effect of planting date on the width of the head is significant at the 5% level. After reviewing Comparing the date of planting, it found no significant difference between two dates of the first and second cultivation in head width, but a significant difference was created between the third planting date and the first and second dates in the head width and in the third planting date, the head width was reduced significantly. The maximum width of the head was observed in the second planting date.</p>
<p>Number of leaves</p> <p>The effect of planting date on the number of leaves is significant at the 1% level. After reviewing Comparing the date of planting, it was found a significant difference between the third planting date with the first and second in the number of leaves, but there was no significant difference between the first and second dates in the number of leaves. The minimum number of leaves was observed on the third planting date and the maximum was observed in the second planting date.</p>
<p>Performance per unit area</p> <p>The effect of planting date on the performance is significant at the 1% level. After reviewing Comparing the date of planting, it found no significant difference between two dates of the first and second cultivation in performance per unit area, but a significant difference was created between these two dates with the third planting date in the performance and the performance was reduced significantly in the third planting date. The maximum performance was observed in the second planting date.</p>

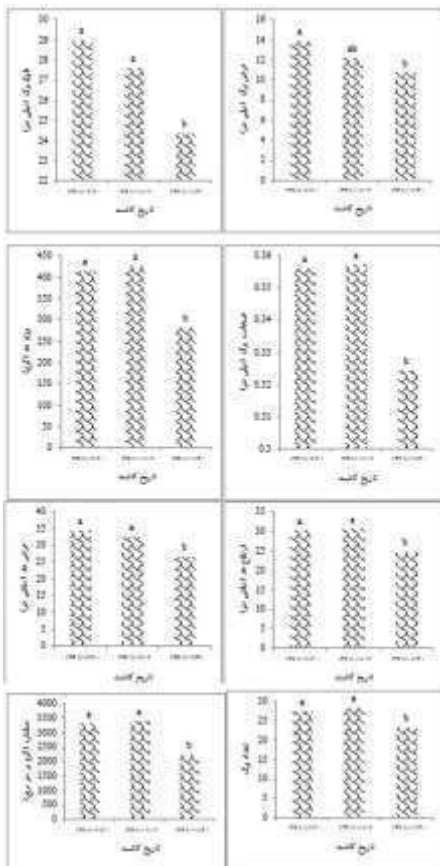


Fig. 2: graphs of the effect of planting date on the physical characteristics of lettuce are plotted:

Mass Effect

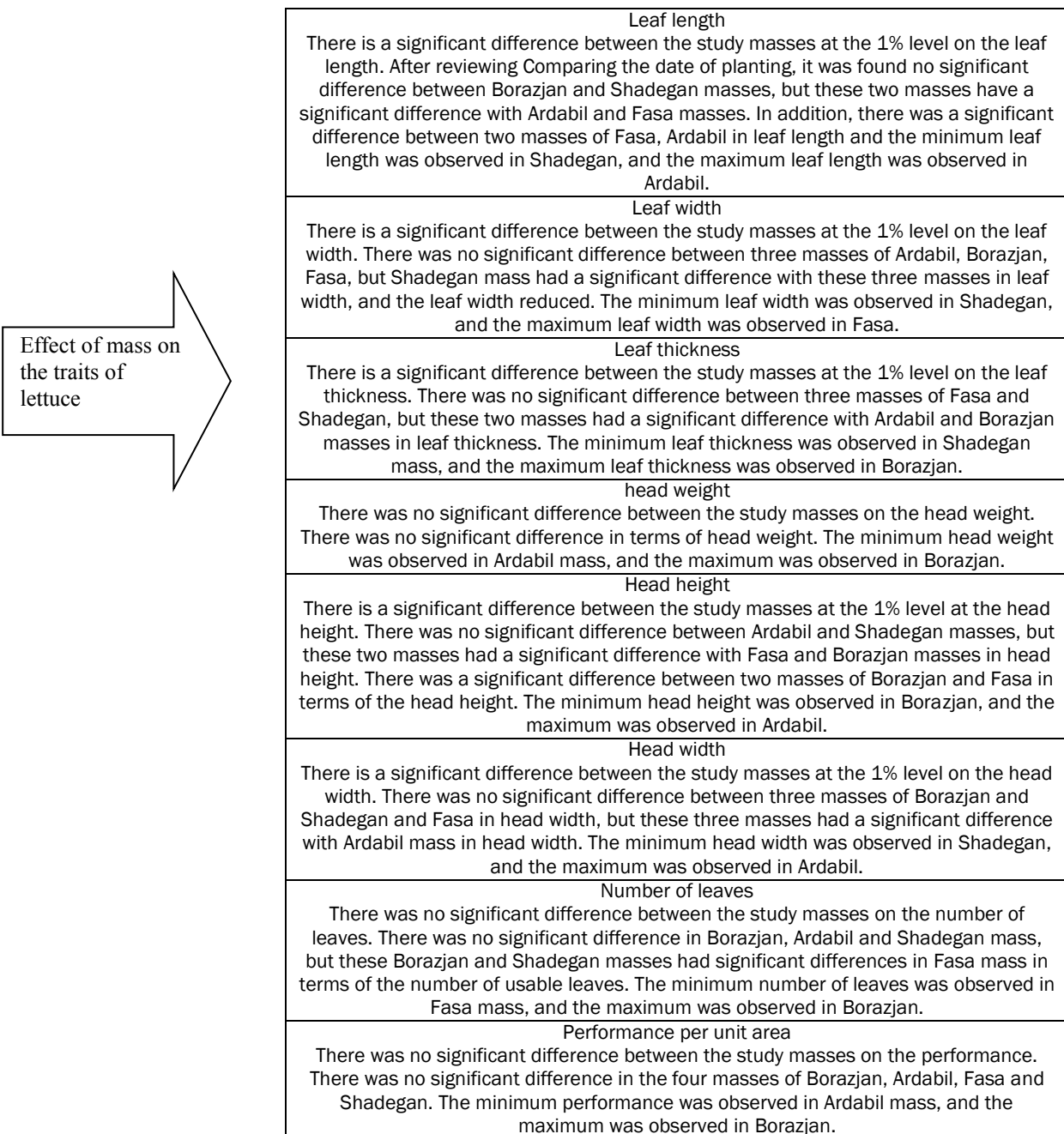
In [Table 6], Mean comparisons of different masses on leaf length, leaf width, leaf thickness, head weight, head height, head width, number of leaves and performance per unit area are shown.

Table 6: Mean comparisons of different masses, on the traits

The mean comparison of different masses on the traits in lettuce									
Trait	Mass	Leaf length(cm)	Leaf width(cm)	Leaf thickness(mm)	head weight(gr)	Head height(cm)	Head width(cm)	Number of leaves	Performance(gr per m ²)
Ardabil		33.89a	13.08a	0.3664b	331.11a	33.53a	38.17a	26.17ab	2648.9a
Borazjan		22.39c	12.39a	0.3975a	418.06a	21.00c	28.72b	28.17a	3344.4a
Fasa		29.81b	13.81a	0.3167c	346.94a	26.89b	30.44b	23.17b	2775.6a
Shadegan		22.00c	9.83b	0.3033c	402.78a	32.69a	27.97b	27.67a	322.2a

The Column with the same letters are not significantly different.

In summary, the findings in the effect of mass on the physical characteristics of lettuce are shown in [Fig. 3] and we continue the discussion:



In [Fig. 4] graphs of the effect of mass on the physical characteristics of lettuce are plotted:

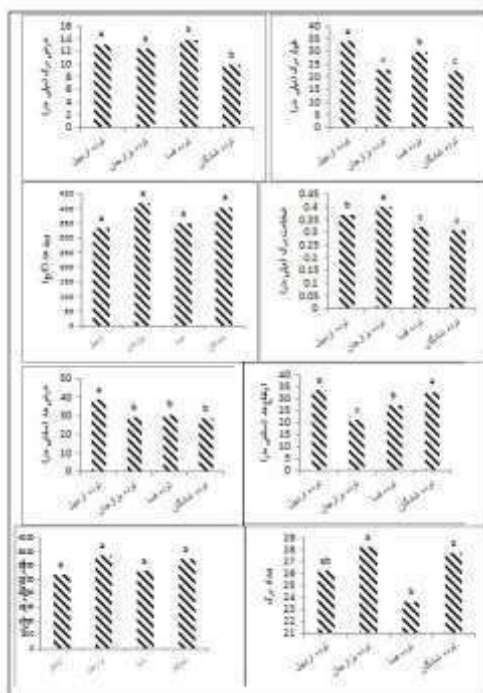


Fig. 4: Charts for mass effect on the physical characteristics of lettuce

Interaction between planting date and the mas:

In [Table 7], Mean comparisons of interaction between planting date and the mass on leaf length, leaf width, leaf thickness, head weight, head height, head width, number of leaves and performance per unit area are shown.

Mean comparisons of interaction between planting date and the mass on the traits in lettuce

Mass	Time	Leaf length(cm)	Leaf width(cm)	Leaf thickness(mm)	head weight(gr)	Head height(cm)	Head width(cm)	Number of leaves	Performance(gr per m ²)
Ardabil	6.21 x	37.00a	14.08ab	0.3725bc	371.67bcd	35.83ab	43.25a	26.00 b-f	2973.3bcd
	7.10	33.00ab	12.67bcd	0.3592bcd	333.33bcd	32.75a-d	38.75ab	24.50 c-f	2666.7bcd
	7.30	31.67abc	12.50bcd	0.3675bc	288.33cd	32.00 a-d	32.50 a-d	28.00 a-e	2306.7cd
Borazjan	6.20 x	23.17d-g	13.42abc	0.3883b	408.33a-d	21.17ef	30.00bcd	28.83 a-d	3266.7 a-d
	7.10	25.67 c-f	14.42ab	0.4467a	558.33a	23.17def	34.00 a-d	33.83a	4466.7a
	7.30	18.33g	9.33 cd	0.3575bcd	287.50cd	18.67f	22.17d	21.83 ef	2300.0 cd
Fasa	6.20 x	32.42ab	17.00a	0.3275cd	425.83 a-d	30.08 a-e	34.67 abc	24.50 c-f	3406.7 a-d
	7.10	29.33 bcd	12.00bcd	0.3158 cde	330.83 bcd	27.25 b-f	28.17 bcd	24.00 def	2646.7 bcd
	7.30	27.67 b-e	12.42 bcd	0.3067 de	284.17 cd	23.33 def	28.50 bcd	22.33 def	2273.3 cd
Shadegan	6.20 x	23.58 d-g	11.17 bcd	0.3358 bcd	459.17 abc	34.17 abc	30.17 bcd	30.83 abc	3673.3 abc
	7.10	22.42 efg	9.50 cd	0.3083 de	482.50 ab	38.67 a	30.17 bcd	31.33 ab	3860.0 ab
	7.30	20.00 fg	8.83 d	0.2658 e	266.67 d	25.5253 c-f	23.58 cd	20.83 f	2133.3 d

The Column with the same letters are not significantly different.

Table 7: Comparison interaction of planting date × the mass in traits

Leaf length

The interaction of the mass in planting date was not significant on the leaf length. After reviewing the mean comparison, the interaction of mass was cleared in planting date. There was no significant difference between the first date of Borazjan mass with the second and third date of Shadegan mass in leaf length. However, there was a significant difference between the interaction of the first date of Ardabil mass with the first date of Borazjan and Shadegan masses. However, the minimum leaf length was observed in the third planting date of Borazjan mass and the maximum leaf length was

Effect of planting date and the mass on the traits of lettuce

observed in the first planting date of Ardabil mass.
<p style="text-align: center;">Leaf width</p> <p>The interaction of the mass in planting date was not significant on the leaf width. There was a significant difference between the first planting date of Ardabil, Fasa and Borazjan mass with the third planting date of Shadegan mass in leaf width. There was a significant difference between the first planting date of Fasa mass with the second and third planting date of Ardabil, Fasa and Borazjan mass in leaf width. The minimum leaf width was observed in the second planting date of Borazjan mass and the maximum leaf width was observed on the third planting date of Shadegan mass.</p>
<p style="text-align: center;">Leaf thickness</p> <p>The interaction of the mass in planting date was not significant on the leaf thickness. There was a significant difference between the second planting dates of Borazjan mass with other dates and other masses in leaf thickness. However, there was no significant difference between the second planting date of Ardabil mass with the third planting date of Borazjan mass and the first date of Shadegan mass in leaf thickness. The minimum leaf thickness was observed in the third planting date and Shadegan mass and the maximum leaf thickness was observed in the third planting date of Borazjan mass.</p>
<p style="text-align: center;">head weight</p> <p>The interaction of the mass in planting date was not significant on the head width. There was a significant difference between the second planting date of Borazjan mass, the first planting date of Borazjan, Fasa and Shadegan masses and the second planting date of Shadegan mass with other dates and masses in terms of head weight. The minimum head width was observed in the third planting date of Shadegan mass and the maximum head width was observed in the third planting date of Shadegan mass.</p>
<p style="text-align: center;">Head height</p> <p>The interaction of the mass in planting date was not significant on the head height. There was a significant difference between the first, second and third planting date of Borazjan mass with the first planting date of Ardabil and Shadegan mass in head height. There was a significant difference between the third planting dates of Ardabil mass with the third planting date of Borazjan mass in head height. But there was no significant difference between the second and third planting date of Ardabil mass with the second planting date of Borazjan and the first, second and third planting date of Fasa masses in head height. The minimum head height was observed in the third planting date of Borazjan mass and the maximum head height was observed in the second planting date of Shadegan mass.</p>
<p style="text-align: center;">Head width</p> <p>The interaction of the mass in planting date was not significant on the head width. There was no significant difference between the first planting dates of Ardabil mass with the first planting date of Fasa mass in head width. There was a significant difference between the first planting dates of Borazjan mass with the first planting date of Shadegan mass in head width. The minimum head width was observed on the third planting date of Borazjan mass and the maximum head width was observed in the first planting date of Ardabil mass.</p>
<p style="text-align: center;">Number of leaves</p> <p>The interaction of the mass in planting date in head width was significant on the number of leaves at the 5% level. The planting date became clear, there was a significant difference between the second planting date of Borazjan mass and the second planting date of Ardabil and Fasa mass in the number of leaves. There was no significant difference between the first and second planting dates of Shadegan mass with the third planting date of Ardabil mass. The minimum number of leaves was observed on the third planting date of Shadegan mass and the maximum number of leaves was observed on the second planting date of Borazjan mass.</p>
<p style="text-align: center;">Performance per unit area</p> <p>The interaction of the mass in planting date was not significant on the performance. There was a significant difference between the second planting date of Borazjan mass with the first, second and third planting date of Ardabil, second and third planting date of Fasa mass and the third planting date of Shadegan mass in performance. There was no significant difference between the first planting dates of Borazjan mass with the first, second and third planting date of Ardabil, Fasa and Shadegan mass in performance. The minimum performance was observed on the third planting date of Shadegan mass and the maximum head height was observed in the second planting date of Borazjan mass.</p>

In [Fig. 5] interactions of the planting date and the mass on the physical characteristics of lettuce are plotted:

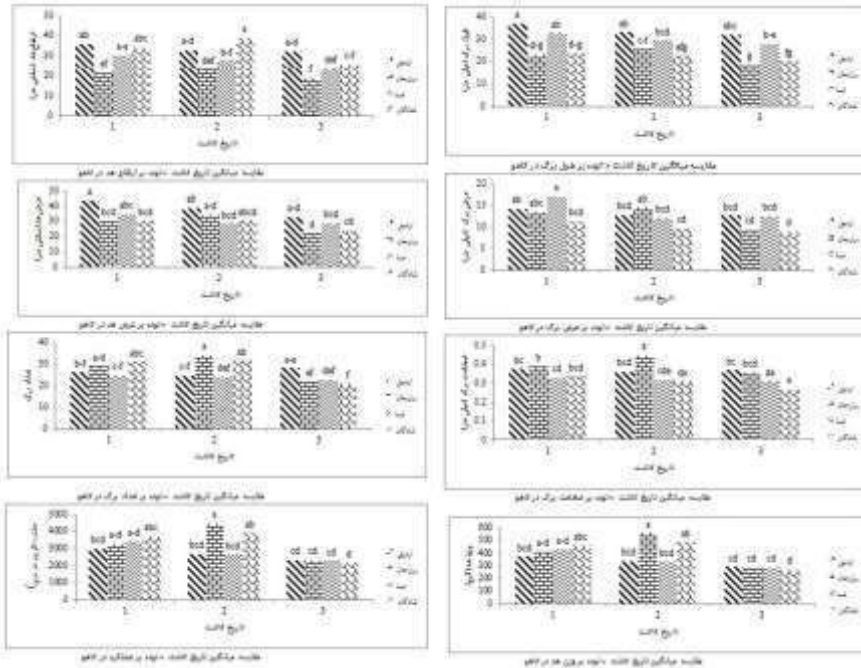


Fig. 5 : Charts for interaction of planting date and mass effect on the physical characteristics

o Correlation coefficient

Pearson correlation coefficients in [Table 8] is listed to examine the relation between each of the traits

Table 8: Pearson's correlation coefficient for the relation between traits

Correlation	Leaf length(cm)	Leaf width(cm)	Leaf thickness(mm)	head weight(gr)	Head height(cm)	Head width(cm)	Number of leaves	Performance(gr per m ²)
Leaf length(cm)	1							
Leaf width(cm)	0.704*	1						
Leaf thickness(mm)	0.208**	0.489**	1					
head weight(gr)	0.036**	0.360**	0.504**	1				
Head height(cm)	0.485**	0.053**	0.185**	0.257**	1			
Head width(cm)	0.861**	0.674*	0.450**	0.328**	0.583*	1		
Number of leaves	0.019**	0.211**	0.599*	0.867**	0.334**	0.321**	1	
Performance(gr per m ²)	0.267**	0.014**	0.260**	1.00**	0.057**	0.136**	0.774**	1

ns, * and ** are respectively, the absence of a significant difference, a significant difference in the level of 5% and 1%

[Table 8] shows a significant positive correlation between leaf length and leaf width, the higher length of the leaves, the leaf width more increase significantly. In addition, there was a significant positive correlation between leaf length and the width of the head, the higher length of the leaf, and the width of the head increases significantly. There was no significant relation between leaf length and other traits. There was a positive and significant relation between leaf width and the width of the head, with increasing leaf width, the width of the head increases.

There was a significant and positive correlation between the thickness and number of leaves. With increasing leaf thickness, the leaf number increases.

There was a significant positive relation between head weight and number of leaves as well as the performance. With increasing head weight, number of leaves increases as well as with increasing head weight, the performance increases.

There was a positive and significant correlation with 95% confidence between head height and head width, by increasing the head height, the head width increases.

There was a positive and significant relation between the number of leaves and the performance with 99% confidence, with an increase in the number of leaves, the performance increases.

RESEARCH FINDINGS

According to the fact that the variance analysis test table is general, maybe, there a significant difference between the lowest and highest average of traits, that cannot be identified by using variance analysis tables, that is due to the uniform distribution of averages related to trait levels of study around the total average, so, in an average comparison table, by using Duncan test, in general, any small fluctuations between level traits are identified and maybe, according to Duncan test, a significant difference will be observed. For example, an interaction effect between the date of planting and leaf length was not significant, after examining the comparison of average for mass interaction effect in the date of planting, It was found a significant difference in the first date of Ardabil mass with the first date of Borazjan and Shadegan mass on the leaf length or according to the table; an interaction effect between the date of planting and the leaf width was not significant, after checking Compare average, an interaction effect between the date of planting became clear, in the first planting date of Ardabi, Fasa and Borazjan masses with the third planting date of Shadegan mass, there was a significant difference in leaf width attribute, also there is a significant difference in the first date of planting of Fasa mass with the second and third planting date of Ardabil, Fasa and Borazjan mass in a width of the leaf.

CONCLUSION OF THE RESEARCH

In the hypothesis of this study, it was predicted a difference between the masses of Iranian lettuce in the greenhouse cultivation, also there was a difference between the different dates of planting lettuce in the greenhouse. Of course, in this study, different quantitative traits, including leaf length and width, head height and width, thickness and number of leaves and the performance per unit area between four masses of Iranian lettuce (Ardabil, Fars, Borazjan and Shadegan) was determined, therefore, in the general view, there was a significant difference in three planting dates between the traits, which in the following the traits are discussed and concluded.

In studying the effect of planting date, it was concluded no significant difference between the first and the second planting date in leaf length, but in the third planting date, a significant difference was created between the leaf length and two previous dates. There was significant difference between two planting dates of first and second, second and third in the leaf width, but a significant difference was created between third and first planting date in leaf width, also, there was no significant difference between the first and the second planting date in the thickness of leaves, but in the third planting date, a significant difference was created with the previous two planting dates, also there was no significant difference between the first and the second planting date in the head weight, but a significant difference was created between the third planting date and the first and second planting date in the head weight, also there was no significant difference between the first and second planting date, at head height, but a significant difference was created on the third planting date with two previous dates, also, there was no significant difference between the first and the second planting date in the width of the head, however a significant difference was created between the third planting date and the first and second planting date, also a significant difference was created between the third planting date with the first and second in the number of leaves, but there was no significant difference between the first and second date in the number of leaves, and finally, there was no significant difference between the first and second planting date in the performance per unit area, however, these two planting dates were created a significant difference with the third planting date in the performance [Table 4-2].

In studying the effect of the mass, it was concluded no significant difference between Borazjan and Shadegan masses in the length of the leaf, but these two masses were significantly different with the masses of Ardabil and Fasa, and there was a significant difference between the two masses of Fasa and Ardebil in terms of the leaf length, also, there was no significant difference between three masses of Ardabil, Borazjan and Fasa in terms of leaf width, but Shadegan mass was significantly different with these three masses in terms of leaf width, also there were no significant differences between the masses of Fasa and Shadegan in leaf thickness, but these two masses were significantly different with masses of Ardabil and Borazjan and there was a significant difference between the two masses of Borazjan and Ardebil in terms of leaf thickness, also, there was no significant difference between the four masses of Ardabil, Borazjan, Fasa and Shadegan in terms of the weight of the head, also, there was no significant difference between the masses of Ardabil and Shadegan in the height of head, but two masses were significantly different with the masses of Fasa and Borazjan and there was a significant difference between the two masses of Borazjan and Fassa in terms of head height, also there was no significant difference between three masses of Borazjan, Fasa and Shadegan in terms of the width of the head and the three masses were significantly different with the masses of Ardabil in terms of the width of the head, also there was no significant difference between the three masses of Borazjan, Ardabil and Shadegan in

the number of leaves and masses of Borazjan and Shadegan were significantly different with the Fasa mass in terms of the number of leaves, ultimately, there was no significant difference between four Borazjan masses of Borazjan, Ardabil, Fasa and Shadegan in terms of performance.

According to compare the research results with the results of other researchers in the field to study the effects of planting date on various plants, it can be seen that planting date and variety have a significant effect on the performance and characteristics of various plants, for example, in the research of Mr. Balandari and Rezvani, in 2010, about the effect of planting date (23.04, 11.09 and 01.11.2010) and density of shrub on the leaf surface traits, leaf dry weight, stem and inflorescence dwarf chicory, the results show that, planting date has significant effects on dry weight, and the highest dry weight was in a second planting date and the lowest was in the third planting date that are similar to the results of this study about the second planting date of Borazjan lettuce and the third planting date of all masses. Or in the investigation of Mr. Abu Talib and colleagues, about the effect of planting date on components and performance of two varieties of Hamedan and Ramhormoz garlic in 2010, the test results showed that the effect of planting date (23.10, 06.11, 21.11 and 06.12.2010) and the number of leaves, plant height, stem diameter and performance is significant, that are similar to the results, about the effect of planting date and the masses on the lettuce traits, of course, in this study, some characteristics, in some masses of the first planting date was significant compared to other masses, like the first date in Ardebil mass and the first date in Borazjan mass had significant difference in leaf width attribute that were in conflict with the results of Mr. Aboutalebi, based on Hamedan varieties in the first cultivate had a significant superiority in all traits compared to the Rāmhormoz type. Compared with the results, Mr. Seyedi and Nemati about the effect of the arrangement and planting date (20.1, 30.1, 10.2 and 20.2) on melon fruit performance and components in Jarju area in 2007, results showed that the effect of planting date on performance, average weight and number of melon fruits were significant per hectare and were the most widely performance in the first planting date, that in comparing with the results of this study, it was similar to the effect of planting date on lettuce traits, but in the performance of lettuce in this study, the difference between the first and second planting date was not significant, but both tests were similar about the significant reduction of performance in the third planting. In addition, the results of Mr. Hosseini Darani and his colleagues, in 2011, about the effects of planting date (09.04, 19.04, 29.04 and 05.09.2011), on the traits of stem height, stem diameter and dry weight and performance of two varieties of spinach, the results showed, firstly, the planting date and variety and interaction on all traits were significant except for diameter, secondly, the maximum height was in the first planting and in foreign varieties and the most diameter was in the second planting, in the comparison of these cases with the results of this study, firstly, the planting date effect and the mass in the lettuce was significant in all traits, secondly, in lettuce about the height and width of head, the difference was not significant between the first and second planting date and in the third planting, the difference was significant and have been reduced and also at head of lettuce, the difference between Ardabil and Shadegan mass was not significant and in the width of the head of lettuce, the difference between Fasa and Borazjan and Shadegan masses was not significant. In another comparison with the results of Mr. Alam et al., In 2003, about the effect of planting date (10, 20 and November 30 and 10, 20 and 30 December) and the distance for the production of lettuce in the Hill area, the results showed, the highest production was in the first planting that has contradicted compared with the results of this study because the highest performance in this study was in the second planting date. Of course, in the greenhouse, because of the control over certain environmental conditions and plants, as well as the same water and temperature supply under greenhouse conditions, in different growth times, performance reduction in greenhouse on different dates than the declining performance in a different time of open spaces was low or perceptible. In addition, compared with other products, lettuce is the vegetable groups that are plant able under greenhouse conditions. In addition, the production of lettuce in the greenhouse and out of season is cost effective, and according to the average of lettuce production performance per unit area, in outdoor farms in the country, the average performance of lettuce production in the greenhouse is more than open space and is economical.

SUGGESTIONS

To obtain practical results, it is suggested:

- ♣ To examine the effect of planting date on the time it takes to reach the maximum yield of lettuce in the greenhouse.
- ♣ To examine the effect of planting date on the duration of flowering lettuce in the greenhouse.
- ♣ To test in an extensive level and in greenhouse conditions.
- ♣ To examine the effect of planting density and density on yield and disease outbreaks under greenhouse conditions.
- ♣ To examine the effect of planting date on the duration of storage after the harvest.
- ♣ To examine the effect of planting date, drought, salinity and pH on yield under greenhouse conditions.
- ♣ To examine the effect of planting date and heavy metals on yield in greenhouse conditions.
- ♣ 10- Effects of planting date will be examined and compared between the lettuce and other vegetables grown in greenhouses.

- Limitations

Since the research was conducted in the same condition of greenhouse, there was no certain limitation during the study.

CONCLUSION

After studying the Effects of planting date on the lettuce quantitative traits, it was found that planting date at the 5% level is significant in the leaf length, the most leaf length was in the first planting date, as well as the planting date, at 1% level is significant in the leaf width and the maximum leaf width was in the first planting date, as well as planting date at the level of 5% is significant in leaf thickness and the maximum leaf thickness was in the second planting date, also the planting date at 1% level was significant in head weight and the maximum head weight was in the second planting date. The planting date at the 5% level was significant in head height and the maximum height of the head was in second planting date, as well as planting date at the 5% level was significant in the width head, and the maximum width of the head was in the first planting date, as well as planting date at the 1% level was significant in the number of leaves and the highest number of leaves was in the second planting date, finally, planting date at the 1% level was significant in performance and the maximum performance was in the second planting date. On the other hand, in all of the traits in lettuce, the lowest was in the third date. After studying the Effect of mass on quantitative traits of lettuce, it became clear that mass, at the 1% level was significant in the leaf length and the maximum leaf length was in Ardabil mass and the lowest was in Shadegan mass, also the mass was significant at the level of 1% in leaf width and the maximum leaf width was in Fasa mass and the lowest was in Shadegan masses. The mass was significant at the 1% level in the thickness of the leaf and the maximum leaf thickness was in Borazjan mass and the lowest was in Shadegan, also the mass had no significant effect on head weight and the maximum weight of the head was in Borazjan mass and the lowest was in Ardabil mass. Also the mass was significant at the 1% level in the height and width of the head and the maximum height and width of the head was in Ardabil mass and the lowest was in Borazjan and Shadegan, as well as the mass had no significant effect on leaf number and the highest number of leaves was in Borazjan mass and the lowest was in Fasa mass and ultimately, the mass had no significant effects on performance and the highest performance was in Borazjan mass and the lowest was in Ardabil mass.

After examining the interaction effect of mass in planting date, it became clear, the interaction effect of planting date and the mass was not significant in length, width and thickness of leaves, height, width and weight of the head, and the performance and it was significant only in the number of leaves, at 5% level, and the maximum length of the leaf was in the first planting date of Ardabil mass and the lowest leaf width was in the third planting date of Shadegan mass, as well as the maximum leaf thickness was in the second planting date of Borazjan mass and the lowest leaf thickness was in the third planting date of Shadegan mass, as well as the maximum head weight was in the second planting date of Borazjan mass and the minimum was in the third planting date of Shadegan mass. Also the maximum head height was in the second planting date of Shadegan mass and lowest was in the third planting date of Borazjan mass, the maximum width of the head was in the first planting date of Ardabil mass and the lowest was in the third planting date of Borazjan mass and also, the maximum number of leaves was in the second planting date of Borazjan mass and the lowest in the third planting date of Shadegan mass and finally, the maximum performance was in the second planting date on Borazjan mass and the lowest was in the in the third planting date of Shadegan mass.

CONFLICT OF INTEREST

There is no conflict of interest.

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None

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ARTICLE

GEOMETRIZATION OF THE MOTION OF A PARTICLE IN THE THREE DIMENSIONAL GENERAL INNER PRODUCT SPACE

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ABSTRACT

The Frenet-Serret formulas describe the kinematic properties of a moving particle along a smooth trajectory in the three dimensional Euclidean space with standard inner product. More specially, the formulas describe the derivatives of tangent, normal and binormal unit vectors in terms of each other. The formulas are named after the two French mathematicians who independently discovered them, Jean Frédéric Frenet in his thesis in 1847 and Joseph Alfred Serret in 1851. Here, using linear algebra, the Frenet-Serret formulas would be generalized in the three dimensional general inner product space.

INTRODUCTION

The Frenet-Serret formulas describe the properties of the smooth trajectory of a moving particle in the three dimensional space R^3 , in the case that the whole space admits the standard dot product [1].

In this study, using an orthonormal basis constructed by applying the Gram-Schmidt process in linear algebra, we are going to generalize the same formulas in the general case, i.e., the case that R^3 has the general inner product form σ given below [2].

We begin with some ingredients which are necessary for this purpose. The standard inner product of R^3 would be denoted by \langle, \rangle , i.e., $\langle p, q \rangle = p_1q_1 + p_2q_2 + p_3q_3$ for $p = (p_1, p_2, p_3)$ and $q = (q_1, q_2, q_3)$ in R^3 . More generally, the inner product of points $p = (p_1, p_2, p_3)$ and $q = (q_1, q_2, q_3)$ in R^3 is a number $\sigma(p, q)$ with the following properties: (1) Bilinearity: $\sigma(ap + bq, r) = a\sigma(p, r) + b\sigma(q, r)$, $\sigma(r, ap + bq) = a\sigma(r, p) + b\sigma(r, q)$ for arbitrary points p, q and r of R^3 , and a, b are real numbers. (2) Symmetry: $\sigma(p, q) = \sigma(q, p)$. (3) Positive definiteness: $\sigma(p, p) \geq 0$ and $\sigma(p, p) = 0$ if and only if $p = 0$.

The norm of a point $p \in R^3$ is the number $\|p\| = \sqrt{\sigma(p, p)}$. The norm is thus a real-valued map on R^3 , it has the fundamental properties $\|p + q\| \leq \|p\| + \|q\|$ and $\|ap\| = |a| \|p\|$ where $|a|$ is the absolute value of the number a [3]. If p and q are points of R^3 , the distance from p to q is the number $\|p - q\|$.

Definition 1.1. Let $\alpha: I \rightarrow R^3$ be a smooth trajectory. If $h: J \rightarrow I$ is a differentiable map on an open interval J , then the composite map $\beta = \alpha(h): J \rightarrow R^3$ is a smooth trajectory called a reparametrization of α by h [4]. Using the chain rule for a composition of real-valued maps implies that $\beta'(s) = \alpha'(h(s))h'(s)$ [5].

Definition 1.2. Let $\alpha: I \rightarrow R^3$ be a smooth trajectory in R^3 with $\alpha = (\alpha_1, \alpha_2, \alpha_3)$. For each number t in I , the velocity vector of α at t is the tangent vector at the point $\alpha(t)$ in R^3 . In terms of Euclidean coordinates $\alpha = (\alpha_1, \alpha_2, \alpha_3)$, the velocity vector of α at t is $\dot{\alpha}(t) = (\alpha_1'(t), \alpha_2'(t), \alpha_3'(t))$. The speed map v of α is given by $v(t) = \sqrt{\sigma(\dot{\alpha}(t), \dot{\alpha}(t))}$.

From the viewpoint of calculus, the most important condition on a smooth trajectory α is that it be regular, that is, have all velocity vectors different from zero. The distance traveled by a moving point is determined by integrating its speed with respect to time. Thus, the arc length of α from $t = a$ to $t = b$ would be the number $l = \int_a^b \|\dot{\alpha}(t)\| dt$.

CHANGING THE PARAMETER

Substituting the formula for $\|\dot{\alpha}\|$ given above, we get the formula for arc length. This length involves only the restriction of α (defined on some open interval) to the closed interval $[a, b]$. Sometimes one is interested only in the route followed by a smooth trajectory and not in the particular speed at which it traverses its route. One way to ignore the speed of a smooth trajectory α is to reparametrize α to smooth trajectory β that has unit speed $\|\beta'\| = 1$. Then β represents α "standard trip" along the route of α .

Theorem 2.1. If α is a regular smooth trajectory in (R^3, σ) , then there exists a reparametrization β of α such that β has unit speed.

Proof. Let t_0 be an arbitrary number in the domain I of $\alpha: I \rightarrow R^3$, and consider the arc length map $s(t) = \int_{t_0}^t \|\dot{\alpha}(u)\| du$. Thus the derivative of the map $s = s(t)$ is the speed map $v = \|\dot{\alpha}(t)\|$ of α . Since α is regular, by definition $\dot{\alpha}$ is never zero; hence $s'(t) > 0$. By the inverse mapping theorem [6], the map s has an inverse map $t = t(s)$, whose derivative at $s = s(t)$ is the reciprocal of v at $t = t(s)$. In particular, $t'(s) > 0$. Let β be the reparametrization $\beta(s) = \alpha(t(s))$ of α . We

KEY WORDS

Inner product space;
Frenet-Serret formulas;
Gram-Schmitt process

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assert that β has unit speed. In fact, as asserted above $\dot{\beta}(s) = \dot{\alpha}(t(s))t'(s)$. Hence, by the preceding notes, the speed of β is $|\dot{\beta}(s)| = |\dot{\alpha}(t(s))|t'(s) = s'(t(s))t'(s) = 1$.

THE GENERAL FRENET-SERRET FORMULAS

We now derive mathematical measurements of the turning and twisting of a smooth trajectory in (R^3, σ) . Throughout this section we deal only with unit-speed trajectories, in the next we extend the results to arbitrary regular trajectories.

Let $\beta: I \rightarrow R^3$ be a unit-speed smooth trajectory, so $|\dot{\beta}(s)| = 1$ for each s in I . Then $T = \dot{\beta}$ is called the unit tangent vector field on β . Since T has constant length 1, its derivative $T' = \beta''$ measures the way the smooth trajectory is turning in (R^3, σ) . We call T' the curvature vector field of β . Differentiation of $\sigma(T, T) = 1$ gives $\sigma(T, T') = 0$, so T' is always orthogonal to T , that is, normal to β . The length of the curvature vector field T' gives a numerical measurement of the turning of β .

The real-valued map κ such that $\kappa(s) = |T'(s)|$ for all s in I is called the curvature map of β . Thus $\kappa \geq 0$, and the larger κ is, the sharper the turning of β . To carry this analysis further, we impose the restriction that κ is never zero so $\kappa > 0$. The unit-vector field $N = T'/\kappa$ on β then tells the direction in which β is turning at each point. N is called the principal normal vector field of β . According to Gram-Schmidt process let $\bar{B} = \beta'' - \sigma(\beta', \beta'')\beta' - \kappa^{-2}\sigma(\beta'', \beta'')\beta'$. The vector field $B = |\bar{B}|^{-1}\bar{B}$ on β is called the binormal vector field of β .

Lemma 3.1. Let β be a unit-speed smooth trajectory in (R^3, σ) with $\kappa > 0$. If $\beta', \beta'', \beta'''$ are linearly independent, then the three vector fields T, N and B on β are unit vector fields that are mutually orthogonal in (R^3, σ) at each point.

Proof. By definition $|T| = 1$. Since $\kappa = |T'| > 0$, $|N| = 1$. We saw above that T and N are σ orthogonal, that is, $\sigma(T, N) = 0$. If $\beta', \beta'', \beta'''$ are linearly independent, then $\bar{B} \neq 0$, $\sigma(T, \bar{B}) = \sigma(\beta', \beta'') - \sigma(\beta', \beta'')\sigma(\beta', \beta') - \kappa^{-2}\sigma(\beta'', \beta'')\sigma(\beta', \beta') = 0$ and $\sigma(N, \bar{B}) = \kappa^{-1}\sigma(\beta'', \beta'') - \sigma(\beta', \beta'')\beta' - \kappa^{-2}\sigma(\beta'', \beta'')\beta' = \kappa^{-1}\sigma(\beta'', \beta'') - \kappa^{-2}\sigma(\beta'', \beta'')\beta' = 0$. Therefore, $|B| = 1$ and B is orthogonal to both T and N .

Definition 3.2. We call T, N, B the Frenet-Serret frame field on β corresponding to β .

Remark 3.3. The key to the successful study of the geometry of a smooth trajectory β is to use its Frenet-Serret frame field T, N, B on β corresponding to β whenever possible, instead of the standard Frenet-Serret field T, N, B , i.e., Frenet-Serret frame field T, N, B on β corresponding to β .

The Frenet-Serret frame field of β corresponding to β is full of information about β , whereas the standard Frenet-Serret field contains none in (R^3, σ) at all, because of its own inner product of the space. The first and most important use of this idea is to express the derivatives T', N', B' in terms of T, N, B . Since $T = \dot{\beta}$, we have $T' = \beta''$. We claim that T' is, at each point, a scalar multiple of N .

To prove this, it suffices by σ orthonormal expansion to show that $\sigma(T', T) = 0$ and $\sigma(T', B) = 0$. The former holds since T is a unit vector. To prove the latter, differentiate $\sigma(T, B) = 0$, obtaining $\sigma(T', B) + \sigma(T, B') = 0$; then $\sigma(T', B) = -\sigma(T, B') = -\sigma(B, \kappa N) = -\kappa\sigma(B, N) = 0$. Thus we can now define the torsion map τ of the smooth trajectory β to be the real-valued map on the interval I such that $B' = -\tau N$.

By contrast with curvature, there is no restriction on the values of τ , it may be positive, negative, or zero at various points of I . We shall presently show that τ does measure the torsion, or twisting, of the smooth trajectory β .

Theorem 3.4. (Frenet-Serret formulas in the general inner product space (R^3, σ)). If $\beta: I \rightarrow R^3$ is a unit-speed smooth trajectory in the inner product space (R^3, σ) with curvature $\kappa > 0$ and torsion τ , then $T' = \kappa N, N' = -\kappa T + \tau B, B' = -\tau N$.

Proof. As we saw above, the first and third formulas are essentially just the definitions of curvature and torsion. To prove the second, we use σ orthonormal expansion to express N' in terms of T, N, B to find that $N' = \sigma(N', T)T + \sigma(N', N)N + \sigma(N', B)B$. Differentiating $\sigma(N, T) = 0$, we get $\sigma(N', T) + \sigma(N, T') = 0$, hence $\sigma(N', T) = -\sigma(N, T') = -\sigma(N, \kappa N) = -\kappa\sigma(N, N) = -\kappa$. As usual, $\sigma(N', N) = 0$, since N is a unit vector field. Finally, $\sigma(N', B) = -\sigma(N, B') = -\sigma(N, -\tau N) = \tau$.

ARBITRARY SPEED TRAJECTORIES

It is a simple matter to adapt the results of the previous section to the study of a regular smooth trajectory $\alpha: I \rightarrow R^3$ that does not necessarily have unit speed. We merely transfer to α the Frenet-Serret apparatus corresponding to σ of a unit-speed reparametrization β of α . Explicitly, if s is an arc length map for α as indicated in Theorem 2.1, then $\alpha(t) = \beta(s(t))$ for all t , or $\alpha = \beta \circ s$. Now if $\kappa_\beta > 0, \tau_\beta, T_\beta, N_\beta$ and B_β are defined for β as above, we define for α the curvature map, $\kappa_\alpha(t) = \kappa_\beta(s)$; torsion map, $\tau_\alpha(t) = \tau_\beta(s)$; tangent vector field, $T_\alpha(t) = T_\beta(s)$; normal vector field, $N_\alpha(t) = N_\beta(s)$; binormal vector field: $B_\alpha(t) = B_\beta(s)$. In general κ_α and κ_β are different maps, defined on different intervals. But they give exactly the same description of the turning of the common route of α and β , since at any point $\alpha(t) = \beta(s(t))$ the numbers $\kappa_\alpha(t)$ and $\kappa_\beta(s(t))$ are by definition the same. The Frenet-Serret formulas corresponding to σ are valid only for unit-speed trajectories; they tell the rate of change of the frame field T, N, B with respect to arc length. However, the speed v of the smooth trajectory is the proper correction factor in the general case.

Lemma 4.1. If α is a regular smooth trajectory in (R^3, σ) with $\kappa > 0$, then $T' = \kappa v N, N' = -\kappa v T + \tau v B, B' = -\tau v N$.

Proof. Let β be a unit-speed reparametrization of α . Then by definition, $T_\alpha(t) = T_\beta(s)$, where s is an arc length map for α . The chain rule as applied to differentiation of vector fields gives $T'_\alpha(t) = T'_\beta(s)s'(t)$. By the usual Frenet-Serret equations corresponding to σ , $T'_\beta(s) = \kappa_\beta(s)N_\beta(s)$. Substituting the map s in this equation yields $T'_\beta(s) = \kappa_\beta(s)N_\beta(s) = \kappa_\alpha(t)N_\alpha(t)$ by the definition of κ_α and N_α in the arbitrary-speed case. Since $s'(t)$ is the speed map v of α , these two equations combine to yield $T'_\alpha = \kappa_\alpha v N_\alpha$. The formulas for N'_α and B'_α are derived in the same way.

Lemma 4.2. If α is a regular smooth trajectory with speed map v in (R^3, σ) with $\kappa > 0$, then the velocity and acceleration of α are given by $\alpha' = vT, \alpha'' = v'(t)T + \kappa v^2 N$.

Proof. Since $\alpha = \beta(s)$, where s is the arc length map of α , we find that $\alpha' = \beta'(s)s'(t) = vT_\beta(s) = vT_\alpha(t)$. A second differentiation yields the other.

Example 4.3. Consider (R^3, σ) with inner product $\sigma(p, q) = p_1q_1 + p_2q_2 + 2p_3q_3$. Then $\beta(s) = (\cos \frac{s}{2}, \sin \frac{s}{2}, \sqrt{\frac{3}{8}}s)$ unit-speed smooth trajectory, so a simple computation, using Frenet-Serret formulas corresponding to σ shows that

$$T(s) = (-\frac{1}{2}\sin \frac{s}{2}, \frac{1}{2}\cos \frac{s}{2}, \sqrt{\frac{3}{8}}), N(s) = (-\cos \frac{s}{2}, -\sin \frac{s}{2}, 0),$$

$$B(s) = (\frac{\sqrt{3}}{2}\sin \frac{s}{2}, -\frac{\sqrt{3}}{2}\cos \frac{s}{2}, \frac{1}{\sqrt{8}}), \kappa(s) = \frac{1}{4}, \tau(s) = -\frac{\sqrt{3}}{4}.$$

Note that the Frenet-Serret formulas for β , as a smooth trajectory in the standard inner product space (R^3, \langle, \rangle) asserts that

$$T(s) = (-\sqrt{\frac{2}{5}}\sin \frac{s}{2}, \sqrt{\frac{2}{5}}\cos \frac{s}{2}, \sqrt{\frac{3}{5}}), N(s) = (-\cos \frac{s}{2}, -\sin \frac{s}{2}, 0),$$

$$B(s) = (\sqrt{\frac{3}{5}}\sin \frac{s}{2}, -\sqrt{\frac{3}{5}}\cos \frac{s}{2}, \sqrt{\frac{2}{5}}), \kappa(s) = \frac{2}{3}, \tau(s) = \frac{\sqrt{6}}{5}.$$

One can see easily that in each case, the formulas of Lemma 4.2 are satisfied.

Example 4.4. The spherical image of a unit-speed smooth trajectory β in (R^3, σ) is the smooth trajectory $\delta = T_\beta = \beta'$ with the same Euclidean coordinates. Thus δ , lies on the unit sphere S , and the motion of δ represents the turning of β . The equation of δ implies that $T_\delta = \delta' = T'_\beta = \kappa_\beta N_\beta$, so the speed of δ is equal to the curvature of β , i.e., $v_\delta = \kappa_\beta$. Moreover, $T'_\delta = \delta'' = T''_\beta = (\kappa_\beta N_\beta)' = \kappa'_\beta N_\beta + \kappa_\beta N'_\beta = -\kappa_\beta^2 T_\beta + \kappa_\beta N'_\beta + \kappa_\beta \tau_\beta B_\beta$. So $T'_\delta = \kappa_\delta v_\delta N_\delta$ implies that $\kappa_\beta^4 + (\kappa'_\beta)^2 + \kappa_\beta^2 \tau_\beta^2 = \kappa_\delta^2 \kappa_\beta^2$, and $\kappa_\delta \geq \sqrt{\kappa_\beta^2 + \tau_\beta^2}$.

CONFLICT OF INTEREST
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ARTICLE

ON THE LIMIT PROPERTIES OF THE VERHULST POPULATIONS

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ABSTRACT

Those who have studied the population size, i.e., the demographers, are eager to build a real model which not only describe the demographic changes in the past periods, but can predict these changes in coming periods. They are very eager to find what factors are effective in the population size, and which of these factors can be controlled by social policies? These are difficult questions. The prediction of Verhulst law about great bunch of populations has been correct. In this study, we are going to show that the populations modeled by Verhulst equation are not a limit of a sequence of cyclic generations.

INTRODUCTION

The logistic (Verhulst) growth model and its current applications in the problem of growth in biology are all based on the notion that the isothermal momentary growth rate is proportional to the momentary population's size and the fraction of resources that are still available in the habitat [1, 2].

A mathematical model, as a combination of probability and Verhulst population model indicating the effort of some believes in decreasing, constancy or increasing the population of an ethnic minority, or whole peoples with common believes of a country, in the crossing stage from one generation to another had been provided in [3]. In this study, assuming the constancy of two coefficients of Verhulst equation, we are going to find some properties of the acyclic populations which are a limit of a sequence of cyclic generations.

PRELIMINARIES

Let J be a compact interval and $k \geq 1$. The set of all maps $J \rightarrow J$ with k continuous derivatives will be denoted by $D^k(J)$. We define

$$\forall f, g \in D^k(J, R), \quad \forall \lambda \in R, \quad \forall x \in J; \quad (f + g)(x) = f(x) + g(x), \quad (\lambda f)(x) = \lambda f(x).$$

For $f \in D^k(J)$ let $\|f\| = \sup_{x \in J} (|f(x)| + |f'(x)| + \dots + |f^{(k)}(x)|)$, then

The proofs of the following theorems are straightforward [4].

Theorem 2.1. $(D^k(J), +, \cdot)$ is a vector space.

Theorem 2.2. $(D^k(J), \| \cdot \|)$ is a normed vector space.

MATERIALS AND METHODS

In the following, using the method similar to [5], we are going to investigate the properties of the populations which are a limit of a sequence of cyclic ones.

Theorem 3.1. Let $f, f_n \in D^k(J)$, $f_n \rightarrow f$ in $(D^k(J), \| \cdot \|)$, and $a_n, p \in J$ are such that $a_n \rightarrow p$. Then $f_n(a_n) \rightarrow f(p)$.

Proof. For $\epsilon > 0$ there exists $n_0 \in N$ such that if $n > n_0$ then $\|f_n - f\| < \epsilon/2$. Therefore $|f_n(a_n) - f(a_n)| \leq \|f_n - f\| < \epsilon/2$.

Since f is continuous and $a_n \rightarrow p$, then there exists $n_1 \in N$ such that if $n > n_1$ then $|f(a_n) - f(p)| < \epsilon/2$. Now if $n_2 = \max\{n_0, n_1\}$ and $n > n_2$ then $|f_n(a_n) - f(p)| \leq |f_n(a_n) - f(a_n)| + |f(a_n) - f(p)| \leq \epsilon/2 + \epsilon/2 = \epsilon$.

Theorem 3.2. Let $f, f_n \in D^k(J)$, $f_n \rightarrow f$ in $(D^k(J), \| \cdot \|)$ and f is an acyclic map. For $n \in N$ let $\{a_n, b_n\}$ be a 2-cycle for f_n such that $a_n \rightarrow p \in J$, $b_n \rightarrow q \in J$. Then $p = q$ and p is a fixed point for f , and $f'(p) = -1$.

Proof. Since $f_n(a_n) = b_n$, $f_n(b_n) = a_n$, Theorem 3.2 asserts that $f(p) = q$, $f(q) = p$. Now acyclicity of f implies that $p = q$. Moreover, $f_n \rightarrow f$ in $(D^k(J), \| \cdot \|)$ asserts that $f'_n \rightarrow f'$, and so $-1 = (a_n - b_n)(b_n - a_n)^{-1} = (f_n(b_n) - f_n(a_n))(b_n - a_n)^{-1}$. Thus $f'_n(a_n) = -1$. On the other hand, $f_n \rightarrow f$ and an argument similar to the proof of Theorem 3.1 implies that $f'(p) = \lim_{n \rightarrow \infty} f'_n(a_n) = -1$.

The following theorem is a consequence of the Mean Value Theorem [6].

Theorem 3.3. Let $a < p < b$ are the fixed points of $f \in D^1(J)$. Then there are two different points $s, t \in J$ such that

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$a < s < p < t < b$ and $f'(s) = f'(t) = 1$. Moreover, if $f \in D^2(J)$, then there exists some point $s < z < t$ such that $f'''(z) = 0$.

Theorem 3.4. Let $f, f_n \in D^k(J), k \geq 2, f_n \rightarrow f$ in $(D^k(J), \|\cdot\|)$ and f is an acyclic map. For $n \in N$, let $\{a_n, b_n\}$ be a 2-cycle for f_n such that $a_n \rightarrow p \in J, b_n \rightarrow q \in J$. Then $(f \circ f)''(p) = 1, (f \circ f)'''(p) = 0, f''(p) = 0$.

Proof. Without loss of generality, we can assume $\forall n \in N; a_n < b_n$. Since $f_n(a_n) = b_n, f_n(b_n) = a_n$, so the fixed point theorem [6] implies that there exists $a_n < p_n < b_n$ such that $f_n(p_n) = p_n$. According to assumptions $a_n \rightarrow p$ and $b_n \rightarrow q$ and Theorem 3.2, we have $p = q$ and so $p_n \rightarrow p$. Therefore Theorem 3.1 asserts that $f_n(p_n) \rightarrow f(p)$ or $p_n \rightarrow f(p)$, and so $f(p) = p$. Moreover, a_n, p_n and b_n are the fixed points for $f_n \circ f_n$, because $f_n \circ f_n(a_n) = f_n(f_n(a_n)) = f_n(b_n) = a_n, f_n \circ f_n(b_n) = f_n(f_n(b_n)) = f_n(a_n) = b_n$ and $f_n \circ f_n(p_n) = f_n(f_n(p_n)) = f_n(p_n) = p_n$. Now Theorem 3.3 implies that there exist some points $a_n < s_n < p_n, p_n < t_n < b_n$ and $s_n < z_n < t_n$ such that $(f_n \circ f_n)'(s_n) = (f_n \circ f_n)'(t_n) = 1, (f_n \circ f_n)''(z_n) = 0$. But convergence in $(D^k(J), \|\cdot\|)$ implies that $0 = (f_n \circ f_n)'''(z_n) \rightarrow (f_n \circ f_n)'''(p)$, and so $(f \circ f)'''(p) = 0$. On the other hand, the chain rule of differentiation [6] and Theorem 3.2 implies $(f \circ f)''(p) = f'(f(p))f'(p) = f'(p)^2 = 1, 0 = (f \circ f)'''(p) = 2f'(p)f''(p) = -2f''(p)$ and so $f''(p) = 0$.

DISCUSSION AND CONCLUSION

According to Verhulst theory, the law of the growth of population is of the form $f(x) = qx - rx^2$, in which $x, f(x), q$ and r denotes the population of the present generation, the population of the next generation, the rate of collaboration and the rate of competition respectively and vary from one society to another [7]. In the most today's societies, which the internal reduction factors of r and increasing factor of q still exist, the subject of population growth is very serious. A provided mathematical model shows that in addition to medical advances, health and nutrition, some ancient beliefs of peoples are effective on the increasing of the rate of collaboration and so in the growth of population. If the rate of collaboration is $1 \cdot 5$ and the number of initial population is bounded above by $(2r)^{-1}$, then the next generations of population increases and remains bounded by the same upper bound. In this case, if the number of initial population is bounded below by $(2r)^{-1}$, then the next generations of population decreases and remains bounded by the same lower bound. If the rate of collaboration is 2, the population increases but does not exceed from r^{-1} . If the rate of collaboration is 2.25 (res. 2.75), and if the number of population of a generation is less than $5(4r)^{-1}$ (res. $7(4r)^{-1}$), then it will be increasing in the next one, and if the number of population of a generation is more than $5(4r)^{-1}$ (res. $7(4r)^{-1}$), it will be decreasing in the next stage. Therefore the variation of the number of population will be alternative. In all of these cases the number of population is bounded above by $2r^{-1}$ [3].

Some of the most important properties for the populations which are modeled by Verhulst equation can be deduce from the preceding considerations. In fact, the non zero fixed point of Verhulst equation is $p = qr^{-1}$. A simple computation yields that $f'(p) = 2^{-1}q, f''(p) = -2r, (f \circ f)''(p) = 4^{-1}q^2$ and $(f \circ f)'''(p) = -2qr$. Therefore the quadruple system of equations obtained in Theorems 3.2 and 3.4 does not have an acceptable solution, i.e., the populations modeled by Verhulst equation are not a limit of a sequence of cyclic generations.

CONFLICT OF INTEREST

There is no conflict of interest.

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ARTICLE

OPTIMAL OPERATION OF MICROGRIDS INCLUDING PHOTOVOLTAIC/ WIND/ DIESEL

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ABSTRACT

Renewable energy sources (RES) technologies can provide energy solutions to some customers that are more cost-effective, more environmentally friendly, or provide higher power quality or reliability than conventional solutions. Presented in this paper, gives an optimal management strategy of PV/wind/diesel independent hybrid systems for supplying required energy in autonomous microgrids. Wind-Turbine Generators (WTG), Photovoltaic (PV) systems, battery banks and diesel generator are considered in this study. A new optimization problem is formulated for minimizing the capital investment and fuel costs of the system. The proposed model demonstrates that different renewable sources can be used simultaneously for practical applications. A novel algorithm, named GPSO-GM (Guaranteed convergence Particle Swarm Optimization with Gaussian Mutation), for the optimization problem in an autonomous microgrid is proposed. Two operators, mutation and guaranteed convergence, are added to PSO in order to help in finding an optimal solution and to assist in increasing the speed of the proposed algorithm as well as the accuracy of the results. The performance of the proposed strategy is evaluated in two case studies.

INTRODUCTION

A microgrid is seen as an interconnection of distributed generations (DGs) which is integrated with electrical and thermal loads as well as energy storages, and it operates as a single small scale system in low-voltage distribution systems. In microgrids, power quality, reliability and security can be increased by the use of power electronic interfaces and controls (Bala and Siddique, 2009). A microgrid might operate in grid-connected or islanded modes. In a grid-connected mode, the voltage and frequency of microgrids are dictated by the main grid while in an islanded mode control units of DGs along with managing active and reactive power are responsible for frequency and voltage regulation (Deshmukh and Deshmukh, 2008).

The application of renewable resources varies from the very small to large isolated, grid connected and hybrid stand-alone power systems (Eroglu et al, 2011). Additionally, the hybrid power systems show less expensive in terms of generation cost than those that use only one source as well as higher degree of reliability (Zhou et al, 2010). Accessibility and inexhaustibility of solar radiation and wind has made these renewable resources the most preferred energy sources (Saheb-Koussa et al, 2009). Multi-source hybrid power system improves energy availability considerably and it makes these systems profitable for practical applications especially for locations with not-reliable power access that need highly reliable power or those in remote areas which are far from the grids (Weisser, 2007). Reference (Bekele and Tadesse, 2010) shows that under such condition, hybrid PV-Diesel systems are competitive with diesel generation because of high costs of supply of diesel fuel.

Due to the popularity of the hybrid PV-Wind-Diesel systems with battery storage systems a large number of studies were conducted and reported in the literature (Kalantar and Mousavi, 2010). Many of studies carried out in this topic discuss the feasibility and techno-economic analysis of hybrid systems for practical applications. In (Yang et al, 2007) off-grid rural electrification in Dijon district, Ethiopia has been studied and the feasibility of application of small Hydro/PV/Wind hybrid network is shown. A cost of energy less than \$0.16/kWh is calculated by the proposed results. Reference (Rehman et al, 2012) proposes the implementation of hybrid power systems for a village in Saudi Arabia and demonstrates that this system could be a feasible solution with cost of energy of 0.212 US\$/kWh; the results show that the stand-alone system can prevent release of about 5000 tons/year of CO₂ gas in to the local atmosphere of the village.

In (Nfah et al, 2008) put forward hybrid solar wind power system optimization model, which mainly includes the hybrid system model, the probability of loss model, per kilowatt of power generation cost model. An analytical method for sizing and techno-economic optimization of an autonomous solar-wind hybrid energy system has been presented accounting the fraction of time for supplying the specified load and the cost of the system in (Gomaa et al, 1995).

In (Carpinelli et al, 2015) put forward hybrid solar wind power system optimization model, which mainly includes the hybrid system model, the probability of loss model, per kilowatt of power generation cost model. An analytical method for sizing and techno-economic optimization of an autonomous solar-wind hybrid energy system has been presented accounting the fraction

KEY WORDS

Microgrid; Renewable energy resources, Optimization; Wind generation, photovoltaic

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of time for supplying the specified load and the cost of the system in (Mikati et al, 2013).

In (Ma et al, 2015) proposed the pumped hydro storage system as a promising technology for standalone photoelectric energy penetration for small autonomous system in remote using genetic algorithm, along with Pareto optimality concept to minimize system lifecycle cost and maximize power supply reliability simultaneously. In (Ekren and Ekren, 2010) projected simulated annealing algorithm based method to optimize the sizing of integrated solar-wind system with battery storage.

Authors in (Evans et al, 2009) have studied how the grid dependency is affected by integration of renewable subunits and revealing the integration of renewable distributed generation decrease grid usage and then avoids losses during large scale transformation and import of power through distribution substation. The studies of (Stoppato, 2008) proposed a more accurate method for reinforcement of solar and wind generation units into distribution network to bring the parameters close to the desired values considering wide ranges of technical and operational issues.

A novel method to solve proposed optimization problem is proposed to determine the optimum size of the sources in an autonomous microgrid. Minimizing the investment and operational costs while taking into account Life Cycle Assessment (LCA) is the objective of this study while ensuring the reliability requirements. The proposed scheme demonstrates that the hybrid systems are financially and practically reasonable as an islanded power system in remote areas where there is no access to grid.

The paper is organized as follows. Section II shows the mathematical modeling of the system design. Section III gives a proposed method to solve optimization problem. Simulation results are provided in Section IV. Finally, the conclusion remarks are discussed in Section V.

I. MATHEMATICAL MODEL

In the proposed autonomous microgrid four main subsystems including the solar energy system, wind turbines, the battery banks and a diesel generator are considered. Mathematical modeling of these subsystems is presented in the following.

a. PV Modules

The PV cell can directly convert the sunlight to electric power via the photoelectric phenomena. The solar radiation data can be extracted from historical data and for the following years through forecasting. For sake of simplicity and in order to have clear figures only one day of each month is selected for simulation studies. Total area available for PV panels can be limited and it will restrict the total number of PV cells that can be installed. Different types of PV panels with different characteristic and costs are considered for simulation. In a simplified model the power output of a PV panel can be determined based on (1).

$$P^{PV}(t) = I_r(t) \times S \times \eta^{PV} \times \eta_{inv} \tag{1}$$

One can improve by taking into account the impact of temperature on the power output of the PV panels. As the temperature increases, the efficiency of the panel decreases (Fthenakis and Kim, 2009) The effect temperature on the output power of a PV panel is modeled and expressed in (2).

$$P^{PV}(t) = P_{st}^{PV} \times f^{PV} \times \left(\frac{I_r(t)}{I_{r,st}} \right) \times \left(1 + \alpha^{PV} [T_C(t) - T_{C,st}(t)] \right) \tag{2}$$

The PV manufacturer provides the characteristic specifications of their product.

b. Wind power

The power output of wind generators can be determined based on the wind speed at the hub height and the output characteristic of the wind turbine generator. In this paper, the hourly power output of a wind generator is approximated by a piece-wise linear function as depicted and formulated in the following.

$$P_{w,j}(t) = \begin{cases} 0 & v_j < v_{ci,j} \\ P_{w,j}^{rated} \cdot \frac{v_j(t) - v_{ci,j}}{v_j^{rated} - v_{ci,j}} & v_{ci,j} \leq v_j(t) < v_j^{rated} \\ P_{w,j}^{rated} & v_j^{rated} \leq v_j(t) < v_{co,j} \\ 0 & v_{co,j} \leq v_j(t) \end{cases} \tag{3}$$

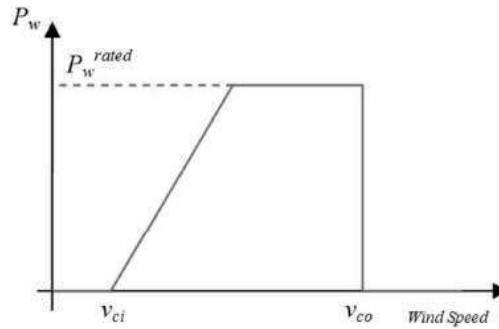


Fig. 1: Typical piece-wise approximation of wind turbine power output.

There is insufficient torque at very low wind speeds, to make the turbine blades rotate. As the speed increases, the wind turbine will begin to rotate and generate power. The speed at which the wind turbine first starts to generate electric power is called the cut-in speed (v_{ci}) and is usually between 3 and 4 m/s. With increase in the wind speed, the electric power generated by the wind turbine rises. Considering the above explanations, equation (3) gives the approximated piece-wise linear function which approximates the electrical output power of a wind turbine generator. This function is presented in [Fig. 1].

It should be noted that the efficiency of the regulator and converter should be taken into account. In section 4, the proposed framework including system operation strategies and system model will be discussed. In the area under study, the historical wind speed data are available at three different hub heights. The wind speed at the hub height can be calculated by using power-law equation (3) if the wind speed is available in a reference height (h_r) only (Koutroulis et al, 2006).

$$v(t) = v_r(t) \left(\frac{h}{h_r} \right)^\gamma \tag{4}$$

c. Batteries

Battery banks are used as the energy storage units. The difference between power generated by renewable energy sources (PVs and wind turbines) and power demand of the area under study, determines whether the battery banks should be charged or discharged. At all times, during the charging process and discharging processes, the state of charge (SOC) constraint should be fulfilled. Equation (5) models this constraint and is based on the model presented in (Alsema and Wild-Scholten, 2005).

$$SOC_{\min,k} \leq SOC_k(t) \leq SOC_{\max,k} \tag{5}$$

The batteries are connected in series to provide the desired DC operating voltage, which is considered to be 440 volts. Therefore, the number of batteries in series ($N_{battery,s}$) can be found easily using (6).

$$N_{battery,s} = \frac{V_{DC}}{V_{battery}^{rated}} \tag{6}$$

The batteries are connected in parallel to provide the desired storage capacity. The number of batteries in parallel which retrieves the total capacity of the battery bank is one of the optimization variables. The efficiency of the regulator and converter should be considered in battery banks' modeling and optimization. The rate of change of SOC of the battery banks limits the maximum charge and discharge rates. The same model as presented in (Alsema and Wild-Scholten, 2005) is borrowed here to model these constraints.

d. Diesel Generator

In grid-independent hybrid systems, there are times in which the sum of output power of renewable resources and the power stored at the battery banks does not meet the load demand. An independent power source as back up is required in such conditions. Fuel cell system or a diesel generator can be assigned for this task. In this study because of the medium size energy system a diesel generator is selected over fuel cell. The size and type of diesel generator is dependent on nature of the load that should be supplied. In the approach proposed in (Notton et al, 1996), in order to find the optimal size of the diesel generator, it is assumed that the diesel generator is directly connected to load and it should be able to satisfy the whole load so the rated capacity of the generator is considered equal to the maximum load.

In this study this approach is not considered and the size of diesel generator is taken into account as the optimization variable that should be optimally determined based on its installation and operational costs in comparison with the cost of reinforcing the renewable resources and battery banks.

PROPOSED OPTIMIZATION METHOD

To solve the paper optimization problem, an optimization algorithm is developed based on the PSO method. Although PSO is fast, compared with other evolutionary methods, it may converge to a local minimum value

which might not be an optimal global solution and also increasing the number of iterations is not able to cope with this global convergence problem. As a consequence, in practice, it might be hard to validate the solution derived by PSO. In an attempt to address this validation problem, the study of (Sharafi and Tarek, 2014) adds a guaranteed convergence operator to PSO to make the convergence of solutions possible. This global improved algorithm called GPSO; however, it fails to deal with problems involving a small searching region because of PSO information sharing mechanism. In order to address this shortfall, this paper develops the GPSO algorithm by adopting a Gaussian mutation operator which assists in finding the optimal global solution. This new algorithm is named GPSO-GM and its scheme might be outlined as follows.

Step 1: *Initialization*: Set $t = 0$ and randomly make m swarms, $[y_i(0), i=1, \dots, m]$. For each swarm, set $y_i^*(0) = y_i(0)$ and $f_i^* = f_i$, $i = 1, \dots, m$. Look for the best value of f_{best} according to (22). Set the particle corresponding to the best value of objective function as the global best, $y_{Best}^{**}(0)$, with an objective function of f^{**} .

Step 2: *Time Updating*: Update $t = t + 1$.

Step 3: *Velocity updating*: Update velocity by,

$$v_{i,k}(t) = w(t)v_{i,k}(t-1) + c_1 r_1 (y_{i,k}^*(t-1) - y_{i,k}(t-1)) + c_2 r_2 (y_{Best}^{**}(t-1) - y_{i,k}(t-1)). \quad (7)$$

Step 4: *Position Updating*: Update the position of each particle by the use of (30) and the value of the updated velocity.

$$y_{i,k}(t) = y_{i,k}(t-1) + v_{i,k}(t). \quad (8)$$

Step 5: *Gaussian Mutation*: Mutate a new position at each swarm by the use of mutation probability (P_n). Then, for each component of the particle position vector, $k = 1, \dots, n$, if $\text{Rand}(0,1) < P_n$, then mutate the component $y_{i,k(t)}$ by,

$$y_{i,k}(t) = y_{i,k}(t) + N(0, \sigma)y_{i,k}(t). \quad (9)$$

where the standard deviation, σ , might be defined as,

$$\sigma = 0.1(y_{max,k} - y_{min,k}). \quad (10)$$

Step 6: *Local Updating*: If $f_{min} < f_i^*$ then update individual best as, (noting that each particle is appraised based on the updated position),

$$y_i(t) = y_i^*(t), f_i = f_i^*. \quad (11)$$

Step 7: *Global Improving*: Set ζ as the index of the global best particle, then update this particle by, (this is based on (Sharafi and Tarek, 2014)),

$$v_{\zeta,k}(t) = -y_{\zeta,k}(t-1) + y_{Best,k}^{**}(t-1) + wv_{\zeta,k}(t-1) + \tau(t-1)(1-2r_2). \quad (12)$$

$$y_{\zeta,k}(t) = y_{Best,k}^{**}(t-1) + wv_{\zeta,k}(t) + \tau(t-1)(1-2r_2). \quad (13)$$

where $\tau(t)$ can be obtained by,

$$\tau(t) = \begin{cases} 2\tau(t-1) & \text{if } \# \text{ successes}(t-1) > s_c \\ 0.5\tau(t-1) & \text{if } \# \text{ failures}(t-1) > f_c \\ \tau(t-1) & \text{otherwise} \end{cases} \quad (14)$$

In (14), the notation “# successes” and “# failures” represent the number of successes or failures, respectively. Here failure is meant $f(y_{Best}^{**}(t)) = f(y_{Best}^{**}(t-1))$.

Step 8: *Global Updating*: If $f_{min} < f^{**}$ then update individual global best as $f^{**} = f_{min}$ and $y_{Best}^{**} = y_{min}^{**}(t)$.
 Step 9: *Stop*: If the considered end criterion is met, then end the calculation otherwise, go to Step 2.

PROPOSED METHODOLOGY

In this section the objective function of the optimization problem is discussed. The installation, maintenance and operating costs of different parts of system are modeled appropriately in order to have a reasonable and precise model. The hybrid energy system configuration is taken from (Eroglu et al, 2011). The diesel generator is designed and utilized to play the role of backup in case renewable resources and battery banks are not able to provide electric power.

The optimization strategy of the proposed hybrid system is depicted in [Fig. 2]. The proposed conceptual

flowchart summarizes the strategy that is used in this paper. In order to have a quick and brief vision, the efficiency of regulators and converters are not included in the equations shown in the flowchart, but they are considered in the simulations and optimal design determination.

In the following the proposed objective function and constraints of the optimization problem are discussed. In order to have an appropriate financial model the following factors are considered: proper planning horizon; interest rate; inflation rate; and life time of different parts of the system including PV units, wind turbines, batteries and diesel generator. Using historical data load pattern in the entire planning horizon, wind speed data, temperature and solar irradiance are forecasted. In order to have a clear vision of the planning costs at the present time it is necessary to calculate the net present value of different costs based on their occurrence year. The proposed objective function of this study includes four different parts regarding each power sources considered. The proposed objective function of the optimization problem is presented in (15). It should be noted that in order to avoid complexity the objective function presented in (15) does not include the interest rate.

$$\begin{aligned}
 Total\ cost = & \sum_{t=1}^T \left\{ \sum_{i=1}^{N_{Wind}} \left[Cost_{inv,i}^{Wind} + Cost_{ins,i}^{Wind} + Cost_{m,i}^{Wind} \right] + \sum_{i=1}^{N_{PV}} \left[Cost_{inv,i}^{PV} + Cost_{ins,i}^{PV} + Cost_{m,i}^{PV} \right] + \right. \\
 & \left. \sum_{i=1}^{N_{Battery}} \left[Cost_{inv,k}^{Battery} + Cost_{ins,k}^{Battery} + Cost_{m,k}^{Battery} \right] + Cost_{inv}^{Diesel} + Cost_{ins,k}^{Diesel} + \sum_{i=1}^T \left[Cost_{operation}^{Diesel} \left(P^{Diesel}(t) \right) \right] \right\}
 \end{aligned}
 \tag{15}$$

Considering the interest rate in calculation of objective function is necessary; equation (16) can be used in this regard. Considering the occurrence of Cost in year *y*, the present value is calculated using this equation and is shown by *IPV*. The objective function is adjusted using (16) to include the effects of the interest rate.

$$IPV = \frac{Cost}{(1 + IR)}
 \tag{16}$$

GPSO-GM begins with creating population. Population represents several numbers of swarms (solutions). Each solution includes the number of batteries, number of PV panels and number of wind turbines. In the simulation study for each month one day is considered. Therefore there are 12 days, each representing one month, in the optimization process, so for each year 284 hours is considered to model the load of the system. In the optimization procedure after initializing the optimization problem and parameters of the mutation, crossover is initiated. For each solution the time simulation is performed. At first based on wind speed and solar irradiance the power generation of PV and Wind turbine generators are calculated.

At each hour based on the load and power generation of PV and wind turbines, using (17) P_{Dif} is calculated. If (10) retrieve a positive value for P_{Dif} there is a part of load that cannot be supplied by the renewable resources. If the value of P_{Dif} is negative it shows that not only the renewable resources can supply the load but also there is extra power that can be stored in the battery banks.

$$P_{Dif} = P_L - (P_{pv} + P_{Wind})
 \tag{17}$$

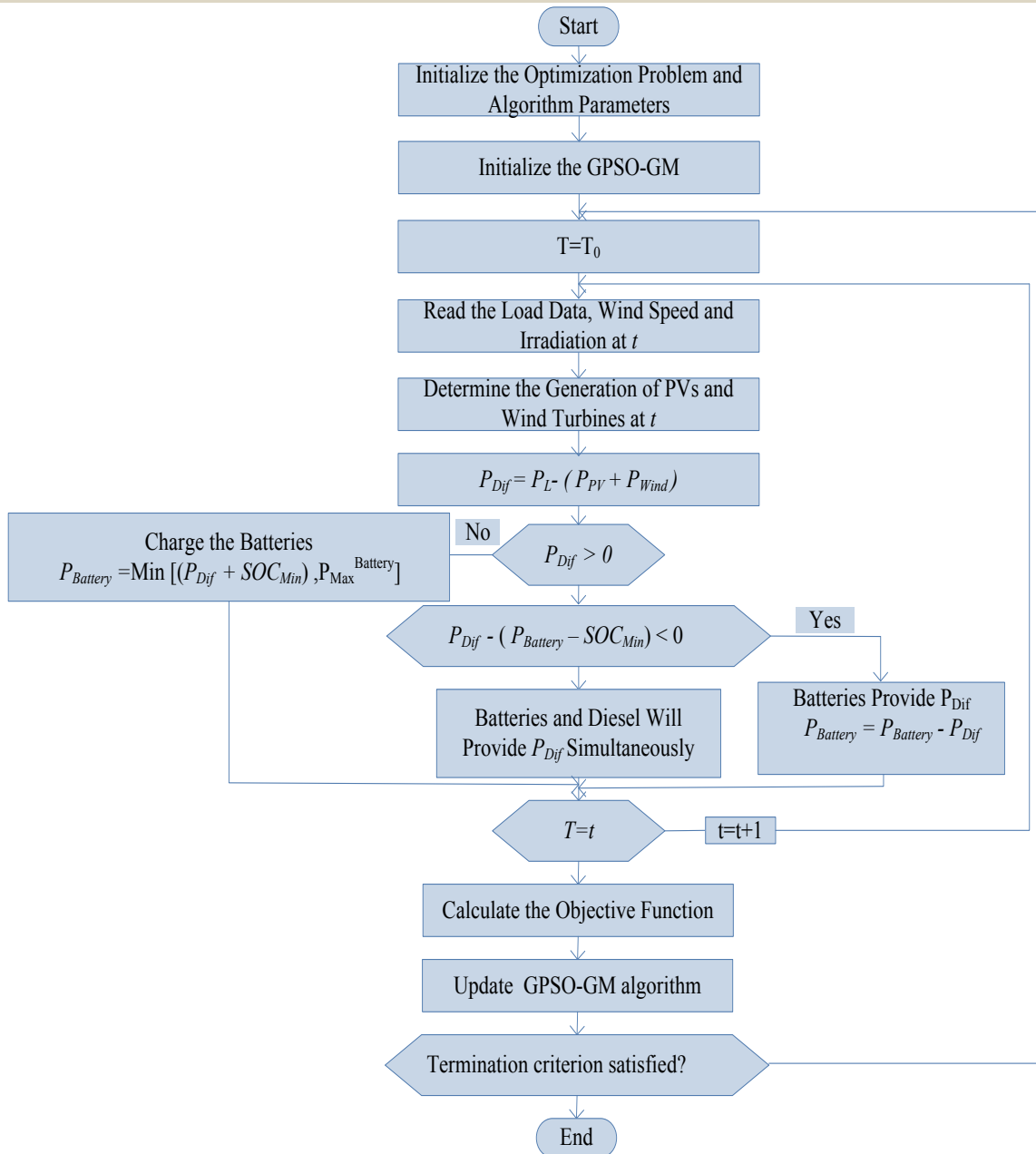


Fig. 2: The conceptual flowchart of the proposed operation strategy.

In case P_{Dif} is positive based on the operation strategy the model tries to supply the load using the power stored in the battery banks. Taking into account the SOC_{Min} constraint of the battery banks if they are able to satisfy the load the load will be supplied by battery banks and renewable resources but if the power achievable from battery banks is not sufficient diesel generator is used to provide the extra power required. This process is formulated in (18).

$$(18) \quad \begin{cases} P_{Dif} - (P_{Battery} - SOC_{Min}) < 0 & \text{Battery provides the extra power required} \\ P_{Dif} - (P_{Battery} - SOC_{Min}) > 0 & \text{Battery and DieselGen. provide the extra power required} \end{cases}$$

This simulation gives the hourly output power of the diesel generator. The maximum output of the diesel generator is selected as its capacity. Therefore, all the optimization variables are determined in the optimization procedure for each solution and therefore the objective function can be calculated. In the optimization process the constraints are handled in time simulation, including satisfaction of power demand; the wind turbine constraints; battery banks' SOC constraints; and PV panels maximum output constraints.

CASE STUDY

A 69-bus autonomous microgrid is used for simulation that shown in [Fig.3]. The locations of RES in 69-bus microgrid are at 42, 23 and 61 buses. The date of 69-bus system can find in (Venkatesh and Ranjan,

2003). The wind speed and solar irradiance data are used from (Skoplaki and Palyvos, 2009). As mentioned earlier, only one day of each month is considered for simulation and the hourly load pattern is determined for all years of the 20-year planning horizon based on the growth rate. The interest rate is considered to be 20% in this study. GPSO-GM parameters are shown in [Table 1].

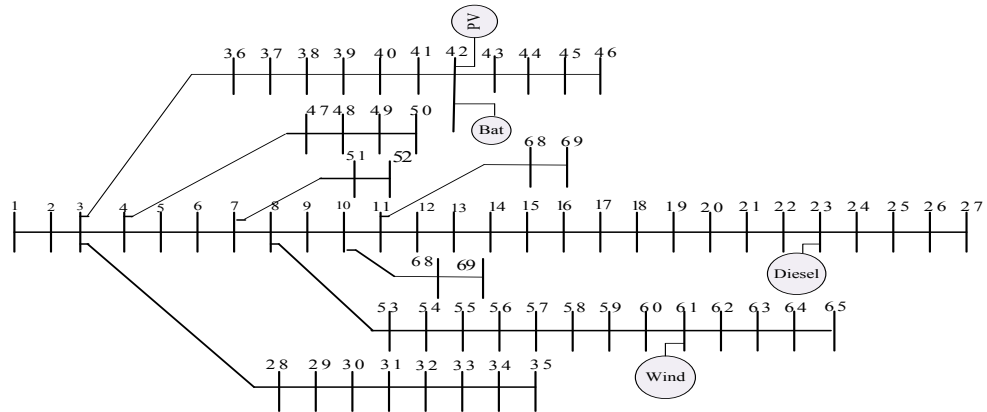


Fig. 3: 69-bus autonomous microgrid system.

TABLE 1 : GPSO-GM AND PSO PARAMETERS

Method	Pop. Size	$c_1 = c_2$	$r_1 = r_2$	w	$\rho(0)$	P_n
GPSO-GM	12	1	1	0.9	1.0	0.5

The load pattern of the present year is given in [Fig. 4]. Different types of wind turbine, PV panels and battery banks are available commercially. Characteristics of different types of these sources are taken from (Eroglu et al, 2011) and are demonstrated in [Table 2]. The investment and installation cost of wind turbines is studied to be 1950 \$/kW of its rated power (Daly and Morrison, 2001). The maintenance cost of wind turbines is considered to be 0.06 \$/kWh of output power. The total cost of 4700 \$/kW is studied for investment and installation costs of PV panels. The maintenance cost of PV panels is 23 \$/kW of the rated power of PV panels. PV area is restricted to 100m² in the simulations. The characteristic and cost of batteries are taken from (Eroglu et al, 2011), (Phaesun, 2009). The lifetime of batteries is considered to be 4 years (Phaesun, 2009). The total investment and installation costs of diesel generator is considered as 900 \$/kW. The operation and maintenance costs of diesel generator are assumed to be 0.05 \$/kWh and 0.02 \$/kWh, respectively based on (Daly and Morrison, 2001).

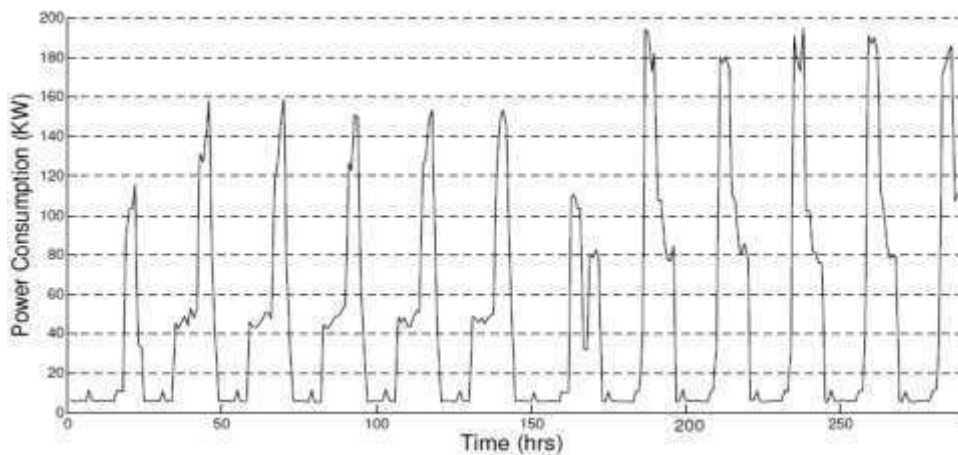


Fig. 4: Load pattern of the 69-bus (each 24 hours representing one month).

Table 2. Characteristics of different types of sources a. Wind Turbine Generator

Type	1	2	3	4
V_{ci} (m/s)	3.5	3	2.5	3
V^{rated} (m/s)	13	12	10	7.4
V_{co} (m/s)	35	28	24	26
P_w^{rated} (kw)	2.4	5	10	25
Tower height (m)	10.6	14	18	27
Rotor diameter(m)	3.72	5.5	9.7	10.8

b. PV panels

Type	1	2	3	4
V^{max} (V)	17.6	17.8	18	18.3
P_w^{rated} (kw)	0.125	0.130	0.135	0.140
Efficiency(%)	16	16	16	16
Efficiency of inverter (%)	95	95	95	95

c. Battery Banks

Type	1	2	3	4
V^{max} (V)	6	6	12	12
Capacity (Ah)	120	150	140	180
Efficiency(%)	85	85	85	85
Cost (\$/kw)	348	415	521	567

The characteristic of the best solution obtained by the proposed technique is presented in [Table 3]. The power generation of the wind turbines, that includes 10 turbines from type 3 and 10 from type 4, is shown in [Fig. 5]. As mentioned earlier the wind turbine generation depends on the wind speed at different hours of the planning horizon as well as their nominal power. The power generation of the PV panels, that includes 43 panels from type 2, is depicted in [Fig. 6]. As it can be seen from [Fig. 5] and comparing it to [Fig. 4] there are times in which the output power of wind turbines is more than the load at that time. The extra power is stored in battery banks during such times. The power stored in battery banks is shown in [Fig. 7]. It should be noted that considering the $SOC_{Min}=50\%$ constraint of the battery banks only half of the power stored in battery banks is available. The initial value of SOC of the batteries is studied to be SOC_{Min} . Fig. 8 presents the power generation of the diesel generator. The diesel generator contributes mostly in power generation only in fall and winter as shown in [Fig. 8] due to low solar irradiance and decrease in wind speed. [Table 4] shows a compression of supplying microgrid power via hybrid of RES, diesel and grid. The result show where the use of RES for supplying microgrid power cause to generation costs has been reduced.

Table 3: Characteristics of the best solution obtained by the GPSO-GM

Source	Size(kw)	Inv. & Ins. Cost(\$)	Gen. Cost (\$/Year)	Maintenance Cost (\$/Year)
PV	5.59	26273	0	128.57
Wind	350	682500	0	81879.096
Battery	616.80	170836.1454	0	0
Diesel	195.2508	175725.7054	1638.7855	655.5142

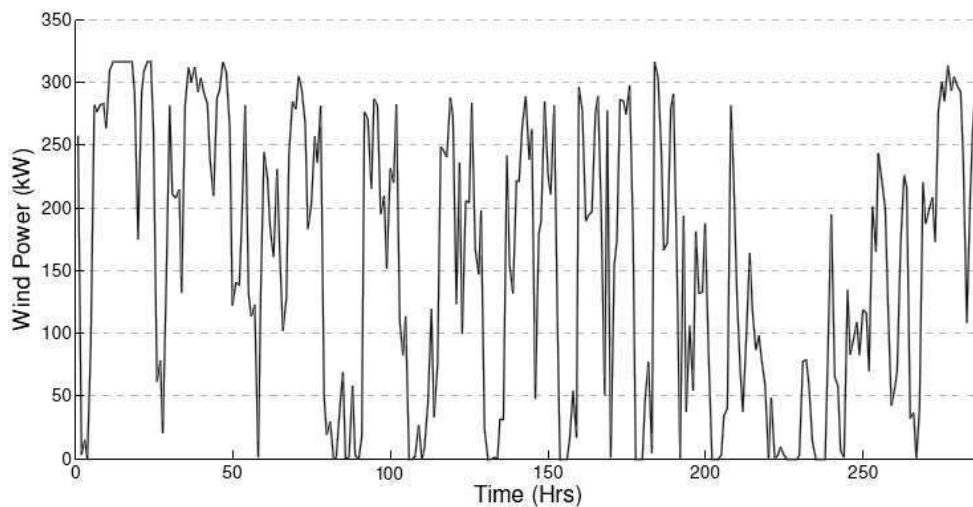


Fig . 5: Wind turbines power generation.

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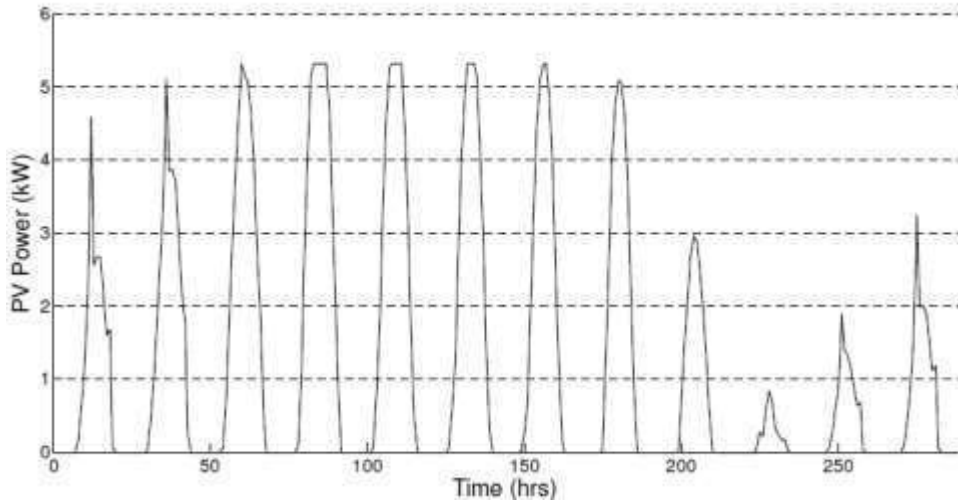


Fig. 6: Power output of the PV panels.

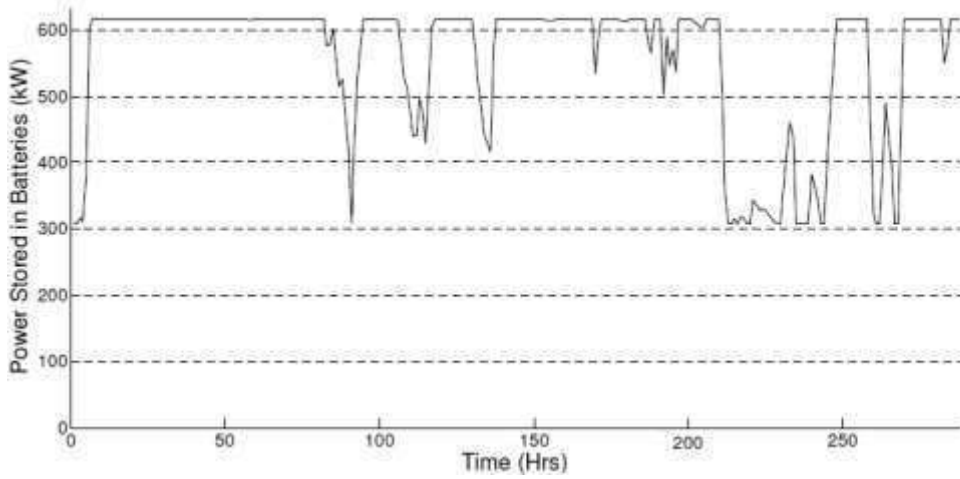


Fig. 7: Power stored in batteries.

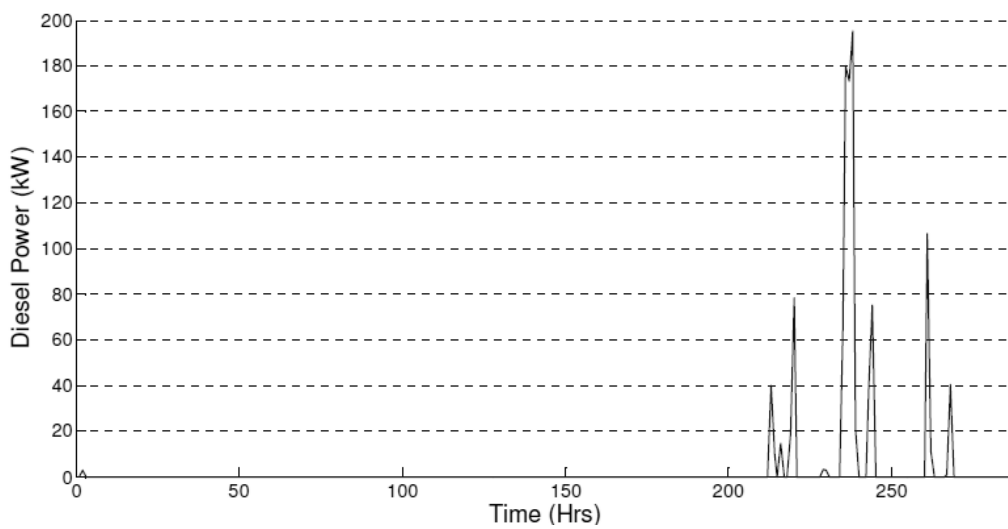


Fig. 8: Power output of the diesel generator.

Table 4: Characteristics of the best solution obtained by the GPSO-GM

Source	Inv. & Ins. Cost(\$/Year)	Gen. Cost (\$/Year)	Maintenance Cost (\$/Year)	Cost of Power(\$/kwh)
PV/ Wind / Battery/ Diesel	247629.7299	1638.7855	82663.1811	0.792055175
Diesel	36086.4212	20953.8241	8381.529640	0.156109392
Grid	1000109.897	29335.3537	4190.7648	2.466461517

CONCLUSION

In this paper, the possibility of covering the total energy needs of an autonomous microgrid exclusively with hybrid energy system including PV, wind, battery banks and diesel generator is investigated. This paper focused on the proper and precise modeling of each power source from operational and financial perspectives. An operating strategy is proposed which aims at maximization of the share of renewable sources in energy provision. According to the results of the simulations, the proposed system is able to completely satisfy the electricity demands of the microgrid. The results also demonstrate the effectiveness of proposed formulation and optimization method in finding the optimum design. The economic evaluation undertaken demonstrates that the investment is quite attractive in comparison to the other options. The socio-economic benefits of such hybrid energy production strategy can be the subject of the future works since they contribute to regional sustainable development by creation of job opportunities and by reduction of harmful emissions related with the fossil fuels' combustion. They also show that both battery banks and diesel generator together lead to a more optimum design with respect to the designs in which only diesel generator or battery banks are used to support the renewable resources. This model demonstrates that different renewable sources can be used simultaneously to power off-grid practical applications. Also, to solve the developed optimization problem a new method, GPSO-GM, was proposed.

CONFLICT OF INTEREST

There is no conflict of interest.

ACKNOWLEDGEMENTS

None

FINANCIAL DISCLOSURE

None

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ARTICLE

MOVING FRAME EQUATIONS IN THE THREE DIMENSIONAL GENERAL INNER PRODUCT SPACE

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ABSTRACT

In this paper, we are going to generalize the Frenet-Serret formulas for the moving frames in the three dimensional space R^3 , in the case that the whole space admits the general form of inner product.

INTRODUCTION

KEY WORDS

Covariant derivative;
Moving frame; Vector
field

Vectors are used widely in physics and engineering to describe forces, velocities, angular momentum, and many other concepts. To obtain a definition that is both practical and precise, we shall describe an "arrow" in R^3 by giving its starting point p and the change, or vector v , necessary to reach its end point $p + v$. Strictly speaking, v is just a point of R^3 . A tangent vector v_p to R^3 consists of two points of R^3 , its vector part v and its point of application p .

A vector field V on R^3 is a map that assigns to each point p of R^3 a tangent vector $V(p)$ to R^3 at p . There is a natural algebra of vector fields. At each point p , the values $V(p)$ and $W(p)$ are in the same vector space, the tangent space $T_p R^3$, consequently, the formula for the addition is the same as for addition of maps, $(V + W)(p) = V(p) + W(p)$ or all $p \in R^3$.

If f is a real-valued map on R^3 and V is a vector field on R^3 , then fV is defined to be the vector field on R^3 such that $(fV)(p) = f(p)V(p)$ for all $p \in R^3$. Let f be a differentiable real-valued map on R^3 , and let v_p be a tangent vector to R^3 , then the number $v_p[f] = \frac{d}{dt}f(p + tv)|_{t=0}$ is called the derivative of f with respect to v_p . It can be seen that, if $v_p = (v_1, v_2, v_3)_p$ is a tangent vector to R^3 , then $v_p[f] = \sum v_i \frac{\partial f}{\partial x_i}(p)$ [1].

If f and g be maps on R^3 , v_p and w_p tangent vectors, a and b numbers, then

$$(av_p + bw_p)[f] = av_p[f] + bw_p[f], v_p[af + bg] = av_p[f] + bv_p[g], v_p[fg] = v_p[f]g(p) + f(p)v_p[g].$$

For a vector field V , $V[f]$ is the real-valued map whose value at each point p is the number $V(p)[f]$. Similarly, if f, g, h are real-valued maps V, W , are vector fields on R^3 , and $a, b \in R$, then

$$(fV + gW)[h] = fV[h] + gW[h], V[af + bg] = aV[f] + bV[g], V[fg] = V[f]g + fV[g].$$

Replacing f by a vector field W on R^3 gives a vector field $t \rightarrow W(p + tv)$ on the smooth trajectory $t \rightarrow p + tv$. Then the derivative of W with respect to v will be the derivative of $t \rightarrow W(p + tv)$ at $t = 0$. In fact, if W be a vector field on R^3 , and v be a tangent vector field to R^3 at the point p , then the covariant derivative of W with respect to v is the tangent vector $\nabla_v W(p) = \frac{d}{dt}W(p + tv)|_{t=0}$. Evidently $\nabla_v W(p)$ measures the initial rate of change of $W(p)$ as p moves in the v direction. If U_1, U_2 , and U_3 be the vector fields on R^3 and $W = \sum w_i U_i$ is a vector field on R^3 , and v is a tangent vector at p , then $\nabla_v W(p) = \sum v_p[w_i]U_i(p)$.

Moreover, if v and w be tangent vectors to R^3 at p , and let Y and Z be vector fields on the general inner product space (R^3, σ) , then for numbers a, b and map f , we have

$$\nabla_{(av+bw)}Y(p) = a\nabla_v Y(p) + b\nabla_w Y(p), \nabla_v(aY + bZ)(p) = a\nabla_v Y(p) + b\nabla_v Z(p), \nabla_v(fY)(p) = v_p[f]Y(p) + f(p)\nabla_v Y(p), v_p[\sigma(Y, Z)] = \sigma(\nabla_v Y(p), Z(p)) + \sigma(Y(p), \nabla_v Z(p)).$$

Using the point wise principle, we can take the covariant derivative of a vector field W with respect to a vector field V , rather than a single tangent vector v . The result is the vector field $\nabla_V W$ whose value at each point p is $\nabla_{V(p)} W$.

It follows immediately from above considerations that if $W = \sum w_i U_i$, then $\nabla_V W = \sum V[w_i]U_i$. If f, g be differentiable maps, $a, b \in R$ and V, W, Y , and Z be vector fields on R^3 , then as a result of the preceding identities we have, $\nabla_{(fV+gW)}Y = f\nabla_V Y + g\nabla_W Y$, $\nabla_V(aY + bZ) = a\nabla_V Y + b\nabla_V Z$, $\nabla_V(fY) = V[f]Y + f\nabla_V Y$, $V(\sigma(Y, Z)) = \sigma(\nabla_V Y, Z) + \sigma(Y, \nabla_V Z)$ [1].

Frenet- Serret's essential idea was very simple: To each point of a smooth trajectory, a frame is assigned, then using orthonormal expansion expresses the rate of change of the frame in terms of the frame itself. This, of course, is just what the Frenet- Serret formulas do in the case of a smooth trajectory [1, 2].

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In the next, we shall carry out this scheme for the inner product space (R^3, σ) . We shall see that geometry of smooth trajectories and surfaces in (R^3, σ) is not merely an analogue, but actually a corollary, of these basic results [2].

THE METHOD OF MOVING FRAMES

If $A(p) = (p, a(p))$ and $B(p) = (p, b(p))$ are vector fields on R^3 , then the inner product $\sigma(A, B)$ of A and B is the differentiable real-valued map on R whose value at each point p is $\sigma(a(p), b(p))$. The norm $\|A\|$ of A is the real-valued map on R^3 whose value at p is $\|a(p)\|$.

Vector fields T_1, T_2, T_3 on (R^3, σ) constitute a frame field on (R^3, σ) provided where $\sigma(T_i, T_j) = \delta_{ij}$ ($1 \leq i, j \leq 3$) where δ_{ij} is the Kronecker delta [3].

The following useful result is an immediate consequence of orthonormal expansion [3].

Lemma 3.1. Let T_1, T_2, T_3 be a frame field on (R^3, σ) . If V is a vector field on R^3 , then $V = \sum f_i T_i$, where the maps $f_i = \sigma(V, T_i)$. If $V = \sum f_i T_i$ and $W = \sum g_i T_i$, then $\sigma(V, W) = \sum f_i g_i$. In particular, $\|V\| = \sqrt{\sum f_i^2}$.

THE COVARIANT DERIVATIVE OF A FRENET FIELD

The Frenet-Serret formulas express the derivatives of T, N, B in terms of T, N, B , and thereby define curvature and torsion. We shall now do the same thing with an arbitrary frame field T_1, T_2, T_3 on (R^3, σ) , namely, express the covariant derivatives of these vector fields in terms of the vector fields themselves. We begin with the covariant derivative with respect to an arbitrary tangent vector v at a point p . Then $\nabla_v T_i = \sum c_{ij}(v) T_j(p)$ for $i, j = 1, 2, 3$. By orthonormal expansion the coefficients of these equations are $c_{ij}(v) = \sigma(\nabla_v T_i, T_j(p))$. A 1-form f on R^3 is a real-valued map on the set of all tangent vectors to R^3 such that f is linear at each point [4].

Lemma 4.1. Let T_1, T_2, T_3 be a frame field on (R^3, σ) . For each tangent vector v to R^3 at the point p , let $c_{ij}(v)$ be defined as above. Then each c_{ij} is a 1-form, and $c_{ij} + c_{ji} = 0$.

Proof. By definition, c_{ij} is a real-valued map on tangent vectors, so to verify that c_{ij} is a 1-form, it suffices to check the linearity condition. Using above considerations, we get,

$$\begin{aligned} c_{ij}(av + bw) &= \sigma(\nabla_{av+bw} T_i, T_j(p)) = \sigma(a \nabla_v T_i + b \nabla_w T_i, T_j(p)) \\ &= a \sigma(\nabla_v T_i, T_j(p)) + b \sigma(\nabla_w T_i, T_j(p)) = a c_{ij}(v) + b c_{ij}(w). \end{aligned}$$

To prove that $c_{ij} + c_{ji} = 0$ we show that $c_{ij}(v) + c_{ji}(v) = 0$ for every tangent vector v . By definition of frame field, $\sigma(T_i, T_j) = \delta_{ij}$, and since each Kronecker delta has constant value 0 or 1, then $v[\sigma(T_i, T_j)] = 0$, so the above considerations yields $\sigma(\nabla_v T_i, T_j(p)) + \sigma(T_i(p), \nabla_v T_j) = 0$ and the proof is complete [1, 5].

The definition $c_{ij}(v) = \sigma(\nabla_v T_i, T_j(p))$ shows that $c_{ij}(v)$ is the initial rate at which T_i rotates toward T_j as p moves in the v direction. Thus the 1-forms c_{ij} contain this information for all tangent vectors to R^3 .

Theorem 4.2. For any vector field V on (R^3, σ) , $\nabla_V T_i = \sum c_{ij}(V) T_j$ ($1 \leq i, j \leq 3$). In expanded form, $\nabla_V T_1 = c_{12}(V) T_2 + c_{13}(V) T_3$, $\nabla_V T_2 = -c_{12}(V) T_1 + c_{23}(V) T_3$, $\nabla_V T_3 = -c_{13}(V) T_1 - c_{23}(V) T_2$.

Proof. Let i be fixed and $p \in R^3$, then according to the previous considerations $\nabla_{V(p)} T_i = \sum c_{ij}(V(p)) T_j(p)$, so $\nabla_V T_i = \sum c_{ij}(V) T_j$. When $i = j$, the skew-symmetry condition $c_{ij} + c_{ji} = 0$ becomes $c_{ii} = 0$ for $i = 1, 2, 3$. Hence this condition has the effect of reducing the nine 1-forms c_{ij} for $1 \leq i, j \leq 3$ to essentially only three, say c_{12}, c_{13}, c_{23} .

Thus in expanded form, the equations in Theorem 3.2, called moving frame equations, become $\nabla_V T_1 = c_{12}(V) T_2 + c_{13}(V) T_3$, $\nabla_V T_2 = -c_{12}(V) T_1 + c_{23}(V) T_3$, $\nabla_V T_3 = -c_{13}(V) T_1 - c_{23}(V) T_2$.

These equations play a fundamental role in all the differential geometry of (R^3, σ) . The following theorem explains that they are generalized form of Frenet-Serret formulas,

Theorem 4.3. Let β be a unit-speed smooth trajectory in (R^3, σ) with $\kappa > 0$, and suppose that T_1, T_2, T_3 is a frame field on (R^3, σ) such that the restriction of these vector fields to β gives the generalized Frenet-Serret frame field T, N, B of β . Then $c_{12}(T) = \kappa$, $c_{13}(T) = 0$, $c_{23}(T) = \tau$.

Proof. First of all not that, if W be a vector field defined on a region containing a regular smooth trajectory α , then $W_\alpha: t \rightarrow W(\alpha(t))$, the vector field on α , satisfies $\nabla_{\alpha'(t)} W = (W_\alpha)'(t)$. Thus using the generalized Frenet-Serret formulas in [2] implies that

$$\begin{aligned}
 c_{12}(T) &= \sigma(\nabla_T T, N(p)) = \sigma(\nabla_{\beta'(t)} T, N(p)) = \sigma((T_\beta)'(t), N(p)) \\
 &= \sigma(\kappa N(p), N(p)) = \kappa, \\
 c_{13}(T) &= \sigma(\nabla_T B, B(p)) = \sigma(\nabla_{\beta'(t)} B, B(p)) = \sigma((B_\beta)'(t), B(p)) \\
 &= \sigma(-\tau N(p), B(p)) = 0, \\
 c_{23}(T) &= \sigma(\nabla_T N, B(p)) = \sigma(\nabla_{\beta'(t)} N, B(p)) = \sigma((N_\beta)'(t), B(p)) \\
 &= \sigma(-\kappa T(p) + \tau B(p), B(p)) = \tau.
 \end{aligned}$$

Corollary 4.4. Let β be a unit-speed smooth trajectory in (R^3, σ) with $\kappa > 0$, and suppose that T_1, T_2, T_3 is a frame field on (R^3, σ) such that the restriction of these vector fields to b gives the General Frenet- Serret frame field T, N, B of β corresponding to σ . Then $\nabla_T T = \kappa N, \nabla_T N = -\kappa T + \tau B, \nabla_T B = -\tau B$.

Since each regular smooth trajectory in (R^3, σ) has a unit speed reparametrization [2], we have,

Corollary 4.5. Let β be a smooth trajectory in (R^3, σ) with $\kappa > 0$, and suppose that T_1, T_2, T_3 is a frame field on (R^3, σ) such that the restriction of these vector fields to b gives the general Frenet- Serret frame field T, N, B of β corresponding to σ . Then $\nabla_T T = \kappa v N, \nabla_T N = -\kappa v T + \tau v B, \nabla_T B = -\tau v B$.

APPLICATIONS TO GRAVITATIONAL FIELD

Let r, θ, z be the usual cylindrical coordinate maps on R^3 . We shall pick a unit vector field in the direction in which each coordinate increases when the other two are held constant. For r this is evidently $T_1 = (x\sqrt{(x^2 + y^2)^{-1}}, y\sqrt{(x^2 + y^2)^{-1}}, 0)$ pointing straight out from the z axis. Then $T_2 = (-y\sqrt{(x^2 + y^2)^{-1}}, x\sqrt{(x^2 + y^2)^{-1}}, 0)$ points in the direction of increasing θ . Finally, the direction of z is, of course, straight up, so $T_3 = (0, 0, \frac{1}{\sqrt{z}})$. It is easy to check that $\sigma(T_i, T_j) = \delta_{ij}$ for σ defined as in [2], so this is a frame field defined on all of R^3 except the z axis. We call it the cylindrical frame field on R^3 [6].

For an arbitrary differentiable vector field V , a computation yields

$$\begin{aligned}
 \nabla_V T_1 &= (-y\sqrt{(x^2 + y^2)^{-1}}v_1 + x\sqrt{(x^2 + y^2)^{-1}}v_2)T_2, \nabla_V T_2 = (y\sqrt{(x^2 + y^2)^{-1}}v_1 - x\sqrt{(x^2 + y^2)^{-1}}v_2)T_1, \\
 \nabla_V T_3 &= 0.
 \end{aligned}$$

In a similar way, a frame field J_1, J_2, J_3 can be derived from the spherical coordinate functions ρ, θ, φ on R^3 [6]. The unit vector field J_1 , in the direction of increasing ρ , points straight out from the origin; hence it can be expressed as

$$J_1 = (x\sqrt{(x^2 + y^2 + z^2)^{-1}}, y\sqrt{(x^2 + y^2 + z^2)^{-1}}, z\sqrt{(x^2 + y^2 + z^2)^{-1}}).$$

Similarly, the vector field for increasing θ and φ are

$$\begin{aligned}
 J_2 &= (-y\sqrt{(x^2 + y^2)^{-1}}, x\sqrt{(x^2 + y^2)^{-1}}, 0), \\
 J_3 &= (-xz\sqrt{(x^2 + y^2)^{-1}(x^2 + y^2 + z^2)^{-1}}, -yz\sqrt{(x^2 + y^2)^{-1}(x^2 + y^2 + z^2)^{-1}}, \sqrt{(x^2 + y^2)[2(x^2 + y^2 + z^2)]^{-1}}),
 \end{aligned}$$

respectively.

By repeated use of the fundamental identity in trigonometry, we check that J_1, J_2, J_3 is a frame field in (R^3, σ) , called the spherical frame field on R^3 , in which σ is defined as in [2]. Its actual domain of definition is R^3 minus the z axis, as in the cylindrical case.

Newton's law of gravitation states that a body of mass m_1 exerts a force on a body of mass m_2 . The magnitude of the force is $Gm_1m_2r^{-2}$, where r is the distance between their centers of gravity and G is a constant. The direction of the force on m_2 is from m_2 to m_1 . Thus if m_1 lies at the origin of S , and m_2 lies at $x \in S$, the force on m_2 is $-Gm_1m_2\sqrt{(x^2 + y^2 + z^2)^{-3}}(x, y, z)$. We must now face the fact that both bodies will move. However, if m_1 is much greater than m_2 , its motion will be much less since acceleration is inversely proportional to mass.

We therefore make the simplifying assumption that one of the bodies does not move, in the case of planetary motion, of course it is the sun that is assumed at rest. One might also proceed by taking the center of mass at the origin, without making this simplifying assumption. Let now the sun is at the origin of S and consider the vector field corresponding to a planet of given mass m .

This field is then $V(x, y, z) = -c\sqrt{(x^2 + y^2 + z^2)^{-3}}(x, y, z)$ where c is a non-zero constant. Therefore, $\nabla_V T_1 = \nabla_V T_2 = \nabla_V T_3 = 0$. i.e., the initial rate at which each unit vector field in cylindrical coordinate rotates toward another one, as point moves in the direction of gravitational field in (R^3, σ) , is zero. For an arbitrary differentiable vector field V , a similar computation yields, $c_{23} = -yz\sqrt{(x^2 + y^2 + z^2)^{-1}}v_1 + xz\sqrt{(x^2 + y^2 + z^2)^{-1}}v_2$. Therefore, for the gravitational field $c_{23} = 0$, i.e., the initial rate at which the unit vector field J_2 in spherical coordinate rotates toward J_3 , as point moves in the direction of gravitational field in (R^3, σ) , is zero.

CONFLICT OF INTEREST

There is no conflict of interest.

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None

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ARTICLE

ON THE SHAPE OF THE TRAJECTORY OF THE MOTION OF A PARTICLE IN THE THREE DIMENSIONAL GENERAL INNER PRODUCT SPACE

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ABSTRACT

In this paper we are going to establish some necessary and sufficient conditions for the shapes of the smooth trajectories of the motion of the moving particles in the three dimensional general inner product space.

INTRODUCTION

KEY WORDS

Inner product; Isometry; Frenet-Serret formulas

The Frenet-Serret formulas describe the kinematic properties of a particle moving along a smooth trajectory in the three dimensional Euclidean space R^3 , with usual inner product. More specifically, the formulas describe the derivatives of the tangent, normal, and binormal unit vectors in terms of each other.

In [1], using linear algebra, the Frenet-Serret formulas would be generalized to three dimensional Euclidean spaces with general inner product σ . In this paper, using the results obtained in mentioned reference, we would like to obtain some necessary and sufficient conditions for some kinds of smooth trajectories in terms of generalized Frenet-Serret formulas [1].

Note that a plane in the inner product space (R^3, σ) can be described as the union of all the perpendiculars to a given line at a given point. In vector language, the plane through p orthogonal to $q \neq 0$ consists of all points r in R^3 such that $\sigma(r - p, q) = 0$.

BASIC PROPERTIES

In the following theorem, a necessary and sufficient condition that a unit-speed smooth trajectory lies in a plane, would be determined.

Theorem 2.1. Let β be a unit-speed smooth trajectory in (R^3, σ) with $\kappa > 0$. Then β is a plane smooth trajectory if and only if $\tau = 0$.

Proof. Suppose β is a plane smooth trajectory. Then by the above considerations, there exist points p and q such that $\sigma(\beta(s) - p, q) = 0$ for all s . Differentiation yields $\sigma(\beta'(s), q) = \sigma(\beta''(s), q) = 0$. Thus q is always σ orthogonal to $T = \beta'$ and $N = \kappa^{-1}\beta''$. But B is also σ orthogonal to T and N , so, since B has unit length, $B = \pm \|q\|^{-1}q$. Thus $B' = 0$, and by definition $\tau = 0$. Conversely, suppose $\tau = 0$. Thus $B' = 0$; that is, B is parallel and may thus be identified with a point of R^3 . We assert that β lies in the plane through $\beta(0)$ orthogonal to B . To prove this, consider the real valued function $f(s) = \sigma(\beta(s) - \beta(0), B)$ for all s . Then $f'(s) = 0$, but obviously, $f(0) = 0$, so f is identically zero. Thus β lies entirely in this plane orthogonal to the (parallel) binormal of β .

A circle of center $p \in R^3$ and radius $a \geq 0$ in (R^3, σ) consist of all is the set of all $w \in R^3$ such that $(w - p, w - p) = a^2$. Let $\bar{i}, \bar{j} \in R^3$ are two σ orthonormal vectors. The equation of a circle of radius a in (R^3, σ) is given by $\beta(s) = a \cos(a^{-1}s)\bar{i} + a \sin(a^{-1}s)\bar{j}$. Then $\beta'(s) = -a^{-1} \cos(a^{-1}s)\bar{i} - a^{-1} \sin(a^{-1}s)\bar{j}$, $\kappa(s) = \sqrt{\sigma(\beta'(s), \beta'(s))} = a^{-1}$. Therefore, β is a unit-speed smooth trajectory with $\kappa = a^{-1}$, $N(s) = \cos(a^{-1}s)\bar{i} - \sin(a^{-1}s)\bar{j}$ and a circle of radius a has curvature a^{-1} .

Furthermore, the formula given there for the principal normal shows that for a circle, N always points toward its center. This suggests how to prove the following converse.

Theorem 2.2. If β is a unit-speed smooth trajectory with constant curvature $\kappa > 0$ and torsion zero, then β is part of a circle in (R^3, σ) of radius κ^{-1} .

Proof. Since $\tau = 0$, β is a plane smooth trajectory. What we must now show is that every point of β is at distance κ^{-1} from some fixed point, which will be the center of the circle. Consider the smooth trajectory $= \beta + \kappa^{-1}N$. Using the hypothesis on β , and a Frenet-Serret formula in (R^3, σ) , we find $\gamma' = \beta' +$

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$\kappa^{-1}N' = T + \kappa^{-1}(-\kappa T + \tau B) = 0$. Hence the smooth trajectory γ is constant; that is, $\beta(s) + \kappa^{-1}N(s)$ has the same value, say c , for all s . But the distance from c to $\beta(s)$ is

$$d(c, \beta(s)) = \|c - \beta(s)\| = \sqrt{\sigma(c - \beta(s), c - \beta(s))} = \sqrt{\sigma(\kappa^{-1}N(s), \kappa^{-1}N(s))} = \kappa^{-1}.$$

In principle, every geometric problem about smooth trajectories in (R^3, σ) can be solved by means of the Frenet-Serret formulas corresponding to σ . In simple cases it may be just enough to record the data of the problem in convenient form, differentiate, and use the Frenet-Serret formulas in (R^3, σ) . For example, suppose β is a unit-speed smooth trajectory that lies entirely in the sphere S of radius a centered at $c \in R^3$.

To stay in the sphere, β must smooth trajectory; in fact it is a reasonable guess that the minimum possible curvature occurs when β is on a great circle of S . Such a circle has radius a , so we conjecture that:

Theorem 2.3. A unit-speed spherical smooth trajectory β has curvature $\kappa \geq a^{-1}$, where a is the radius of its sphere in (R^3, σ) .

Proof. Since every point of has distance a from c , the center of the sphere, we have $\sigma(\beta - c, \beta - c) = a^2$. Differentiation yields $\sigma(\beta - c, \beta') = 0$, that is, $\sigma(\beta - c, T) = 0$. Another differentiation gives $\sigma(\beta', T) + \sigma(\beta - c, T') = 0$, and by using a Frenet-Serret formula we get $\sigma(T, T) + \sigma(\beta - c, \kappa N) = 0$; hence $\kappa\sigma(\beta - c, N) = -1$. By the Schwarz inequality, $\kappa^{-1} = |\sigma(\beta - c, N)| \leq \|\beta - c\| \cdot \|N\| = a$ and we obtain the required result.

Continuation of this procedure leads to a necessary and sufficient condition expressed in terms of curvature and torsion for a smooth trajectory to be spherical, that is, lie on some sphere in (R^3, σ) .

Theorem 2.4. Let β be a unit-speed smooth trajectory with $\kappa > 0, \tau \neq 0$ in (R^3, σ) . (a) If β lies on a sphere of center c and radius a , then $\beta - c = -\kappa^{-1}N - (\kappa^{-1})'\tau^{-1}B$, and $a^2 = \kappa^{-2} + [(\kappa^{-1})'\tau^{-1}]^2$. Conversely, if $a^2 = \kappa^{-2} + [(\kappa^{-1})'\tau^{-1}]^2$ and $(\kappa^{-1})' \neq 0$, then β lies on a sphere of radius a .

Proof. As in the proof of Theorem 2.3, $\sigma(\beta - c, T) = 0, \sigma(\beta - c, N) = -\kappa^{-1}$. Again differentiation using Frenet-Serret formulas yields $\sigma(\beta', N) + \sigma(\beta - c, -\kappa T + \tau B) = -(\kappa^{-1})'$, or $\sigma(\beta - c, B) = -(\kappa^{-1})'\tau^{-1}$. Since $\beta - c = \sigma(\beta - c, T)T + \sigma(\beta - c, N)N + \sigma(\beta - c, B)B$, we have $\beta - c = -\kappa^{-1}N - (\kappa^{-1})'\tau^{-1}B$. But N and B are σ orthonormal, so

$$a^2 = \|\beta - c\|^2 = \|- \kappa^{-1}N - (\kappa^{-1})'\tau^{-1}B\|^2 = \sigma(-\kappa^{-1}N - (\kappa^{-1})'\tau^{-1}B, -\kappa^{-1}N - (\kappa^{-1})'\tau^{-1}B) = \kappa^{-2} + [(\kappa^{-1})'\tau^{-1}]^2.$$

Conversely, let $a^2 = \kappa^{-2} + [(\kappa^{-1})'\tau^{-1}]^2$ and $(\kappa^{-1})' \neq 0$, differentiation yields $\kappa^{-1}\tau + \tau^{-1}(\kappa^{-1})'' + (\kappa^{-1})'(\tau^{-1})' = 0$. Define $\gamma = \beta + \kappa^{-1}N + (\kappa^{-1})'\tau^{-1}B$, a computation using preceding results yields $\gamma' = 0$, therefore $\beta + \kappa^{-1}N + (\kappa^{-1})'\tau^{-1}B = c$ for some constant $c \in R^3$.

Theorem 2.5. If δ be the spherical image of the unit-speed smooth trajectory β in (R^3, σ) , then $\kappa_\delta \geq \kappa_\beta$.

Proof. The spherical image of a unit-speed smooth trajectory β in (R^3, σ) is the smooth trajectory $\delta = T_\beta = \beta'$ with the same Euclidean coordinates. Thus δ , lies on the unit sphere S , and the motion of δ represents the turning of β . The equation of δ implies that $T_\delta = \delta' = T'_\beta = \kappa_\beta N_\beta$, so the speed of δ is equal to the curvature of β , i.e., $v_\delta = \kappa_\beta$. Moreover, $T'_\delta = \delta'' = T''_\beta = (\kappa_\beta N_\beta)' = \kappa'_\beta N_\beta + \kappa_\beta N'_\beta = \kappa'_\beta N_\beta + \kappa_\beta(-\kappa_\beta T_\beta + \tau_\beta B_\beta) = -\kappa_\beta^2 T_\beta + \kappa'_\beta N_\beta + \kappa_\beta \tau_\beta B_\beta$. So $T'_\delta = \kappa_\delta v_\delta N_\delta$ implies that $\kappa_\delta^4 + (\kappa'_\beta)^2 + \kappa_\beta^2 \tau_\beta^2 = \kappa_\delta^2 \kappa_\beta^2$, and $\kappa_\delta \geq \kappa_\beta$.

Definition 2.6. A unit-speed smooth trajectory β in (R^3, σ) is a helix provided the unit tangent T of β has non zero constant value with some fixed σ unit vector.

Theorem 2.7. A unit-speed smooth trajectory β with $\kappa > 0$ in (R^3, σ) is a helix if and only if the ratio $\kappa^{-1}\tau$ is non zero constant.

Proof. It suffices to consider the case where α has unit speed. If α is a helix with $\sigma(T(s), U) = c \neq 0$, then $0 = \sigma(T'(s), U) = \kappa\sigma(N, U)$. Since $\kappa > 0$, we conclude that $\sigma(N(s), U) = 0$. Thus for each s , U lies in the plane determined by $T(s)$ and $B(s)$. Orthonormal expansion yields $U = \sigma(U, T)T + \sigma(U, B)B$ and $\sigma(U, T)^2 + \sigma(U, B)^2 = 1$, so $\sigma(U, B)$ is also constant. By differentiating and applying Frenet-Serret formulas in (R^3, σ) , we obtain $0 = \sigma(U, T)T' + \sigma(U, B)B' = (\kappa\sigma(U, T) - \tau\sigma(U, B))N$. Hence $\kappa\sigma(U, T) = \tau\sigma(U, B)$, so that $\kappa^{-1}\tau$ has non zero constant value $\sigma(U, B)^{-1}\sigma(U, T)$. Conversely, suppose that $\kappa^{-1}\tau$ is non zero constant. If $V = \kappa^{-1}\tau T + B$ we find $\|V\| = \sqrt{1 + \kappa^{-2}\tau^2} > 1$ and $V' = \kappa^{-1}\tau T' + B' = 0$. This parallel vector field V determines a unit vector $U = \|V\|^{-1}V$, such that $\sigma(U, T) = \sigma(\|V\|^{-1}V, T) = \|V\|^{-1}\sigma(V, T) = (\kappa^{-1}\tau)\sqrt{(1 + \kappa^{-2}\tau^2)^{-1}}$, so β is a helix.

GEOMETRY OF THE GENERAL INNER PRODUCT SPACES

We recall some familiar features of plane geometry. First of all, two triangles are congruent if there is a rigid motion of the plane that carries one triangle exactly onto the other. Corresponding angles of congruent triangles are equal, corresponding sides have the same length; the areas enclosed are equal, and so on. Indeed, any geometric property of a given triangle is automatically shared by every congruent triangle.

Conversely, there are a number of simple ways in which one can decide whether two given triangles are congruent, for example, if for each the same three numbers occur as lengths of sides. In this section we shall investigate the isometries of the inner product space, and see how these remarks about triangles can be extended to other geometric objects in (R^3, σ) .

The inner product of points $p = (p_1, p_2, p_3)$ and $q = (q_1, q_2, q_3)$ in R^3 is a number $\sigma(p, q)$ with the following three properties: (1) Bilinearity: $\sigma(ap + bq, r) = a\sigma(p, r) + b\sigma(q, r)$, $\sigma(r, ap + bq) = a\sigma(r, p) + b\sigma(r, q)$, for p, q and r are arbitrary points of R^3 , and a and b are number (2) Symmetry: $\sigma(p, q) = \sigma(q, p)$, for arbitrary points p, q of R^3 (3) Positive definiteness: $\sigma(p, p) \geq 0$, and $\sigma(p, p) = 0$ if and only if $p = 0$.

The norm of a point $p \in R^3$ is the number $\|p\| = \sqrt{\sigma(p, p)}$. The norm is thus a real-valued function on R^3 , it has the fundamental properties $\|p + q\| \leq \|p\| + \|q\|$ and $\|ap\| = |a| \|p\|$ where $|a|$ is the absolute value of the number a . The distance between two points p and q in R^3 is defined by $d(p, q) = \|p - q\|$ [2].

An isometry of the inner product space is a mapping that preserves the distance d between points, i.e., a mapping $F: R^3 \rightarrow R^3$ such that $d(p, q) = d(F(p), F(q))$ for all points p, q in R^3 . An orthogonal transformation of R^3 , is a linear transformation $C: R^3 \rightarrow R^3$ that preserves inner products in the sense that $\sigma(C(p), C(q)) = \sigma(p, q)$ for all p, q in R^3 . It can be seen easily that an orthogonal transformation is an isometry of R^3 . Moreover, if F is an isometry of R^3 such that $F(0) = 0$, then F is an orthogonal transformation.

If F is an isometry of R^3 , then there exists a unique translation T and a unique orthogonal transformation C such that $F = TC$ [3]. So, if T is translation by $a = (a_1, a_2, a_3)$, then $q = F(p)$ means $q = a + C(p)$, where by a standard result of linear algebra, a linear transformation of $C: R^3 \rightarrow R^3$ is orthogonal if and only if its matrix, $[c_{ij}]$, is (σ) orthogonal with respect to a σ orthonormal basis [4].

Theorem 3.1. Let $F: R^3 \rightarrow R^3$ be an isometry in (R^3, σ) with orthogonal part C . If $\beta = F \circ \alpha$, then $\beta' = C\alpha'$, $\beta'' = C\alpha''$, $\beta''' = C\alpha'''$. Moreover, $\alpha', \alpha'', \alpha'''$ and $\beta', \beta'', \beta'''$ are simultaneously linearly dependent.

Proof. If T is translation by a , then $\beta(t) = a + (C \circ \alpha)(t)$, now linearity of C and chain rule of differentiation [5] implies the theorem. The proof of the rest of the theorem is straightforward.

Theorem 3.2. Let $F: R^3 \rightarrow R^3$ be an isometry and β be a unit-speed smooth trajectory in (R^3, σ) , then $\bar{\beta} = F\beta$ is a unit-speed smooth trajectory in (R^3, σ) .

Proof. Let C be the σ orthogonal part of F . Then according to theorem 3.1, $\sigma(\bar{\beta}', \bar{\beta}') = \sigma(C\beta', C\beta') = \sigma(\beta', \beta') = 1$.

Theorem 3.3. Let $F: R^3 \rightarrow R^3$ be an isometry with orthogonal part C . Let β be a unit-speed smooth trajectory in (R^3, σ) with positive curvature, and let $\gamma = F\beta$. Then $\kappa_\gamma = \kappa_\beta$, $\tau_\gamma = \tau_\beta$, $T_\gamma = CT_\beta$, $N_\gamma = CN_\beta$, $B_\gamma = CB_\beta$.

Proof. Theorem 3.1 asserts that $T_\gamma = \gamma' = C\beta' = CT_\beta$. Therefore $\kappa_\gamma = \|T_\gamma'\| = \|\gamma''\| = \|C\beta''\| = \|CT_\beta'\| = \|C(\kappa_\beta N_\beta)\| = \kappa_\beta \|CN_\beta\| = \kappa_\beta$. For finding B_γ , as in [1] let $\bar{B}_\gamma = \gamma''' - \sigma(\gamma', \gamma''')\gamma' - \kappa_\gamma^{-2}\sigma(\gamma'', \gamma''')\gamma''$, then a computation using Theorem 3.1 yields

$$\bar{B}_\gamma = C\beta''' - \sigma(C\beta', C\beta''')C\beta' - \kappa_\beta^{-2}\sigma(C\beta'', C\beta''')C\beta'' = C(\beta''' - \sigma(\beta', \beta''')\beta' - \kappa_\beta^{-2}\sigma(\beta'', \beta''')\beta'') = C\bar{B}_\beta$$
. Thus $B_\gamma = \|\bar{B}_\gamma\|^{-1}\bar{B}_\gamma = \|C\bar{B}_\beta\|^{-1}C\bar{B}_\beta = CB_\beta$. We can now find the torsion function τ_γ of the smooth trajectory γ as defined in [1] to be the real-valued map such that $B_\gamma' = -\tau_\gamma N_\gamma$. As a result $C(-\tau_\beta N_\beta) = CB_\beta' = (CB_\beta)' = B_\gamma' = -\tau_\gamma N_\gamma = -\tau_\gamma CN_\beta = C(-\tau_\beta N_\beta)$ and so $\tau_\gamma = \tau_\beta$.

Smooth trajectories whose congruence is established by a translation are said to be parallel. Thus, smooth trajectories $\alpha, \beta: I \rightarrow R^3$ are parallel if and only if there is a point p in R^3 such that $\beta(s) = \alpha(s) + p$ for all s in I .

Remark 3.4. An argument, using elementary calculus shows that two smooth trajectories $\alpha, \beta: I \rightarrow R^3$ are parallel if their velocity vectors $\alpha'(s)$ and $\beta'(s)$ are parallel for each s in I . In this case, if $\alpha'(s_0) = \beta'(s_0)$ for some s_0 in I , then $\alpha = \beta$.

Definition 3.5. Two smooth trajectories $\alpha, \beta: I \rightarrow R^3$ are congruent provided there exists an isometry $F: R^3 \rightarrow R^3$ such that $\beta = F\alpha$.

The following theorem is an important converse of Theorem 3.3. The proof is parallel to a similar theorem in $(R^3, <, >)$ [6].

Theorem 3.6. If $\alpha, \beta: I \rightarrow R^3$ are unit-speed smooth trajectories with same torsions and same positive curvatures in (R^3, σ) , then α and β are congruent.

Proof. First of all, note that if two frames on R^3 , say u_1, u_2, u_3 at the point p and v_1, v_2, v_3 at the point q , there exists a unique isometry $F: R^3 \rightarrow R^3$ with orthogonal part C such that $C(u_i) = v_i$ for $i = 1, 2, 3$ [4]. Then consider a number, say t_0 , in the interval I . Let F be the isometry that carries the Frenet-Serret frame $T_\alpha(t_0), N_\alpha(t_0), B_\alpha(t_0)$ of α at $\alpha(t_0)$ to the Frenet-Serret frame $T_\beta(t_0), N_\beta(t_0), B_\beta(t_0)$ of β at $\beta(t_0)$. Denote the Frenet-Serret apparatus of $\bar{\alpha} = F\alpha$ by $\bar{\kappa}, \bar{\tau}, \bar{T}, \bar{N}, \bar{B}$, then it follows immediately from Theorem 3.3 and the above considerations that $\bar{\alpha}(t_0) = \beta(t_0), \bar{T}(t_0) = T_\beta(t_0), \bar{N}(t_0) = N_\beta(t_0), \bar{B}(t_0) = B_\beta(t_0), \bar{\kappa} = \kappa_\beta, \bar{\tau} = \tau_\beta$. Now since $\bar{\alpha}(t_0) = \beta(t_0)$, it will follow that $F\circ\alpha = \beta$. On the interval I , consider the real-valued function $f = \sigma(\bar{T}, T_\beta) + \sigma(\bar{N}, N_\beta) + \sigma(\bar{B}, B_\beta)$. Since these are unit vector fields, the Schwarz inequality shows that $f \leq 3$. Above considerations also imply that $f(0) = 3$. Now consider $f' = \sigma(\bar{T}', T_\beta) + \sigma(\bar{T}, T_\beta') + \sigma(\bar{N}', N_\beta) + \sigma(\bar{N}, N_\beta') + \sigma(\bar{B}', B_\beta) + \sigma(\bar{B}, B_\beta')$. Substitute the Frenet-Serret formulas in (R^3, σ) , in this expression and use the equations $\bar{\kappa} = \kappa_\beta, \bar{\tau} = \tau_\beta$ implies that

$$f' = \bar{\kappa}\sigma(\bar{N}, T_\beta) + \kappa_\beta\sigma(\bar{T}, N_\beta) - \bar{\kappa}\sigma(\bar{T}, N_\beta) + \bar{\tau}\sigma(\bar{B}, N_\beta) - \kappa_\beta\sigma(\bar{N}, T_\beta) + \tau_\beta\sigma(\bar{N}, B_\beta) - \bar{\tau}\sigma(\bar{N}, B_\beta) - \tau_\beta\sigma(\bar{B}, N_\beta) = 0.$$

Thus $f = 3$ and therefore $\sigma(\bar{T}, T_\beta) = 1$. This completes the proof.

CONFLICT OF INTEREST
There is no conflict of interest.

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None

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ARTICLE

SELECTION OF THE MOST APPROPRIATE MARKETING COMPETITIVE STRATEGY WITH COMBINING SUSTAINABLE BALANCED SCORECARD (SBSC) AND MULTIPLE CRITERIA DECISION MAKING (MCDM)

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ABSTRACT

Because of the limited organizational resources and intense competitive atmosphere, organizations are obliged to use the most appropriate strategies to achieve their goals. Tejarat Bank as one of the major banks of the country isn't an exception and has tried to codify and choose the most appropriate marketing competitive strategy. Thus the research questions are: What are Tejarat Bank decision-making criteria based on SBSC for strategy selection? What is the most important factor of Tejarat Bank design making for marketing competitive strategy selection? What is the most appropriate marketing competitive strategy (differentiation, focus, and leadership in the price Strategy) for Tejarat Bank? Also the independent variables of present research included those criteria (Sustainable Balanced Scorecard factors) upon which a marketing competitive strategy might be selected: financial, customer, internal processes, learning and growth, Social and environmental factors. Besides, the dependent variables of marketing competitive strategy were differentiation, focus, and leadership in price strategy. In this research, the biased sampling method was used. The final goal of this research was to prioritize and select a better strategy. Data collection tools in this research included the Tomas Saaty Pairwise comparisons questionnaire which was filled by 15 managers and specialists and calculated by Expert Choice and AVP-Supers software. Also, the Calculator Pro Matrix Software was used to calculate the matrix. Having identified the criteria, it was attempted to determine the criteria weights using the Analytical Network Process and so the financial factor with 0.298326 had the highest priority. Finally and according to the obtained scores, the "differentiation strategy" with the total scores 0.465 was selected as marketing competitive strategy for Tejarat Bank

INTRODUCTION

KEY WORDS
Marketing competitive strategy, Multi-Criteria Decision Making (MCDM), Sustainable Balanced Scorecard (SBSC)

In this research, design-making criteria identified by Sustainability Balanced ScoreCard (SBSC) and then has been seen as a complicated design-making tool by using of the Multi-criteria design-making (MCDM) that contains quantitative and qualitative factors and the most priority strategy was selected between marketing competitive strategies (differentiation, focus, and leadership in price).

Choosing an appropriate strategy is complicated even perilous. Because each strategy conducts organization in a specified competitive environment and determines how the managers should plan for adapting the organizational strengths and weaknesses with environmental threats and opportunities. Always the selection of the most important strategies (with considering of the limited organizational resources and costly of strategies) that have worthiness to allocate the resources, is the main challenge of the managers. In according to the changing environment, to have an appropriate strategy couldn't help to continue surviving and obtaining the competitive advantage. So in the different periods, should be applied the different strategies for the organizational survive. The strategy isn't a plan but also is an attitude that its bias focuses on the diagnosis of the main opportunities and realizing the potential benefits. The purpose of the codifying of the strategy is to determine the company mission, to identify internal strengths and weaknesses, setting the long-term goals, considering the various strategies and selecting the specific strategy to continue the activity.

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Problem statement

In the today's competitive world certainly, can be stated that each strategy is not appropriate for all organizations. If a strategy is appropriate and effective for an organization, will not necessarily useful for the other organizations. Consistent with the global trend of the rising of the interest in using the tools and techniques of strategic management, in our country, for reasons including privatization and preparation for joining the World Trade Organization, The need for effective use of such tools is increasing. The available organizational resources are restricted. Unfortunately, most companies and institutions due to lack of suitable priority of indicators and criteria, lose a lot of their resources in each period and always choosing the most important and the most practical strategy (with considering of organizational resource constraints and costly strategies) that have worthiness to allocate the resources, is the main challenge of the managers. As mentioned above, due to limited resources and intense competition atmosphere, companies are obliged to use the right strategy to achieve their goals. Tejarat Bank as one of the largest banks is no exception and for establishing and improving own competitive position needs to develop a competitive strategy and choose the most appropriate marketing strategy. The functional aim of this study is to provide a method that with a combination (SBSC) and Multiple Criteria Decision Making (MCDM) can choose the most appropriate strategy. Therefore, the main question is to choose the most suitable competitive marketing strategy for Tejarat bank? And the side questions are the identification of Tejarat Bank decision-making criteria based on the SBSC? Which is the most important decision-making criterion of Tejarat

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Bank in the selection of the competitive marketing strategy? What is the priority of each marketing competitive strategy (differentiation, focus, and leadership in reducing the cost strategy)?

Theoretical issues

Marketing Competitive Strategy

Michael Porter in 1980 suggested four marketing strategies that here, one of them was rejected. So the companies according to their circumstances and market conditions select one of three strategies that are as follows (Cutler, 2006)

Leadership in reducing cost: A company follows this policy will try to reduce own production and distribution costs. In this way, the fixed price is lower than competitors and has the advantage.

Differentiation: Based on that the similarities in the market and its resources cause the increasing of the competition in the market, we should seek to differentiate the goods or services. In addition, Bayot and heravi in 1997 said that the differentiation strategy pressure will cause the buyers and their interests will become a priority for the company, it should be noted that this will increase providing different services in a market.

Focus: According to this strategy, the company instead of the selection of the entire market as the target market, selects only small parts of it and focuses its activities on it.

Moderation: The companies that don't follow a certain policy, which means they want to implement all listed strategies together and at a moderate level, these companies are doomed to failure, according to Porter.

Balanced ScoreCard(BSC)

David Norton and Robert Kaplan in the 90 decades created a collection of indicators and named it Balanced ScoreCard. This collection that contains process indicators and final results, rapidly provide the comprehensive image of the function of organization for managers to calculate that how is organization's progress in achieving strategic goals. Kaplan and Norton for the universality of the indicators and perceive a clear picture of organization suggest that the managers collect data about the 4 perspectives in an adjusted note card and analyze it. The 4 perspective are: Financial perspective, customer perspective, internal business perspective, learning and growth perspective (Ali Ahmadi et al, 2003)

Sustainable Balanced ScoreCard

Sustainable Balanced Scorecard concept is derived from Balanced Scorecard (BSC) and two social and environmental issues are considered as two certain dimensions of a sustainable commerce (Vishou, 2011). For the elimination of some deficiencies of Balanced Scorecard, some things done such as providing SBSC model titled the Sustainable balanced scorecard by German scientists, Fige et al. based on what they have expressed in the sustainable Balanced Scorecard; they think this model is useful in the organizational assessment, considering society and organizational environment and evaluating the organizational performance for its sustainability. Thus they say in the performance evaluation should have existed the indicators to indicate how much an organization has been responsible for environment and society needs (Shahband Zade, 2007)

Multiple Criteria Decision Making (MCDM)

Multiple Criteria Decision Making as a part of Operation Research created and for to support the individual evaluation of performance criteria by decision makers has become to the computational and mathematical tools (Banaitiene et al. 2008; Behzadian et al.; 2012 & Zavadskas et al.; 2014) several studies have been done in order to develop of MCDM (Dadalo et al.; 2014 & Shyur and Shih; 2006 & Yazdani et al.; 2014). In the recent years, several studies also use of applications and tools of MCDM for problem-solving in different areas like engineering (Zavadskas et al.; 2014), science (the same) and technology (Bagocius et al.; 2014, Dadalo et al.; 2014 & Shyur and Shih; 2006 & Yazdani et al.; 2014). In the real world, the design making problems typically are uncertain in several aspects. Lack of information could lead to an unclear situation for the future of this system. It should be noted that non-deterministic phenomenon with statistics and probability theory is studied. However, in the various situations of everyday life; for evaluation, judgment, and decision-making, in most cases, we use the natural language to explain the thinking and subjective assessments. In the natural languages, maybe the words haven't clear and well-defined meaning. As a result, if the words are used as a label for a set, the set boundaries that the objects may be or not belong to the set, will be fuzzy. Moreover, when people even judge by using the same word about an event, their views may differ significantly because each of them has different personalities or perception. To overcome this problem, fuzzy numbers be introduced in a way that helps to the linguistic variables that expressed properly. Due to the fact that investors often are evaluating investment strategies based on their subjective preferences based on different criteria numerical values, it is better that it be considered as a matter of fuzzy multi-criteria decision-making.

Develop or choose a strategy

In order to develop or choosing strategies or providing a strategic plan of an organization, in addition to the usual approaches and methods in decision making and planning, can be used different patterns and tools. Daft defines Porter's Competitive Forces and Strategies model (Porter's five competitive forces) and Miles and Snow's strategies topology as two frameworks for strategy formulation (Daft, 2010) from the Porter's perspective, the basis of developing the strategy is in competition and in his view, this competition is not only restricted to competitors within the industry and customers, raw material suppliers, new entrants and substitute products, all are forces that may be more or less prominent and active in terms of branches of industry. The aim of the strategist is the identifying the strength of these forces and find a position in the industry that can protect his/her institution in the best way against these forces and affect them (Quinn et al., 2003: 85) Among the different approaches that have been proposed for strategic decision-making, could be mentioned the eight-stage process provided by Violin and Hunger that there are successful experiences of the implementation in companies such as Warner-Lambert, Target, General Electric, IBM, Avon Products, Bechtel Group Inc and Taisei Corporation which in Figure 1 is shown. The eight main stages of the strategic decision making are as follows:

- Check the current status:** return on investment, profitability and so on the mission, goals, strategies, and current policies.
- Assessment of governmental relations:** in terms of performance and the relationship between the board and senior managers.
- Monitoring and evaluation of the external environment:** To determine the strategic factors that lead to opportunities and threats.
- Monitoring and evaluation of internal environment:** to determine the strategic factors that led to the strengths (especially the main advantages) and weaknesses.
- Analysis of strategic factors:** the precision in areas that have problems and revising the mission and objectives, if necessary.
- Produce, evaluate and select the best strategic option:** to clarify the procedure (and results) in the fifth stage.
- Implementation of the selected strategies:** through the programs, budgets, and procedure.
- Evaluating the implemented strategies:** through feedback systems and controlling the activities to reduce the deviation of the plan.

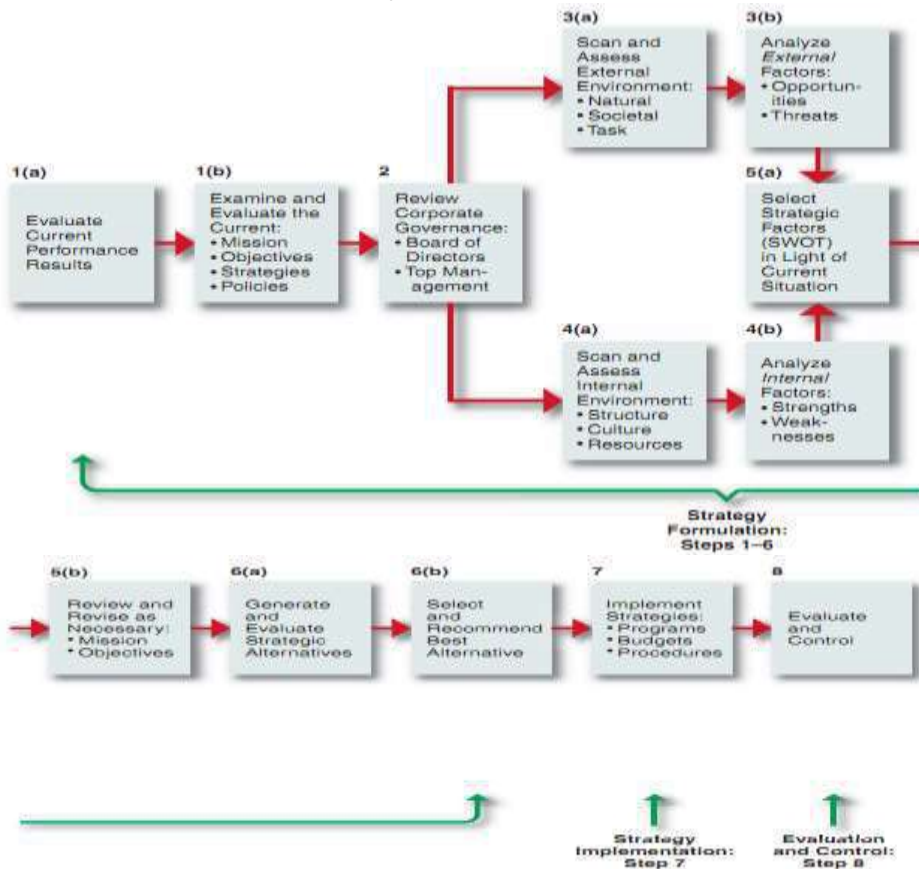


Fig. 1: strategic design making process (Vilen et.al; 2012)

Analytic network process

Analytic Network Process is one of the multi-criteria decision-making techniques known as Analytic Hierarchy Process or AHP has been developed, in which the hierarchy become to the network. In the AHP method, problems divided to the different level and the total levels establish a hierarchy. In this way, each element is linked to higher-level elements. It is also the main weakness of this method. Also, a number of

useful criteria in this system are limited (Saaty, 1999). Therefore, in view of the foregoing, Thomas L. Saaty has developed the generalized and improved AHP technique as titled Analytic Network Process. In this way the interaction between the levels of decision-making and decision criteria more broadly studied and considered. [Fig. 2] shows the hierarchical structure of Analytic Hierarchy Process with the internal correlation structure between elements or clusters in two methods of analysis network process (A) AHP and (B) ANP.

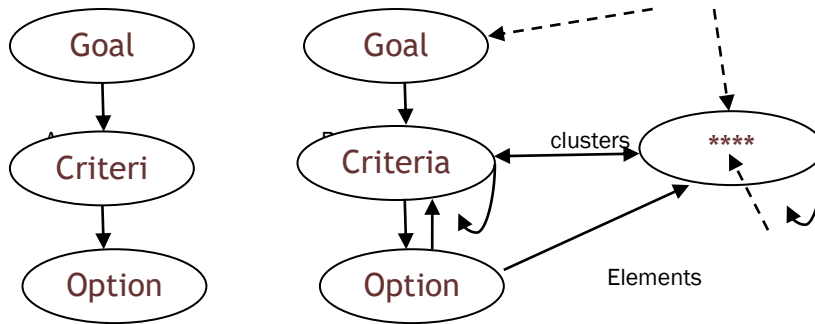


Fig. 2: the differences between ANP and AHP structures (Saaty, 1999)

BACKGROUND OF THE RESEARCH

In this section has been tried after paying attention to a summary of studies from inside and outside the country about the prioritizing and strategy selection, the analytic network technique, also some descriptions of the variables and their results are presented. Saraee and dastmardi (2005) in their research entitled determining of design making criteria by Analytic Hierarchy Process selected appropriate strategy in fuzzy mode and concluded that between three offensive, defensive and stability strategies, the stability strategy has a priority than the other strategies. Moghani and Sarmad Saeedi (2009) tried to identify key factors and indicators as much as possible in sectors of product development in Saipa Group vehicles. Therefore by using of the pre-testing of 12 experts were determined 4 key factors included technology, marketing, trade and managing the product development team and by using AHP approach concluded that the marketing has the first rank, the product development team factor has the second rank, technology factor has the third rank and trade factor has the fourth rank in the product development process.

Samadi and Islam Fakher (2009), by using AHP technique (Case study: Ahwaz Pipe company), first considered different factors in the external environment and identified opportunities and threats, then with emphasis on financial and human aspects, have analyzed the company's internal environment due to determine the internal strengths and weaknesses and identified appropriate marketing strategies. Respectively the first to three priorities are product development, horizontal integration, and similar varieties.

Arefeh Rabbani (2014) in a study entitled providing a new model based on sustainable Balanced Scorecard (SBSC) and (MSDM) for evaluating the performance of oil production companies with independent variables: internal processes, growth and learning, social, environmental and economic variables and dependent variable: oil companies reached the conclusion that Roghan jonoub Company has the highest performance among other companies and Alexander Vernoesse (2012) conducted their study as a multi-dimensional assessment of organizational performance by combining BSC and AHP that the independent variables: internal processes, learning, and growth, financial and consumer and the dependent variable was organizational units that was specified accounting unit has the best performance. Also Chia weihsu (2011) using the FDM and ANP for creating the sustainable Balanced Scorecard (SBSC) with independent variables: internal processes, learning and growth, sustainability and consumer and dependent variables: sub-criteria of the sustainable balanced Scorecard selected the sub-criterion with the highest weight and Chin tsailin & cheng shiung wu (2010) also in a study using analytic hierarchy process for choosing marketing strategies in Taiwan Hotels between the three Porter competitive strategies selected the differentiation strategy as the most appropriate strategy. Also Edgar Elías Osuna & Alvaro Arnedo (2007) in a study with a combination of SWOT and AHP for strategic planning with independent variables: strengths, weaknesses, opportunities and threats and dependent variables: marketing strategy, international development, alliance, microfinance, enterprise development, it was found appropriate strategy is the marketing strategy.

MATERIALS AND METHODS

In this study, after identifying the Tejarat Bank and documentary studies determined the company design making criteria for the selection of strategic and then by using the relative importance questionnaire of the effective criteria in the selection of the optimal strategy in order to identify and characterize the significant coefficients of the effective criteria in the selection of strategy has been determined.

The questionnaire in accordance with Thomas Saaty pairwise comparisons questionnaire in the format of SuperDecision software designed and was completed by 15 managers and experts. Since in the completion of the questionnaire, each person has his own opinion about the paired comparison, different answers were obtained. To get at a single number and neutralize the effects of a large and small numbers, the geometric mean method was used.

Validity and Stability of the questionnaire and Model validation

The used questionnaire in this research taken of Tomas Saaty Theory that has been applied in the many studies and also in the field of the questionnaire validity , it has been surveyed from Supervisors and advisors and a number of managers who completed the questionnaires and confirmed its validity. The other criterion in confirming the model accuracy is consistency ratio (CR) of the pairwise matrices of. The calculated CR with ANP and AHP should be lower than 0.1. The consistency ratio of applied pairwise comparison matrices in this study is calculated by EXPERTCHOICE and ANP-SUPERDECISION software. After obtaining all of the consistency ratios, observed that their amounts maintained lower than 0.1 and with regarding this issue can be certain of the proportionality of the pairwise comparison matrices that applied in this study. Consistency ratios of all questionnaires provided in the [Table 1].

Table 1: the Consistency ratios of questionnaires

CR	criteria
0.0618	Criteria interdependency matrix based on social criterion
0.0909	Criteria interdependency matrix based on learning and growth criterion
0.0627	Criteria interdependency matrix based on internal processes criterion
0.0830	Criteria interdependency matrix based on financial criterion
0.0830	Criteria interdependency matrix based on environmental criterion
0.0830	Criteria interdependency matrix based on customer criterion

Data analysis tools

By using the modeling and multi-criteria design making techniques we prioritize and select strategies. Also to enter pairwise comparisons between factors used ANP-SuperDecision and ExpertChoice software and MatrixCalculatorPro software is used for matrix calculations. The ultimate goal of this research is the prioritization and selection of superior strategy. The process is shown in Figure 3.

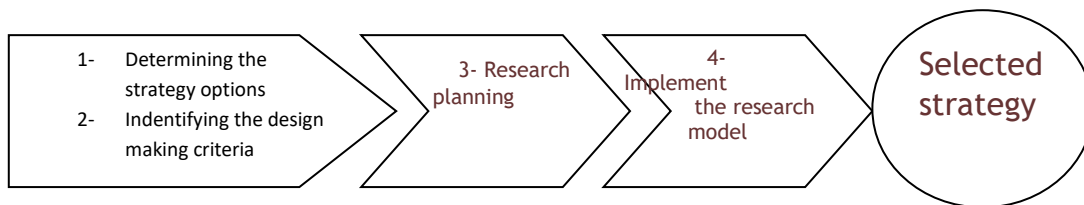


Figure (3): the implementation research process

The first step, to determine the strategic options: In this stage, competitive marketing strategy options were determined for Tejarat Bank.

The second step, to identify decision criteria: At this stage, the most important criteria according to the selected marketing strategy, as shown in [Table 2] was determined. In this study, Sustainable Balanced Scorecard (SBSC) is used and the criteria were selected.

Sub-criteria	criteria
Profitability, revenue growth, liquidity	financial
Customer satisfaction, customer acquisition, customer retention	customer
The process of product development, after-sales service, human resources processes, the process of mobilizing resources	Inter processes
Staff skills, information infrastructure, staff productivity	Learning and growth
Equality, job security, quality of life	Social
Economic conditions, political conditions, competitive conditions	environmental

The third stage, research planning

In this stage, the plan (model)of the study is made that is used the network analysis process model.

The fourth step, model implementation: In this stage according to the ANP method the pairwise comparisons in the form of the designed questionnaire was done and after stages of the analytic network Process, the prioritization of strategies was determined based on the scores, and finally the competitive strategy of marketing was chosen for Tejarat banks. This stage includes the following steps:

The first step: the pairwise comparison of criteria was performed with assuming that there is no relationship between criteria. [Table 3] indicates this matter.

Table 3: The pairwise comparison matrix of criteria with assuming no relationship between them

CR=0.0964	social	Learning and growth	Internal processes	financial	environmental	customer	Significant weights of criteria
social	1.00000	0.50000	0.50000	0.25000	0.50000	0.50000	0.069294
Learning and growth	2.00000	1.00000	0.50000	0.25000	2.00000	2.00000	0.138026
Internal processes	2.00000	2.00000	1.00000	0.33333	0.00000	0.00000	0.175293
financial	4.00000	4.00000	3.00000	1.00000	0.00000	0.00000	0.426595
environmental	2.00000	0.50000	0.00000	0.00000	1.00000	0.00000	0.095396
customer	2.00000	0.50000	0.00000	0.00000	0.00000	1.00000	0.095396

In considering of the obtained weights, the criteria matrix is (W1) that the rows of the matrix respectively shows the weights of social, learning and growth, internal processes, financial, environmental and consumer factors.

Second step: pairwise comparison of criteria with considering of the dependency between the criteria.

Interdependence between the criteria by using the analysis of each criterion effects in the other criteria with the pairwise comparison is determined that results are shown in (4) to (9) tables. On the base of presented interdependence in this figure, the pairwise comparison matrix for criteria is formed.

Table 4: Criteria interdependency matrix based on social criterion

CR=0.0618	Learning and growth	Internal processes	financial	environmental	customer	The relative significant weights
Learning and growth	1.00000	0.33333	0.50000	3.00000	0.50000	0.125026
Internal processes	3.00000	1.00000	0.50000	0.50000	3.00000	0.313380
financial	2.00000	2.00000	1.00000	4.00000	2.00000	0.339312
environmental	0.33333	0.20000	0.25000	1.00000	0.33333	0.057642
customer	2.00000	0.33333	0.50000	3.00000	1.00000	0.164640

Table 5: Criteria interdependency matrix based on learning and growth criterion

CR=0.0909	social	Internal processes	financial	environmental	customer	The relative significant weights
social	1.00000	0.33333	0.25000	0.33333	0.50000	0.075215
Internal processes	3.00000	1.00000	0.33333	1.00000	1.00000	0.176769
financial	4.00000	3.00000	1.00000	2.00000	2.00000	0.384044
environmental	3.00000	1.00000	0.50000	1.00000	1.00000	0.189419
customer	2.00000	1.00000	0.50000	1.00000	1.00000	0.174554

Table (6) Criteria interdependency matrix based on internal processes criterion

CR=0.0627	social	Learning and growth	financial	environmental	customer	The relative significant weights
social	1.00000	0.50000	0.33333	0.50000	0.00000	0.086771
Learning and growth	2.00000	1.00000	2.00000	2.00000	0.50000	0.257539
financial	3.00000	0.50000	1.00000	2.00000	2.00000	0.266166
environmental	2.00000	0.50000	0.50000	1.00000	1.00000	0.153083
customer	0.00000	2.00000	0.50000	1.00000	1.00000	0.236441

Table 7: Criteria interdependency matrix based on financial criterion

	social	Learning and	Internal	environmental	customer	The relative
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CR=0.0830		growth	processes			significant weights
social	1.00000	0.50000	0.50000	0.33333	0.33333	0.085012
Learning and growth	2.00000	1.00000	0.25000	2.00000	0.33333	0.142466
Internal processes	2.00000	4.00000	1.00000	2.00000	0.50000	0.270645
environmental	3.00000	0.50000	0.50000	1.00000	0.33333	0.132929
customer	3.00000	3.00000	2.00000	3.00000	1.00000	0.368948

Table 8: Criteria interdependency matrix based on environmental criterion

CR=0.0830	social	Learning and growth	Internal processes	financial	customer	The relative significant weights
social	1.00000	2.00000	2.00000	0.25000	0.33333	0.137941
Learning and growth	0.50000	1.00000	0.33333	0.33333	0.50000	0.085043
Internal processes	0.50000	3.00000	1.00000	0.33333	0.33333	0.123916
financial	4.00000	0.300000	0.300000	1.00000	2.00000	0.389941
customer	3.00000	2.00000	3.00000	0.50000	1.00000	0.263160

Table 9: Criteria interdependency matrix based on customer criterion

CR=0.0830	social	Learning and growth	Internal processes	financial	environmental	The relative significant weights
social	1.00000	4.00000	3.00000	3.00000	3.00000	0.444242
Learning and growth	0.25000	1.00000	2.00000	2.00000	2.00000	0.197280
Internal processes	0.33333	0.50000	1.00000	1.00000	0.50000	0.101488
financial	0.33333	0.50000	1.00000	1.00000	0.50000	0.101488
environmental	0.33333	0.50000	2.00000	2.00000	1.00000	0.155503

The third step:

Determining of the interdependent of the criteria

In this step calculated the interdependent of criteria as follows:

$$w_2 * w_1 = \begin{bmatrix} 1.000000 & 0.075215 & 0.086771 & 0.085012 & 0.137941 & 0.444242 \\ 0.125026 & 1.000000 & 0.257539 & 0.142466 & 0.085043 & 0.197280 \\ 0.313380 & 0.176769 & 1.000000 & 0.270645 & 0.123916 & 0.101488 \\ 0.339312 & 0.384044 & 0.266166 & 1.000000 & 0.389941 & 0.101488 \\ 0.057642 & 0.189419 & 0.153083 & 0.132929 & 1.000000 & 0.155503 \\ 0.164640 & 0.174554 & 0.236441 & 0.368948 & 0.263160 & 1.000000 \end{bmatrix} *$$

$$\begin{bmatrix} 0.069294 \\ 0.138026 \\ 0.175293 \\ 0.426595 \\ 0.095396 \\ 0.095396 \end{bmatrix} = \begin{bmatrix} 0.186690 \\ 0.279542 \\ 0.358366 \\ 0.596653 \\ 0.223911 \\ 0.354840 \end{bmatrix} / 2 = \begin{bmatrix} 0.093345 \\ 0.139771 \\ 0.179183 \\ 0.298326 \\ 0.111955 \\ 0.177420 \end{bmatrix} = \begin{bmatrix} \text{social} \\ \text{learning and growth} \\ \text{internal processes} \\ \text{financial} \\ \text{environmental} \\ \text{customer} \end{bmatrix}$$

As can be observed there are the major differences in the results for the priority criteria with W1 (weights of the criteria with assuming independence among them). Also the criteria are based on the values as financial priority, priority of the internal processes, priority of the consumer, the priority of the learning and growth, priority of the environmental and social priority.

Fourth Step: At this stage, the internal priorities of the sub-criteria are determined by a pairwise comparison matrix. The pairwise comparison matrix is shown in 10 to 15 tables

Table (10) paired comparison matrix to prioritize the social criteria

CR=0.0516	security	equality	quality	Sub-criteria weights
security	1.00000	0.50000	2.00000	0.310814
equality	2.00000	1.00000	2.00000	0.493386
quality	0.50000	0.50000	1.00000	0.195800

Table (11) the sub-criteria priority matrix of the learning and growth standards

CR=0.0516	Information Infrastructure	Staff skills	Efficiency and productivity	significant weights of sub-criteria
Information Infrastructure	1.00000	0.33333	0.50000	0.157056
Staff skills	3.00000	1.00000	3.00000	0.593634
Efficiency and productivity	2.00000	0.33333	1.00000	0.249310

Table (12) sub-criteria priority matrix of the internal processes

CR=0.0304	After-sales service	resources mobilization process	Process development services	Human resources process	significant weights of sub-criteria
After-sales service	1.00000	0.50000	0.25000	0.33333	0.093419
resources mobilization process	2.00000	1.00000	0.33333	0.33333	0.143218
Process development services	4.00000	3.00000	1.00000	2.00000	0.458558
Human resources process	3.00000	3.00000	0.50000	1.00000	0.304805

Table (13) sub-criteria priority matrix of the financial

CR=0.0064	Revenue growth	profitable	Liquidity	weights of sub-criteria
Revenue growth	1.00000	0.33333	1.00000	0.191941
profitable	3.00000	1.00000	4.00000	0.633700
Liquidity	1.00000	0.250000	1.00000	0.1744359

Table (14) sub-criteria priority matrix of the environmental

CR=0.0707	Economic conditions	Competitive conditions	Political conditions	weights of sub-criteria
Economic conditions	1.00000	0.33333	3.00000	0.268368
Competitive conditions	3.00000	1.00000	4.00000	0.614411
Political conditions	0.33333	0.25000	1.0000	0.117221

Table (15) sub-criteria priority matrix of the costumer

CR=0.0147	Attracting customers	Customer retention	Customer satisfaction	weights of sub-criteria
Attracting customers	1.00000	0.50000	0.33333	0.169205
Customer retention	2.00000	1.00000	1.00000	0.387479
Customer satisfaction	3.00000	1.00000	1.0000	0.443316

Fifth Step: At this stage the overall criteria priorities by using the multiplying interdependent priorities found in the third stage in obtained sub-criteria internal priority in the fifth stage are calculated, these calculations are as follows.

$$W_{\text{social}} * 0.093 = \begin{bmatrix} 0.310814 \\ 0.493386 \\ 0.195800 \end{bmatrix} * 0.093 = \begin{bmatrix} 0.028905 \\ 0.045884 \\ 0.018209 \end{bmatrix}$$

$$W_{\text{learning and growth}} * 0.140 = \begin{bmatrix} 0.157056 \\ 0.593634 \\ 0.249310 \end{bmatrix} * 0.140 = \begin{bmatrix} 0.021987 \\ 0.083108 \\ 0.034903 \end{bmatrix}$$

$$W_{\text{internal processes}} * 0.179 = \begin{bmatrix} 0.093419 \\ 0.143218 \\ 0.458558 \\ 0.304805 \end{bmatrix} * 0.179 = \begin{bmatrix} 0.016722 \\ 0.025636 \\ 0.082081 \\ 0.054560 \end{bmatrix}$$

$$W_{\text{financial}} * 0.298 = \begin{bmatrix} 0.191941 \\ 0.633700 \\ 0.174659 \end{bmatrix} * 0.298 = \begin{bmatrix} 0.057198 \\ 0.188842 \\ 0.052048 \end{bmatrix}$$

$$W_{\text{environmental}} * 0.112 = \begin{bmatrix} 0.268368 \\ 0.614411 \\ 0.117221 \end{bmatrix} * 0.112 = \begin{bmatrix} 0.030057 \\ 0.068814 \\ 0.013129 \end{bmatrix}$$

$$W_{\text{customer}} * 0.177 = \begin{bmatrix} 0.169205 \\ 0.387479 \\ 0.443316 \end{bmatrix} * 0.177 = \begin{bmatrix} 0.029949 \\ 0.068583 \\ 0.078467 \end{bmatrix}$$

$$W_{\text{sub-criteria}} = \begin{bmatrix} 0.028905 \\ 0.045884 \\ 0.018209 \\ 0.021987 \\ 0.083108 \\ 0.034903 \\ 0.016722 \\ 0.025636 \\ 0.082081 \\ 0.054560 \\ 0.057198 \\ 0.188842 \\ 0.052048 \\ 0.030057 \\ 0.068814 \\ 0.013129 \\ 0.029949 \\ 0.068583 \\ 0.078467 \end{bmatrix}$$

Sixth Step: In this stage, the degree of importance of each strategy according to the following sub-criteria calculated. Pairwise comparison matrices results are shown in 16 to 34 tables.

Table (16) Matrix of the determining strategies priorities related to security

CR=0.0734	Differentiation strategy	Focus strategy	Leadership of reducing in cost strategy	Strategies weights
Differentiation strategy	1.00000	7.00000	4.00000	0.695524
Focus strategy	0.14286	1.00000	0.25000	0.075429
Leadership of reducing in cost strategy	0.25000	4.00000	1.00000	0.229047

Table (17) The paired comparison Matrix of the determining strategies priorities related to equality

CR=0.0734	Differentiation strategy	Focus strategy	Leadership of reducing in cost strategy	Strategies weights
Differentiation strategy	1.00000	0.50000	0.20000	0.122020
Focus strategy	2.00000	1.00000	0.33333	0.229651
Leadership of reducing in cost strategy	5.00000	3.00000	1.00000	0.648329

Table (18) The paired comparison Matrix of the determining strategies priorities related to quality

CR=0.0734	Differentiation strategy	Focus strategy	Leadership of reducing in cost strategy	Strategies weights
Differentiation strategy	1.00000	3.00000	0.33333	0.258285
Focus strategy	0.33333	1.00000	0.20000	0.104729
Leadership of reducing in cost strategy	3.00000	5.00000	1.00000	0.636986

Table (19) The paired comparison Matrix of the determining strategies priorities related to information infrastructure

CR=0.0734	Differentiation strategy	Focus strategy	Leadership of reducing in cost strategy	Strategies weights
Differentiation strategy	1.00000	5.00000	1.00000	0.636986
Focus strategy	0.33333	1.00000	3.00000	0.258285
Leadership of reducing in cost strategy	0.20000	0.333333	1.00000	0.104729

Table (20) paired comparison Matrix of the determining strategies priorities related to staff skills

CR=0.0734	Differentiation strategy	Focus strategy	Leadership of reducing in cost strategy	Strategies weights
Differentiation strategy	1.00000	5.00000	1.00000	0.444294
Focus strategy	0.20000	1.00000	0.16667	0.083616
Leadership of reducing in cost strategy	1.00000	6.00000	1.00000	0.472090

Table (21) paired comparison Matrix of the determining strategies priorities related to the employee productivity and efficiency

CR=0.0734	Differentiation strategy	Focus strategy	Leadership of reducing in cost strategy	Strategies weights
Differentiation strategy	1.00000	0.500000	0.333333	0.136422
Focus strategy	2.00000	1.00000	0.500000	0.296610
Leadership of reducing in cost strategy	3.00000	2.00000	1.00000	0.593614

Table (22) paired comparison Matrix of the determining strategies priorities related to after-sales services

CR=0.0734	Differentiation strategy	Focus strategy	Leadership of reducing in cost strategy	Strategies weights
Differentiation strategy	1.00000	3.00000	2.00000	0.539614
Focus strategy	0.33333	1.00000	0.50000	0.163424
Leadership of reducing in cost strategy	0.50000	2.00000	1.00000	0.296961

Table (23) paired comparison Matrix of the determining strategies priorities related to the resources mobilization process

CR=0.0734	Differentiation strategy	Focus strategy	Leadership of reducing in cost strategy	Strategies weights
Differentiation strategy	1.00000	0.33333	0.25000	0.117221
Focus strategy	3.00000	1.00000	0.33333	0.268368
Leadership of reducing in cost strategy	4.00000	3.00000	1.00000	0.614411

Table 24: Paired comparison Matrix of the determining strategies priorities related to services development process

CR=0.0734	Differentiation strategy	Focus strategy	Leadership of reducing in cost strategy	Strategies weights
Differentiation strategy	1.00000	0.33333	0.20000	0.104729
Focus strategy	3.00000	1.00000	0.33333	0.258285
Leadership of reducing in cost strategy	5.00000	3.00000	1.00000	0.636986

Table 25: paired comparison Matrix of the determining strategies priorities related to human resources process

CR=0.0734	Differentiation strategy	Focus strategy	Leadership of reducing in cost strategy	Strategies weights
Differentiation strategy	1.00000	4.00000	0.33333	0.270557
Focus strategy	0.25000	1.00000	0.16667	0.085220
Leadership of reducing in cost strategy	3.00000	6.00000	1.00000	0.644223

Table 26: Paired comparison Matrix of the determining strategies priorities related to Revenue growth

CR=0.0734	Differentiation strategy	Focus strategy	Leadership of reducing in cost strategy	Strategies weights
Differentiation strategy	1.00000	0.50000	1.00000	0.259921
Focus strategy	2.00000	1.00000	1.00000	0.412602
Leadership of reducing in cost strategy	1.00000	1.00000	1.00000	0.327477

Table 27: paired comparison Matrix of the determining strategies priorities related to profitable

CR=0.0734	Differentiation strategy	Focus strategy	Leadership of reducing in cost strategy	Strategies weights
Differentiation strategy	1.00000	3.00000	5.00000	0.636986
Focus strategy	0.33333	1.00000	3.00000	0.258285
Leadership of reducing in cost strategy	0.20000	0.33333	1.00000	0.104729

Table 28: paired comparison Matrix of the determining strategies priorities related to liquidity

CR=0.0734	Differentiation strategy	Focus strategy	Leadership of reducing in cost strategy	Strategies weights
Differentiation strategy	1.00000	6.00000	2.00000	0.614411
Focus strategy	0.16667	1.00000	0.50000	0.117221
Leadership of reducing in cost strategy	0.50000	2.00000	1.00000	0.268369

Table 29: paired comparison Matrix of the determining strategies priorities related to economic conditions

CR=0.0734	Differentiation strategy	Focus strategy	Leadership of reducing in cost strategy	Strategies weights
Differentiation strategy	1.00000	6.00000	3.00000	0.654807
Focus strategy	0.16667	1.00000	0.33333	0.095338
Leadership of reducing in cost strategy	0.33333	3.00000	1.00000	0.249856

Table 30: paired comparison Matrix of the determining strategies priorities related to competitive conditions

CR=0.0734	Differentiation strategy	Focus strategy	Leadership of reducing in cost strategy	Strategies weights
Differentiation strategy	1.00000	6.00000	5.00000	.0732429
Focus strategy	0.16667	1.00000	1.00000	.0129718
Leadership of reducing in cost strategy	0.200000	1.00000	1.00000	.0137853

Table 31: paired comparison Matrix of the determining strategies priorities related to political conditions

CR=0.0734	Differentiation strategy	Focus strategy	Leadership of reducing in cost strategy	Strategies weights
Differentiation strategy	1.00000	5.00000	5.00000	.0708856
Focus strategy	0.20000	1.00000	0.50000	.0112524
Leadership of reducing in cost strategy	0.200000	2.00000	1.00000	.0178620

Table 32: paired comparison Matrix of the determining strategies priorities related to attracting customers

CR=0.0734	Differentiation strategy	Focus strategy	Leadership of reducing in cost strategy	Strategies weights
Differentiation strategy	1.00000	1.00000	2.00000	0.376397
Focus strategy	0.1.00000	1.00000	4.00000	0.474230
Leadership of reducing in cost strategy	0.500000	0.25000	1.00000	0.149373

Table 33: paired comparison Matrix of the determining strategies priorities related to Customer retention

CR=0.0734	Differentiation strategy	Focus strategy	Leadership of reducing in cost strategy	Strategies weights
Differentiation strategy	1.00000	2.00000	2.00000	0.50000
Focus strategy	0.50000	1.00000	1.00000	0.25000
Leadership of reducing in cost strategy	0.50000	1.00000	1.00000	0.25000

Table 34: paired comparison Matrix of the determining strategies priorities related to customer satisfaction

CR=0.0734	Differentiation strategy	Focus strategy	Leadership of reducing in cost strategy	Strategies weights
Differentiation strategy	1.00000	3.00000	5.00000	0.648329
Focus strategy	0.33333	1.00000	2.00000	0.229651
Leadership of reducing in cost strategy	2.00000	0.50000	1.00000	0.122020

Using the software, calculated the eigenvectors and then by analyzing the matrices, W4 is calculated

$$W_4 = \begin{bmatrix} 0.695524 & 0.122020 & 0.258285 & 0.636986 & 0.444294 & 0.163424 & 0.539614 & 0.117221 & 0.104729 & 0.270557 & 0.259921 & 0.636986 \\ 0.075429 & 0.229651 & 0.104729 & 0.258285 & 0.083616 & 0.296961 & 0.163424 & 0.268368 & 0.258285 & 0.085220 & 0.412602 & 0.258285 \\ 0.229047 & 0.648329 & 0.636986 & 0.104729 & 0.472090 & 0.539614 & 0.296961 & 0.614411 & 0.636986 & 0.644223 & 0.327477 & 0.104729 \end{bmatrix}$$

Seventh step: finally calculated the total priority of the strategies that reflected interdependent between criteria

$$W_{options} = W_4 * W_{sub-criteria} = \begin{bmatrix} \text{Differentiation strategy} \\ \text{Focus strategy} \\ \text{Leadership of reducing in cost strategy} \end{bmatrix}$$

$$\begin{bmatrix} 0.695524 & 0.122020 & 0.258285 & 0.636986 & 0.444294 & 0.163424 & 0.539614 & 0.117221 & 0.104729 & 0.270557 & 0.259921 & 0.636986 \\ 0.075429 & 0.229651 & 0.104729 & 0.258285 & 0.083616 & 0.296961 & 0.163424 & 0.268368 & 0.258285 & 0.085220 & 0.412602 & 0.258285 \\ 0.229047 & 0.648329 & 0.636986 & 0.104729 & 0.472090 & 0.539614 & 0.296961 & 0.614411 & 0.636986 & 0.644223 & 0.327477 & 0.104729 \end{bmatrix}$$

$$\begin{bmatrix} 0.028905 \\ 0.045884 \\ 0.018209 \\ 0.021987 \\ 0.083108 \\ 0.034903 \\ 0.016722 \\ 0.025636 \\ 0.082081 \\ 0.054560 \\ 0.057198 \\ 0.188842 \\ 0.052048 \\ 0.030057 \\ 0.068814 \\ 0.013129 \\ 0.029949 \\ 0.068583 \\ 0.078467 \end{bmatrix} = \begin{bmatrix} 0.465388 \\ 0.214194 \\ 0.319500 \end{bmatrix} = \begin{bmatrix} \text{Differentiation strategy} \\ \text{Focus strategy} \\ \text{Leadership of reducing in cost strategy} \end{bmatrix}$$

RESULTS

With regard to the steps taken, the obtained results and according to research aim, identifying the decision-making criteria and selection of competitive marketing strategies using multiple criteria decision making and analytic network process (ANP) techniques took place and have been marked criteria and marketing strategy. In this way, the financial criteria allocated the highest priority with the weight of 0.298326. Weights of the criteria are provided in the [Table 35]

Table 35: The priority of the criteria

Criteria weights	criteria
0.298326	financial
0.179183	Internal processes
0.177420	customer
0.139771	Learning and growth
0.111955	environment
0.093345	social

Choosing of marketing competitive strategy

According to the scores, the overall priority of the strategies in the table (36) is provided.

Table 36: the overall priority of strategies based on the MCDM method

strategy	Total score	priority
Differentiation	0.465	1
Leadership in the reducing cost	0.320	2
Focus	0.214	3

According to the results the choosed marketing competitive strategy for Tejarat Bank is "differentiation strategy "

According to the entity of this research seems that the bank shouldn't neglect of creating the strategic and systematic thinking culture and so it is necessary that the top managers that have competency of culture making become pioneers of an internal revolution and a new mobility, therefore the alignment of the personal goals and bank strategic goals, the strategy implementation process will be facilitated and taking the appropriated strategy needs changes that the conducting and managing this change needs sufficient perceive of the bank human resources. In the selection of the differentiation strategy was suggested to pay attention to the human resource areas, organizational systems, considering the business environment and information systems.

Human resources

1. In order to the growth of organizations, the change is inevitable and the organizational personnel must be adapted to the trend. This adaptation can be achieved through learning of the new skills.
2. The best way of the creating working style and new and sustainable thinking is forming a "learning organization."
3. Organizations and their personnel must have a positive attitude towards the change issue, so that can remain their competitiveness in today's aggressive markets.
4. Creating a positive work culture and removing the negative cultures in the organizational work trend.
5. Administrators to create and develop the favorable organizational cultural face to the human factor. A human that has power, motivation, faith and hidden beliefs that should have been realized in a positive direction and this can't be achieved unless having a strong and efficient management.
6. Considering to developing the work ethic is the most valuable component that forming the work culture in the organization and the first point of the better work and getting to the productivity and efficiency.

Organizational Systems

1. Organizational structure, policies and regulations, ethics and social responsibility, reward systems, selection, and training.

2. Applying of consolidated paradigm with considering of different doctrines developing in the context of time appropriate to the organizational and environmental circumstances and situations.
3. The application of the most appropriate strategic management methods according to the type, scope and mission of the organization due to the need for localization methods.
4. Trying to obtain the necessary skills in the applying the strategic management due to necessities, benefits of using it and knowledge of the stages, implementation contests and effective factors and the implementation process of strategic management and how to develop it due to intrinsic and environmental barriers.

Interest groups outside of the organization (environment)

- 1- General Regulations, clients, specific groups, competitors and...
- 2- The necessity of the identifying the different organizational issues and the external environment based on the delicacies and instabilities and realities by managers and optimal conduction and organizational control accordingly to it and the applying of macro-thinking, holistic and foresight ways in strategic management.

SUGGESTIONS FOR FUTURE RESEARCH

In this study, the available resources were evaluated using fuzzy MCDM methods to provide an incentive for further studies before researchers. In order to future investigations following items are suggested.

1. Future studies on the anatomy of fuzzy MCDM can be continued further. In this study, several techniques as fuzzy individual techniques were studied and integrated or combined with other techniques, however, many other MCDM techniques still have not been studied
2. The other suggestion for future studies to investigate the similarities and differences between fuzzy MCDM methods. This study focuses on the use of fuzzy DM techniques, so we can consider a broader scope of future investigations.
3. Also recently developed synthetic and modular methods have become increasingly important. In order to help researchers and professionals that are interested in the hybrid FMCDM techniques and applications of hybrid FMCDM methods, it is essential that these issues are investigated in the future and the results of these studies are published.

CONFLICT OF INTEREST

There is no conflict of interest.

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None

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ARTICLE

THE INVESTIGATION OF THE STRATEGIC THINK TANK IN ISLAMIC AZAD UNIVERSITY OF GAEMSHAHR

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ABSTRACT

The present research is aimed to investigate the Strategic Think tank in Islamic Azad University of Gaemshahr so that in the light of it, the understanding about think tanks status in the studied organizations can be gained. In terms of aim, the study is functional, and in terms of research methodology, it is cross-sectional and descriptive scanning. The study population has been two groups, the first of them consisted of 12 faculty members of the university's Think Tank; and the second group consisted of all 300 faculty members of the university; that the size and the population of the second group, according to Cochran method, were determined 160 people, and samples were selected by the use of relative stratified sampling method. The data collection method has been by library and by field, that the required information were collected through questionnaire and were analyzed through the software SPSS. To investigate the questions of the questionnaire, inferential and descriptive statistics was used. The research results imply that the think tank exists, but it has a performance within very weak-weak, the most important causes of which respectively are: 1) the highest rating on the fifth items: the performance of the think tank in offering appropriate solutions and strategies in order to take appropriate decisions with the average rating 6.95; 2) the second priority on the sixth items: how to improve the quality of the determined public policies and its feedback on the society with the average rating 6.45; 3) the third priority on the third items: the performance of the think tank in solving the problems of the education system with the average rating 5.95; and on the eighth items: clear understanding and nobility of the authorities on the positive functions of the think tank formation in the university with the average rating 5.95; 4) the fourth priority on the first items: the quantity of holding the meetings and sessions monthly and seasonal with the average rating 5.45; on the fourth items: the performance of the think tank in solving the management and administrative macro-problems with the average rating 5.45; and on the seventh items: the flexibility of the senior upstream officials and allocation of the specific and determined budgets to practice the determined strategies by the think tank with the average rating 5.45; 5) and finally, the last and the least important priority on the second items: the quality of holding the meetings and sessions and discussing various issues with the average rating 4.45; on the ninth items: the extent of your satisfaction with the specified budgets in the university to form the think tank with the average rating 4.45; and on the tenth items: the interaction and consultation between the senior authorities and faculty members of the university with the average rating 4.45. In addition, from the viewpoint of the faculty member, the think tank with the average rating 2.95 is within the weak-middle range. Finally, the suggestions are offered.

INTRODUCTION

KEY WORDS
 The think tank, the strategic think tank, Islamic Azad University

In the developing countries, the weakness and lack of effective think tank and the existence of often incomplete, inaccurate or processed information make statesmen and politicians with a downfall which is mentioned as "wrong decision" [3] In general, the objectives of the above tanks formation are to develop the strategic think, provide data analysis context, process ideas, and give expert opinion to facilitate administrative decision-making (Bromley, 2006). The role of the think tank is important because it could provide politicians and managers with being influenced by intellectuals and professionals (Starkey, 2002).

Different definitions have been proposed for strategic think tank and the way of their organizing. The idea of developing the strategic think tank was first proposed by Thomas Clarkson, the founder of the Anti-Slavery Association in Africa in 1782. In this idea, he portrayed, with high accuracy, the conditions of slaves trading and transferring them from Africa and ethical principles governing on it [10].

Most researchers believed that to survive in the competitive environment, the think tank should adopt the strategies that lead to increasing the management allocations and improvement of the network. However, according to Astaraki (2002), [11] and Tanert (2006), a useful and effective attempt is that the think tank should reconsider its organizing every few years; work in the realms of idea and thought; have further attention on Applied Sciences; show more flexibility to employ professional, expert, and efficient researchers in projects and research teams; have more attention on early-return plans than long-term plans; and understand audiences' identities in the successful tanks. The tanks should be aware that the important ideas are not always affective on the attraction of audiences and do not lose the intelligence and tact to use opportunities and situations [5]. Also, McGann considers that the funding strategy from multiple resources is critical for the think tank and emphasizes on the importance of financial transparency and effective communications with media, and believes that in order to guarantee the independence of the think tank, it is necessary to have transparency about the way of financing and the quality of communications. Also, the necessity of transparency or a similar degree of transparency compared to the successful tanks and the other leading counterparts is considered (McGann, 2005). The think tank as databases classify the research findings and make them available to the policy makers and politicians, which are used in the preparation of the agenda for the policy makers [3]. McGann, who has conducted extensive researches for the American think tank, is considered as an expert with international experience in this field. According to his personal experiences in a survey conducted in 20 European countries, he has identified three different kinds of the think tank; and based on this study, he considers that the think tank have four functions: 1) to conduct short-term and long-term researches; 2) publication

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of books or articles that focus on short-term pragmatic issues; 3) consideration of public, policy makers, and media opinions; and 4) to provide the government with stable personnel [11]. In the recent years, the role of think tank in improving the quality of public policies has become more important; because the think tank affect the adoption of better policies, and in the viewpoint of experts and scholars, understanding this impact could be affective on taking base decisions in order to revise and improve their participation in the cycle of public policies (preparation of agenda, development, implementation, and evaluation) (Alavani, 2007).

In today universities, the process of policy-making and decision-making at various levels needs specific organizing. Rapid enhancements of the world and growing dimensions of improvement are factors that determine the necessity for rapid development of policies and patterns of decision-making; something that is not possible without the use of new ideas, and documentation and summarizing the experiences and opinions of experts and creative peoples. The speed of local developments and the emergence of cross-sectional requirements in the new era, in most cases, have led to consumption of predecessors' intellectual assets of by universities in the country; and due to the lack of investment in the intellectual foundation, inadvertently, the past capital is spent widely and universities are involved in routines. For example, it can be acknowledged that in health education, research, and ... systems, there is nothing but copying, and also in their executive areas, thought position and philosophical do not appear. The think tank is a rational strategy to strengthen the thinking and idea-processing institutions. It seems that the strategy of the think tank when faced with destructive politicization, translation, and populism mentalities in university and research tanks, can guide society towards innovation and creative decision-making.

The think tanks are environments to nurture talents and educate institution and university elites and provide the update context and the emergence of such forces. Accurate identification and description of the university issues, critical assessment of policies, current programs and issues and emerging issues and offering views, conversion of general ideas and raw suggestions into applicable policies and programs, the localization of policies derived from benchmarking and comparative studies, preparing the ground for the constructive exchange of information and opinions between experts, the identification and education of experts in policy-making researches, creating consensus among executives and conducting futurology and foresight studies are among the think tank tasks.

In addition to what was said, one of the reasons and necessities for building the think tank in university and scientific tanks is their incomplete efficiency. In addition to educating the experts in all fields in the country, universities should address developmental researches and provide a space for the development of thought and creativity. In such a situation, in addition to performing the university tasks, the think tanks could also be a space for attracting the elites of the country. However, the present study seeks to examine the situation of the think tank in Islamic Azad University of Gaemshahr.

RESEARCH LITERATURE

Theoretical Bases of Research The Origin of Creating the Think tank

By the addition of needs and the complexity of responding to them, the complexity of the existing relationships, the speed of environmental development, and dynamics of structures in all areas, the need to make right decisions and more creativity is sensed because one of the problem-solving solutions in the field of management is creativity; i.e. to find an appropriate and optimal answer to developments and events. In this regard, one of the tools for creativity and making new ideas that makes rid of the bad habit of action before thinking or thinking after action and provides an opportunity for conceptualization and making concept is the think tank; the main mission of the think tank is intellectual and advisory support for policy-makers and decision-makers and manipulation of the idea and knowledge in order to fulfill the organizational goals [1].

The Think tanks, with the goals they have ahead, invite somehow to self-esteem and self-awareness, following it self-reform is achieved as well. To achieve an agreement on the vote, debate occurs and thus creativity also shows itself. The think tank is an institution or organization that offers ideas or advices about political, trade, social, military, and etc. issues based on collective and hierarchical action; In other words, organizations that employ theorists and thinkers to provide policy-makers with analyses and guidelines for macro issues. The think tanks are the strategic research and thought-making tanks that conduct applied research by basic meditations and generate thoughts, ideas, and knowledge for universities and research tanks and make them operational for politicians and executives. The think tank, by engaging in issues and challenges that are beyond the abilities of individuals or average specialist groups of shows its role well. Long-term and in-depth study is the wok style of the think tanks. The think tanks have had a good development but in different names that their substance is the think tank; Different names such as institution, foundation, think club, policy-making tank, and other names that by referring to process of their activities, it could be received that they act in the form of think tanks. The think tank members can be classified in the two groups of intellectual elites and instrumental elites. Theoretical (intellectual) elites are those who have academic experience; or in other words, they know the science and theory of the topic, have understood the human thought theoretically, and also have the necessary

information about interdisciplinary concepts. The second or instrumental groups are those who have had activity experience in different fields in the past and have enough experience to thinking. The think tanks could originate from basic and important issues or stem from an individual's or a small group of experts' mind. In general, two main reasons for creating these tanks are mentioned: First, the need for building a national institutional had been sensed so that it does qualified research in national and international subjects, in particular the subjects related to the foreign policies, because there were not any constitutions in this context. Second, there was no institution that can bring together professionals and experts in these subjects. As a result, think tanks obviate these needs by the help of brainstorming techniques.

Understanding the Nature of Think tank

Think tanks as the substrate shaping public opinions and decision-making for community managers, in some communities, have an affecting mission. This mission is getting deeper and more effective. In future societies that cultural, social, political, scientific, technological, and economic movements will not be formed exclusively in terms of time and thought of a government and the party forming that government, those are strategic think tanks that could be the guiders for these movements based on their own knowledge and value. In the not too distant future, the think tanks would be the mechanism for applying the knowledge of scientists in practice and society, specially, for playing the role of humanities and social sciences in policy-making and decision-making area. The way of organizing the think tanks also plays an important role in the richness of their research and activities. Experts believed that the members of the think tank group might offer effective returns and work results. Nevertheless, it should be noted that adoption of more appropriate tactics by management in order to organize think and research groups and form the strategic think tanks will make achievement of results and finding more effective and satisfactory. As such, Strachan (2002) believes that the review of groups' performance and organizing are considered as an opportunity, so three tasks should be considered: first, there are several options, based on which the think tank activities can be organized; second, it is necessary that some information about the way of doing operations in different conditions are offered by groups in the think tank; third, senior managers of groups in the think tanks should be offered helpful advices, so that in the assessment of the nature of existent organizing as the best and the most appropriate situation for doing the considered activities, they could attempt effectively (Raymond, 2002).

In some viewpoints such as [11], tanks have been divided into different groups of research institutions that do activities on the university think tanks like advisory think tanks based on the contract and for-profit, and the interest groups of party think tanks and parties-affiliated research tanks; while Pohan (2008) notes that in general, discussions on the think tanks have witnessed major changes, such as changes based on public specialization in the recent years. This insight change differs widely from what was common in the literature of America and Europe in the past. In other words, some kind of mergers and acquisitions in the past views and what exists today towards these tanks has been done. The research conducted through comparing the think tanks in different countries including Europe and America imply the high influence of the way of organizing in effectiveness of their activities [12].

The Theory and Components of the Think Tank

The theory of think tank is to open mind in the fundamental areas of thought. This theory has three components:

1. A room for think-making and thinkers' conceptual thinking;
2. A room for providing think-makers and planners a recognition to promote the thinking culture in the society and organization;
3. A workshop for think-making and the revival of fundamental thinking based on the studies that these workshops are as the seat of thought and the extract of the think tank. In other words, the think tank has a research and education instruction and does local shaping, so that in all organizational areas, those who have the background of think-making and understanding the think, enjoy the necessary facilities and opportunities in scoring their thoughts (Hart and Vromen, 2006).

The Tasks of the Think tank

Three-task Strategy:

Organizing the activities of the think tank;

Promoting the knowledge of the think tanks group in the way of doing operations in different situations;

Offering useful advices for senior managers of groups in the think tanks to assess the nature of organizing used by the think tank and prepare the best situation and the most appropriate way for the think tanks. To do the considered works, another important factor that have attracted the attention in the tanks organizing is the impacts of the funding suppliers' decisions on the way of selecting the researchers by the think tanks.

Hart and Vromen believe that easy and sufficient funds are not always available for the think tanks, therefore in the case of funds shortage, the first part of activities that are usually excluded from the budget is the issues related to the scientific research and investigations in the body of governmental organizations. Hence, most suppliers of financing in the private sector request that the think tanks address issues based on the applied projects rather than producing new ideas. At the present, most think

tanks are under this pressure that firstly, they should be more flexible in the researcher selection; secondly, rather than offering long-term programs and ideas, they should address issues, effect of which will be short-term and early-returned; thirdly, thoughts and imagines based on the knowledge, relying on the professional reputation and scientific rating of its provider might not be applicable, or the applicant or client, exclusively with emphasis on the scientific and professional status of the theory and idea owner would not be interested in accepting the idea, but in such cases, with the critical attitudes stated towards such ideas, they would prefer to reach their considered achievements by conducting research that personally provides their financial resources (Hart and Vromen, 2008).

Barriers to Organizing the Effective Think tanks

One of the important challenges that always preoccupy the minds of policy-makers and politicians is the investigation of different alternatives of different combinations of possibilities and the selection of the best existing objects for decision-making based on data and information. In the developed countries, with regard to the time element, the above tasks have been devolved to the groups consisted of knowledgeable, experienced, outstanding, and renowned researchers, so that after their reviews, they present the best existent options to policy-makers and managers for decision-making. Now, the above tanks, which have been mentioned as the strategic think tanks, have significant application in most countries of the world. Also, in our country, according to the Fourth Economic, Social, and Cultural Development Program, the establishment of the think tanks has been placed on the government agenda. In the industrial countries, the tasks of data collection, their processing, and decision-making based on the provided information have been devolved to the groups consisted of researchers with scientific experiences in policy-making and management, so that after the investigation of different alternatives and combinations of various possibilities, they offer the best existent options for decision-making to managers. Hart and Vromen introduce a new kind of think tanks that always at the time and place, to evolve ideas, seeks to hold seminars and meetings to increase discourses. In most cases, the world of think tanks differs somewhat from other emerging professions. In a wide range, the strategic think tanks are increasingly shaping horizontally or by operating beyond geographical boundaries and other directions. This means that equations related to the principles priorities of the think tanks formation are changing, and at the present, the serious attention of the strategic think tanks is focused on building expertise to manage complex networks of the policy-making process (Hart & Vromen, 2008).

The strategic think tanks in Europe, with the participation of a large number of institutions and researchers in different areas, have been structured. The existent of various sources of funding for the think tanks has led to the formation of a more effective organizing for these tanks. For example, the increased scientific validity for the studies of the tanks is provided through appropriate financing for each project. In this regard, [11], with emphasis on numerous obstacles being faced by think tanks, especially the existent conflicts and tensions between financing and scientific validity as well as the challenges shaped by interactions between decision-makers and the media, believe that the capabilities and capacities of some think tanks are practiced only if the conflicts between scientific validity on the one hand and the need to create effective consultations to reach decision-makers on the other hand are managed in the best way [12]. Bell et al. believe that the strategic think tanks now have had successful activities in most major decision-making bodies and even in the private companies in the industrial countries of the world, so that it could be claimed that the rapid development of these activities are somehow related to the human enhancements in the different fields. In general, the objectives of these tanks formation are development of the strategic thinking, creating the context for analysis, ideation and presenting the professional and expert opinion to facilitate administrative decision-makings. Identifying the characteristics of the think tanks has a high impact on the way of their organizing; including the identification of objectives and visions of the think tanks in organizations and different countries that can be affective in identifying their specifications (Bell et al, 2005).

Research History

Sharifi in 2012 in his study on the investigation of the role and the importance of strategic thinking in the organization investigates the real sample in applying these think tanks in the organization. In the study conclusion, the author emphasizes on the importance of strategic thoughts in the organization in order to prepare long-term programs in the organization, and in his opinion, for competitive and complex environment, having practical and applicable thoughts is an appropriate solution which depends on having new think tanks. In a study by Danaeifard et al. in 2011 under the title of "the promotion of policy-making capacity for the country: typology of the role of the think tanks", the study results show fourteen classifications of opinions and beliefs of participants in both public and private sectors. The classified views have pointed out to the different roles of the think tanks in public policies of the country; and these roles respectively are interpretable as policy-makers, recommenders without role, conservatives, supporters, low-oriented critics, negativists, independent tank, uncoordinated actors, policy critics, ineffective fanatics, responsibility-escapers, efficient influencers, positive amplifiers, and unknown capacities. The roles evaluated by the participants in groups were similar, selected and evaluated have been considered as "the new roles" of the think tanks in the field of public policies which has been obtained by Q-like analysis, the attention to the magnitude of the operating load in the analysis, the importance of job positions of the group participants, the number of group members, and the factors that have expressed a large percent of the total variance. In a study by Lajavadi, KharfElahi and Mottaghi in 2010 under the title of "barriers to effective organization of the strategic think tanks", the study population

has consisted of the management faculty members of State Universities across the country. The study results obtained by t-test and Friedman test showed that some barriers have had the most significant impact on the effectiveness of organizing the think tanks. Also, there is a direct and strong relationship between organizing the tanks and their effectiveness. On the other hand, three factors also have not been considered as the barriers to effective organization of the think tanks and have not been approved. Bauer in his article in 2011 under the title of "the role of information technology in the establishment of the strategic think tanks" has investigated the organizations that have used information technology as a more competitive advantage than competitors and have benefited from the formation of the creative and innovative think tanks in order to fulfill the goals of the organization in accordance with new technologies; viewing the profiles of three senior managers of the study organizations are seen: identifying the organization situation; identifying gaps or unfulfilled opportunities; and tracing the environmental factors. Bauer considers these components as the output result of the think tanks in successful organizations that, relying on the latest technologies while facilitating the realization of their goals, try to ensure a continuous growth. Pohan in his study in 2008 about the creation and development of think tanks considers the emergence of a large number of problems and also the existing issues in the inter-organizational communications as a result of poor management of the think tanks and emphasizes that in many cases, the implementation of the ideas and attitudes within and between independent firms, as a management method, has not enough accuracy, delicacy, and firmness, devotes much time to build trust and attract others, and especially in the absence of governance structures and contractual arrangements with effective and appropriate usage to ensure the real and special cases, it lacks the necessary decisiveness.

METHODS

This research is Applied-Res in terms of the aim and is descriptive-scanning and cross-sectional in terms of method; and in terms of information gathering, it can be considered as a kind of field research.

The study population is two groups, that the first consists 12 faculty members who are members of the think tank of Islamic Azad University of Gaemshahr, and the second consists of all 300 faculty members of the university; so that the volume and the sample of the second group, according to the Cochrane method, was determined 160 people, that the samples were selected by the relative stratified sampling method.

The tool for gathering the required data on the investigation of the situation and performance of the think tank in Islamic Azad University of Gaemshahr has been a questionnaire based on [6] study. This questionnaire includes three parts of: 1) general questions, 2) 10 specific questions to investigate the performance of the think tank from the viewpoint of the think tank members, and 3) 19 specific questions to evaluate the think tank situation from the viewpoint of the faculty members.

Validity of this study questionnaire is of formal and content validity kind; that in this regard, the content of the questionnaire was analyzed by honorable supervisor; and after identifying and declaration of their opinion, the used questionnaire was recognized as appropriate and in accordance with the model. To determine the stability, the method of Chronbach's alpha calculation has been employed, so that the amounts of the calculated alphas for the variables of the think tank performance and the think tank situation equaled to 0.85 and 0.87, respectively, have been used.

The Theoretical Framework of the Research

The think tanks which have been formed informally nearly in 1800, and in 1960, after World War II, they have been recognized and noted; and also, as the substrate shaping public opinions and decision-making for community managers, in some communities, they have an influential mission. To investigate the status of the think tank in Islamic Azad University of Gaemshahr, the previous studies conducted on the think tanks were studied. So far, limited in the country studies have addressed the "think tank". Most of these studies lack a comprehensive conceptual model to investigate the status of the think tank. Of the few good studies conducted in this regard has been the study by [6]. In their study, these researchers investigated the barriers to effective shaping and organizing the think tanks by employing the comments of the management faculty members of the State Universities in Iran and identified the barriers. By referring to the contents of the interviews and the gathered articles and scientific resources of the study, they identified 16 factors as the study indices to identify the barriers to effective organizing in the think tanks and compared and analyzed these factors by statistical tests. Due to the proximity of the present study subject to Lajavardi's et al study as well as the sameness of the study population members in both studies, in this study the pattern used by the mentioned researchers is used and the status of the think tanks in Islamic University of Gaemshahr is addressed.

The Research questions

1. Is there the think tank of Islamic Azad University of Gaemshahr?
2. If the answer to the question 1 of the research on the existence of the think tanks in Islamic Azad University of Gaemshahr is positive, from the tank members view, how is their performance and how are prioritized their ratings?
3. From the viewpoint of the faculty members, how is the status of the think tanks in Islamic Azad University of Gaemshahr?

Using descriptive statistics methods such as drawing frequency distribution, frequency percent, relative cumulative frequency, mean, median, standard deviation, minimum, and maximum tables and charts, the data were described; and inferential statistics methods such as Kolmogorov-Smirnov, one-sample t-test, and Friedman test were used to analyze the data. The software SPSS was used to evaluate the research questions, and Kolmogorov-Smirnov test was used to assess the normality of the data obtained from the study variables.

Data analysis

Descriptive findings

In the descriptive assessment, of 10 members of the think tank, the all were male, and of 169 faculty members, 136 were male (80.5%) and 33 were female (19.5%); in the marital status of 10 members of the think tank, all were married; of 169 faculty members, 22 were single (13%) and 147 were married (87%). In the age ranges, of 10 members of the think tanks, 2 (20%) were 31 to 40 years old, 6 (60%) were 41 to 50 years old, and 2 (20%) were above 50 years old; and of 169 faculty members, 66 (39.1%) were 31 to 40 years old, 60 (35.5%) were 41 to 50 years old, and 43 (25.4%) were above 50 years old. Finally, in the work experience discussion, of 10 members of the think tank, 2 (20%) had 6 to 10 years experience, 2 (20%) had 11 to 15 years experience, 4 (40%) had 16 to 20 years experience, and 2 (20%) had above 20 years experience; and of 169 faculty members, 16 (9.5%) had less than 5 years experience, 51 (30.2%) had 6 to 10 years experience, 55 (32.5%) had 11 to 15 years experience, 34 (20.1%) had 16 to 20 years experience, and 13 (7.7%) had above 20 years experience.

RESULTS

After gathering the data related to the study variables, the Kolmogorov-Smirnov test was carried out, the results of which showed that the study variables were normal; therefore parametric tests were used to assess the questions and respond to them.

The first question of the study: Is there the think tank of Islamic Azad University of Gaemshahr?

According to the conducted investigations and follow-ups, it is indicated that in Islamic Azad University of Gaemshahr, 12 faculty members were appointed under official verdicts as the think tanks members of the university, so the think tank exists in Islamic Azad University of Gaemshahr.

The second question of the study: If the answer to the question 1 of the research on the existence of the think tanks in Islamic Azad University of Gaemshahr is positive, from the tank members view, how is their performance and how are prioritized their ratings?

To answer the second question, a questionnaire consisted of 10 questions has been used to assess the performance of the tank from the viewpoint of its members.

As noted above, to answer to this question, the questionnaire was distributed among the think tank members of the university, and by continuous pursuits, 10 questionnaires were completed and collected.

Table 1: The statuses of responds to the performance indices of the think tank by its members

Statements	Very low	Low	Middle	High	Very high
1 The quantity of holding meetings and sessions monthly and seasonally	6	4	-	-	-
2 The quality of holding meetings and sessions and discussing different issues	8	2	-	-	-
3 The think tank performance in solving the education problems	5	5	-	-	-
4 The think tank performance in solving macro management and administrative problems in the university	6	4	-	-	-
5 The think tank performance in offering appropriate solutions and strategies to take appropriate decisions	3	7	-	-	-
6 How to improve the quality of the determined public policies and its feedback on the society	4	6	-	-	-
7 Flexibility of the senior upstream authorities and allocation of the specific budgets to exercise the determined strategies by the think tank	6	4	-	-	-
8 Clear understanding and full control of the authorities on the positive functions of the think tank formation in the university	5	5	-	-	-
9 Your satisfaction with the specific budgets in the university for the think tank formation	8	2	-	-	-
10 Interaction and consultation between the senior authorities of the university and the faculty members	8	2	-	-	-

Table 2: The descriptive indices of the variable of the thinks tank performance from its members view

Research variable	Number	Mean	Median	Mode	Standard deviation	Minimum	Maximum
The think tank performance	10	1.41	1.40	1.40	0.18	1.10	1.80

The think tank performance variable from its members view has the mean 1.41, the median 1.40, the mode 1.40, the standard deviation 0.18, the minimum 1.10, and the maximum 1.80, that the mean 1.41 over the theoretic mean 3 lays within very low-low.

According to the results, the members of the think tank in Islamic Azad University of Gaemshahr evaluated the performance of this tank as low and very low. However, by the lack of holding the tank meetings, this result seems reasonable. Naturally, when meetings are not hold regularly and in presence of members, the tank would not have any performance or have a very low performance.

Also, according to the assessment of the statements (indices), the priority of each of them through Freidman test is presented in [Table 3].

Number	Statements	Average rating	Priority
1	The think tank performance in offering appropriate solutions and strategies to take appropriate decisions	6/95	First
2	How to improve the quality of the determined public policies and its feedback on the society.	6/45	Second
3	The think tank performance in solving the education problems	5/95	Third
4	Clear understanding and full control of the authorities on the positive functions of the think tank formation in the university	5/95	Third
5	The quantity of holding meetings and sessions monthly and seasonally	5/45	Fourth
6	The think tank performance in solving macro management and administrative problems in the university	5/45	Fourth
7	Flexibility of the senior upstream authorities and allocation of the specific budgets to exercise the determined strategies by the think tank	5/45	Fourth
8	The quality of holding meetings and sessions and discussing different issues	4/45	Fifth
9	Your satisfaction with the specific budgets in the university for the think tank formation	4/45	Fifth
10	Interaction and consultation between the senior authorities of the university and the faculty members	4/45	Fifth

According to [Table 1] and Friedman ratings, the highest rate is for the fifth index: The think tank performance in offering appropriate solutions and strategies to take appropriate decisions with the average rating 6.95; and the lowest rate is for second statement: The quality of holding meetings and sessions and discussing different issues with the average rating 4.45; ninth: Your satisfaction with the specific budgets in the university for the think tank formation with the average rating 4.45; and tenth: Interaction and consultation between the senior authorities of the university and the faculty members with the average rating 4.45.

The third question of the study: From the viewpoint of the faculty members, how is the status of the think tanks in Islamic Azad University of Gaemshahr?

Before examining the research question, we do the descriptive investigation of the variable. [Table 4] presents the descriptive indices such as mean, median, mode, standard deviation, maximum, and minimum.

Table 4: The descriptive indices of the research variable from the faculty members view.

Research variable	Number	Mean	Median	Mode	Standard deviation	Minimum	Maximum
The think tank status	196	2.95	2.84	2.42	0.54	2.00	4.42

As shown in [Table 4], the think tank variable has the mean 2.95, the median 2.84, the mode 2.42, the standard deviation 0.54, the minimum 2.00, and the maximum 4.42; which in terms of descriptive, the calculated mean (2.95) is less than the theoretic mean, so the think tank status in Islamic Azad University of Gaemshahr, from the faculty members view, is less than average.

After the normality test and proving the descriptive indices of the research variable, the third question of the study has been investigated. To investigate and analyze the study question, the one-sample t-test was used. As the statements are with five-option Likert responses, the resulted mean for each variable was compared with the theoretic mean with the value 3, the null hypothesis in this test is the mean less than or equal to 3, and when the value of the computational t is large or the value of sig. is less than 0.05, that means that the level of that variable is higher than the average, and if the value of sig. is higher than 0.5, that means that the level of the considered variable is less than or equal to the average.

Table 5: The investigation of the think tank status in University of Gaemshahr from the viewpoint of the faculty members using the one-sample t-test

Variables	The constant value of the test 3					Test result	Status
	Mean	Standard deviation	t-statistic	Degree of freedom	Probability		
Strategic think tanks (whole questionnaire)	2.95	0.54	-1.09	168	0.95	Null hypothesis confirmation	Inappropriate

To investigate the status, the following hypotheses are used.

H₀. The think tank status in Islamic Azad University of Gaemshahr is not sociable from the viewpoint of the faculty members.

H₁. The think tank status in Islamic Azad University of Gaemshahr is sociable from the viewpoint of the faculty members.

$$\begin{cases} H_0 : \mu = 3 \\ H_1 : \mu \neq 3 \end{cases}$$

As it can be seen, the research variable, i.e. the think tank has the mean 2.95 and the standard deviation 0.54, and with regard to the t-statistic value -1.09 and the probability value 0.05, the null hypothesis of the research is confirmed; so the think tank status lays in less than the average 3. Therefore, the think tank status in Islamic Azad university of Gaemshahr has not a sociable status.

SUMMARY AND CONCLUSIONS

First, Kolmogrov-Smirnov test was used to investigate the data distribution of the quantitative variables; and the results showed that the research variables have normal distributions; and after conducting this test and achieving this result, we were allowed to use the parametric test in order to investigate the research questions.

The results indicate that the think tank exists, but it has a performance within very low-low range, and the most important causes of it, respectively, are: 1) the highest rating on the fifth items: the performance of the think tank in offering appropriate solutions and strategies in order to take appropriate decisions with the average rating 6.95; 2) the second priority on the sixth items: how to improve the quality of the determined public policies and its feedback on the society with the average rating 6.45; 3) the third priority on the third items: the performance of the think tank in solving the problems of the education system with the average rating 5.95; and on the eighth items: clear understanding and nobility of the authorities on the positive functions of the think tank formation in the university with the average rating 5.95; 4) the fourth priority on the first items: the quantity of holding the meetings and sessions monthly and seasonal with the average rating 5.45; on the fourth items: the performance of the think tank in solving the management and administrative macro-problems with the average rating 5.45; and on the seventh items: the flexibility of the senior upstream officials and allocation of the specific and determined budgets to practice the determined strategies by the think tank with the average rating 5.45; 5) and finally, the last and the least important priority on the second items: the quality of holding the meetings and sessions and discussing various issues with the average rating 4.45; on the ninth items: the extent of your satisfaction with the specified budgets in the university to form the think tank with the average rating 4.45; and on the tenth items: the interaction and consultation between the senior authorities and faculty members of the university with the average rating 4.45.

Suggestions Based on the Research Findings

Based on the obtained data and the results of the present research questions, some suggestions for improving the statuses of the strategic think tanks in Islamic Azad University of Gaemshahr and other universities are offered as follows:

1. The allocation of a suitable budget and various financial suppliers in the university plays a positive role in the formation and the appropriate status of the think tanks.
2. To exploit the professional views in the university plans by the enjoyment of all scientific capabilities and the experience human forces of the university.
3. The existence of flexibility, understanding and consultation between members (faculties) to take common decisions in the think tanks undoubtedly will be effective in upgrading the place of the this tank to create thought.
4. The practical believe of the senior authorities of the university to the participative management system and the extent in which suggestions and critiques are welcomed by the faculty members in order to achieve the university goals and programs.
5. The transparency and explicit, real, and suitable accountability of the senior authorities of the university.
6. To introduce the role and the place of the strategic think tanks in generating thoughts to create tendency among the faculty members to join in such a tank in the university will be effective.

CONFLICT OF INTEREST

There is no conflict of interest.

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ARTICLE

TIDAL CURRENTS MODEL OF PERSIAN GULF

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ABSTRACT

One of the elementary and effective aspects associated to the formation of hydrodynamic conditions and characteristics of coastal regions is the tide. Tide is the basic and most compulsory information in order to study on sedimentation, erosion and morphological changes in beaches, coastal flooding, and is moreover very obliging for shoreline management. In this article, it is tried to practice on MIKE21-HD-FM as a mathematical model to predict tide in Persian Gulf coast areas. Forecasting the tidal currents will be conceivable by utilizing the hydrographic information of seabed, tidal specifications of the stations and measured water level in tidal stations. The results presented that the model has been well simulated the documented pattern of fluctuations in water level in both Bahman port and Salakh port stations. It is revealed that there are no significant differences in model results based on diverse coefficients bed resistance. After ensuring the calibration of tidal model in Persian Gulf, the tidal fluctuations records were introduced in calibration model in 2011 in Jask in order to produce the relevant information. The results exposed that the output of the model is a respectable match with the measured values.

INTRODUCTION

KEY WORDS

Tide, MIKE21, Persian Gulf

The tide is one of the main factors influencing in formation of situations and characteristics of hydrodynamic coastal areas. In this paper, the water level fluctuations and the tide flow patterns in the Persian Gulf were investigated. The results of these studies will assist us in sedimentation, erosion, coastal morphological changes, coastal flooding studies and shoreline management. It should be mentioned that the main tool in order to achieve this model is the mathematical modeling of tidal wave and by expending these models, the ability to calculate and determine the pattern of flow rate and water level changes caused by tides will be provided. Thus, in the first step, the main work and its procedures were described and then in the second step, the establishment of simulation model was presented and finally, the evaluation results were discussed. Ershadi et al. [3] focused on field data in their studies that included changes in water level, speed and direction of currents, hydrography, boundaries and software MIKE21, tried to simulate tidal currents in Tiab lake in 2013. In their study, it was clear that by analyzing the tidal flow simulation in the lake it was clear that they got a great model and good results by comparing between the output of the mentioned model and the field data. Chen et al. [1] tried to utilize three-dimensional model called semi-implicit Eulerian-Lagrangian finite-element in order to model the water levels and tidal flow in the Taiwan Strait in 2013, and it should be mentioned that according to this model, they determined potential sites on the way to use tidal currents' energy. The cited model used nine tidal elements (M2, S2, N2, K2, K1, O1, P1, Q1 and M4) to be conducted in open borders. The results revealed that this model is competent to predict the tidal flow. In addition, it should be declared that in relation to the researches, the highest tidal currents occurred in Penghu channel in Taiwan Strait. Jasmi et al. [4] tried to focus on Arvand river to analyze the tidal flow in this zone. MIKE11 was the unsteady mathematical model established in this study to simulate hydraulic changes in Arvand river. In the direction of simulating the data, they tried to practice on the water level changes in the middle of the Arvand river and in river inputs. Via this data, the model was calibrated and in the next step the tide and flood conditions were assisted to determine the water depth and flow velocity in diverse parts of the river. The results indicated that the roughness coefficient of the river was between 0.048 and 0.055.

Another study represented by Babo et al. [2] analyzed and simulated the tidal currents in Kachachh in 2005 that is located in the southwest of India and they exact model they were working with was the mathematical MIKE21 model. The outcomes of the modeling were obtained by field data that were measured at three dissimilar times. The model outcomes displayed good agreement with field data and it expressed that the model output was capable of simulating the tidal currents.

Additional research related to Azmoudeh and Tourian [6] published the study that is linked to the tidal changes in water surface of Gulf of Oman and Persian Gulf and they got the data from the TOPEX Poseidon satellite in almost eleven years besides they collected the coastal tide gauge information by employing Fourier analysis method and finally, they model estimated the results in least squares of tidal components that was placed in a larger period of four hours. Later, the mean sea levels and the tidal model were regulated and in the following phase, and in advance, the mean sea level map and the tidal amplitude and phase components maps were determined for four components presented as s2, M2, K2 and O1.

The outcomes expose that the used technique is well able to model the tidal currents. Rabiee far et al. [5] evaluated water level in Shahid Rajaei port in almost eleven years and in the end they got a numerical model in 2007 that could determine tide regime in any location in the heart of the sea. In their study, they practiced on MIKE21 software to have a harmonic analyze (linear regression) on the main domains of the

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tide and in the end, they compared their results. The outcomes presented that the numerical model used in this project was well capable of calculating tidal regime.

Area of Study

Persian Gulf is at 24 to 30 degrees 30 minutes' north latitude and 48 to 56 degrees 25 minutes' east longitude from Greenwich meridian. Persian Gulf is located between Strait of Hormuz and Gulf of Oman, through which is linked to the high seas and it extends in an area of 225,000 square kilometers, which has dissimilar latitudes. The minimum width of water is 180 kilometers and the maximum width is 300 kilometers. The length of the Persian Gulf from the beginning of the Arvand River to the Strait of Hormuz is 900 kilometers. The depth of the water of the Persian Gulf is on average between 50 and 80 meters in the east and in the west it is approximately 10 to 30 meters. [Fig. 1] displays the location of the study area.

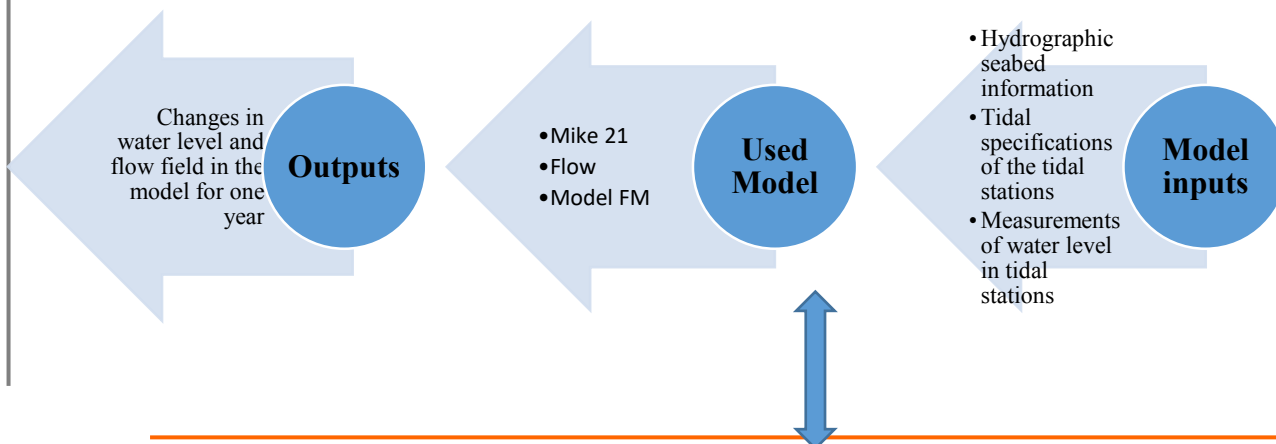


Fig. 1: The location of the study area.

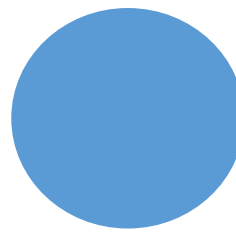
METHODS

Presenting MIKE21-HD-FM model

In this paper, MIKE21-HD-FM which is a mathematical model is applied to forecast the tide in the Persian Gulf coast. In mathematical modeling of tidal wave propagation, there are two-dimensional horizontal equations in the shallow water that are used as the averaged flow equations in depth. These equations consist of a mass conservation equation and momentum conservation equations (in two horizontal dimension) and via this system of equations, it will be possible to calculate the three unknown elements of water depth (h) and the two components of speed at which are in Cartesian coordinates. The goal is to get the best model to predict fluctuations in water level. In order to gain this, in the first step a comprehensive tidal model for the Persian Gulf was prepared and in the next step based on the comparison of model results with measured water level fluctuations at several tidal stations in the Gulf the general model has been calibrated. [Fig. 2] shows how the model of tidal in Persian Gulf works.



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Evaluation and
validation of
comprehensive models

Fig. 2: The procedure of the comprehensive tidal model in Persian Gulf.

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In addition, by using the calibrated model, tidal currents in the Gulf were simulated for one year. At that point, by evaluating the results of the comprehensive model at several stations, it assured the comprehensive model's operation.

Used Information

First of all, it should be declared that data collection is one of the most imperative parts in this study. In this section, in order to get a set of basic and necessary information, we will introduce this information and their sources.

- Geometry of the study area

The boundary between the land and the sea in Persian Gulf were extracted from the Mike C-map digital data. This information gathered from some of the islands in the Persian Gulf borders, such as Qeshm, Kish, Hormuz, Lark, Bahrain and so on. The scale of the data is 1: 250,000.

- Hydrography information of the study area

One of the essential information for any kind of hydrodynamic simulation is the depth information or hydrographic information about the limitations and the boundaries of the study. For this purpose, the entire Persian Gulf hydrographic information was gathered from the Mike C-map digital information bank. The scale of the data is 1: 250,000.

- Tidal information

All the information needed in calibration and evaluation of modeling results like any vital info in any simulation is numerical. Due to this purpose, all of the tidal information recorded in the Jask station in 2011 are prepared in a shape of a time series with the time step of 30 minutes from the water level fluctuations of the lowest water level in the Chart Datum. The most suitable information gathered in this year is related to Salakh, Bahman and Loft ports and will be used as a data for the calibration model.

Also, in the direction of having a greater scrutiny on calibration accuracy, it is needed to use the predicted results from the tide levels in three stations that are Shahid Rajaee, Lengeh and Kangan ports, which are made from the site of the mapping organization. The timeframe of these points is in November 2011. The location of the places used in the calibration model is exposed in [Fig. 3].

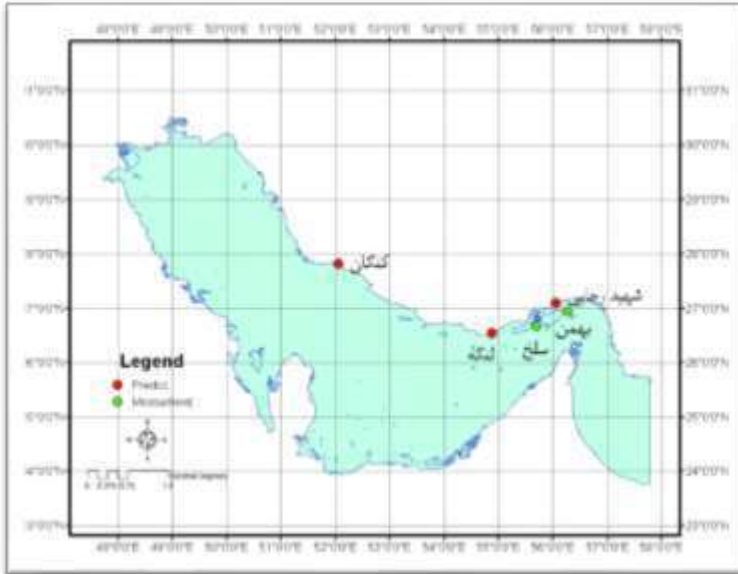


Fig. 3: The location of the places used in calibration of the tidal model.

RESULTS

Establishing up the comprehensive tidal model of Persian Gulf

In the model presentation, the minimum step time parameter value is 0.01 and the maximum time step is 15 seconds and the maximum allowable courant number is 0.5. One of the adjustments related to the model is actions related to the effects of Coriolis. Due to the size of the investigative area, the effect of these forces will be noticeable on the output results. [Fig. 4] expresses the output from running the model.

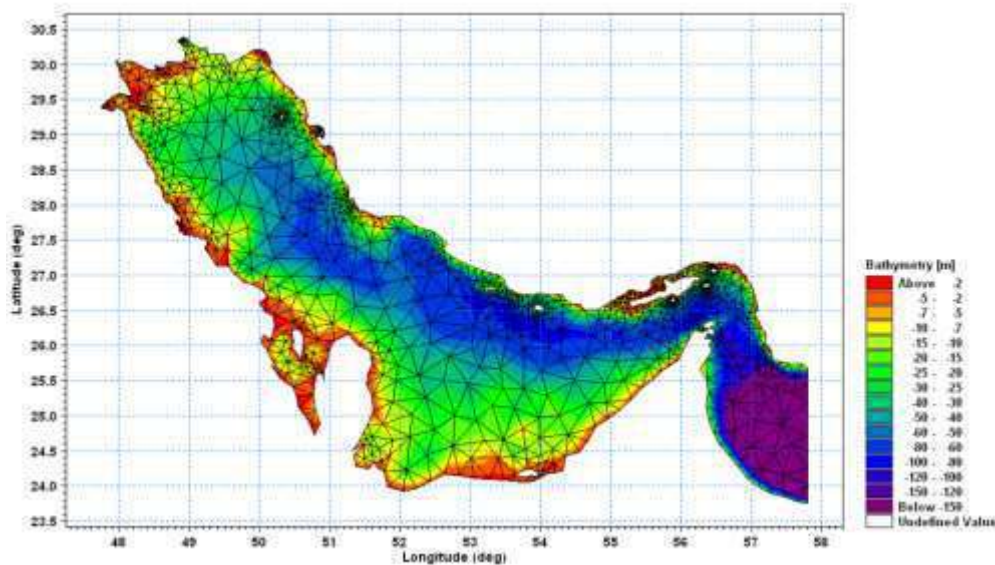


Fig. 4: A comprehensive tidal model of the Persian Gulf.

Calibration of the comprehensive tidal Gulf model

The obtained model is implemented for different values of resistance substrate that are 32, 40, 50 and 55 and the results were compared to the values sensitivity. Therefore, the results of the model in each of these scenarios were compared with the measured corresponding data related to the Salakh and Bahman ports and the predicted values from the Shahid Rajaee, Lengeh and Kangan ports.

The model is responsible for calculating the water level fluctuations in Salakh and Bahman ports and later the results were compared as shown in [Fig. 5].

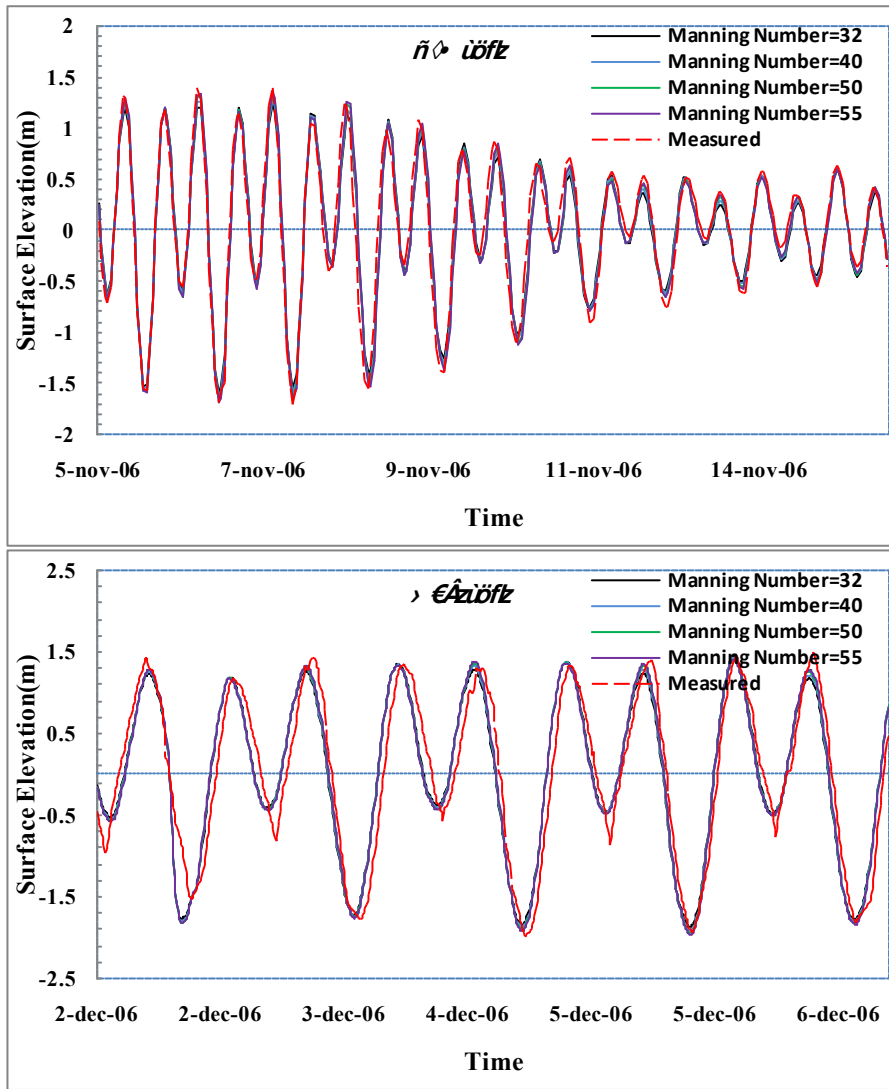


Fig. 5: the comparison between the simulated water level fluctuations and the corresponding measured values in Salakh and Bahman ports.

As shown in this [Fig.5], the tidal model in Persian Gulf is well talented to simulate the recorded water level fluctuation patterns in both of Bahman and Salakh ports. It is clear that there are no significant differences in model results for different coefficients of the bed resistance.

[Fig. 6] shows the comparison between the calculated water level fluctuations based on the model and the corresponding predicted values related to the mapping organization focused on the Shahid Rajaei, Lengeh and Kangan ports in November. The amount of 50 were nominated for bed resistance.

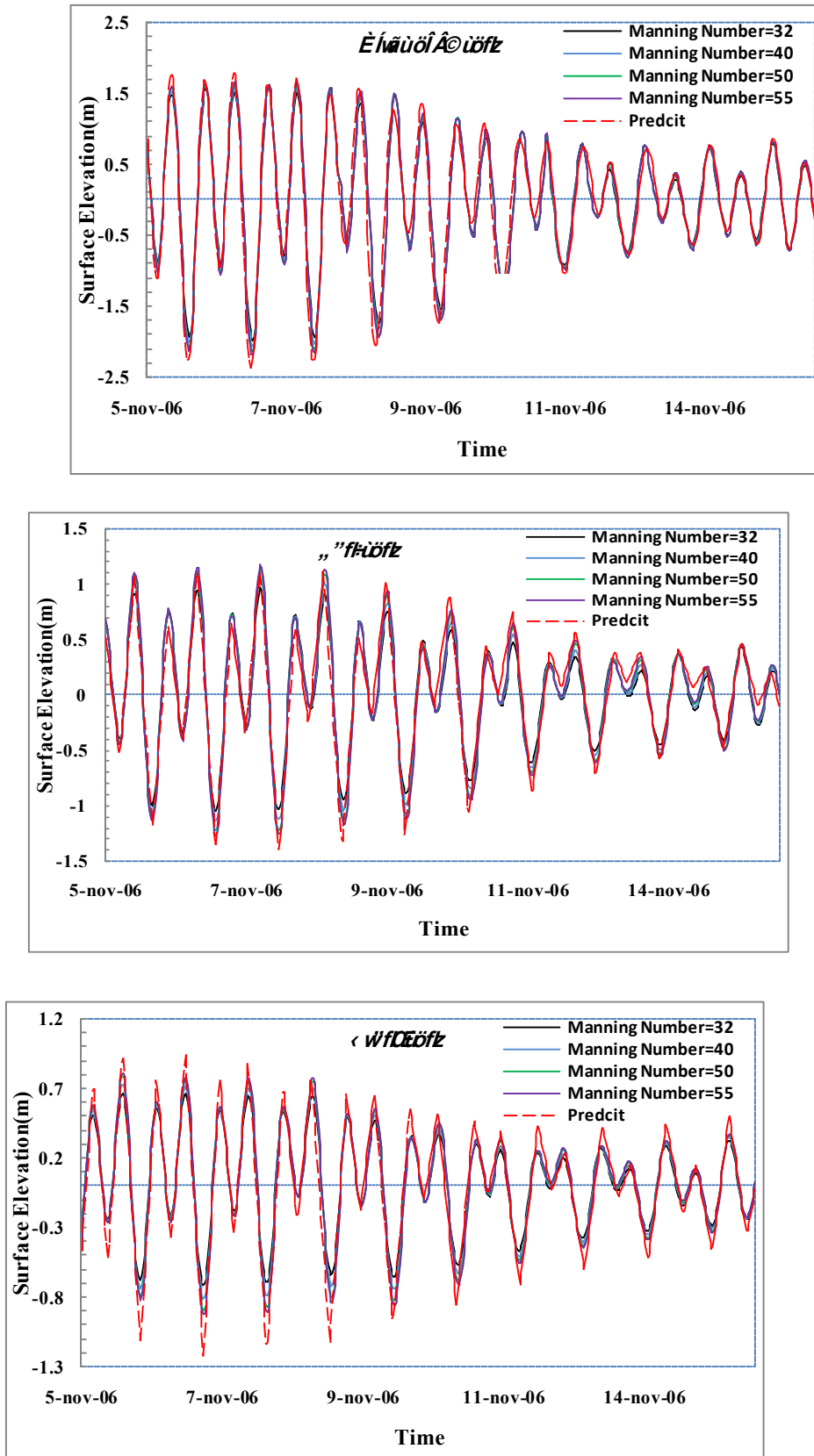


Fig 6: Comparing the simulated water level with corresponding predicted values (in November).

The results of a comprehensive tidal model in the Persian Gulf

After ensuring the outcome of the calibration of tidal model in Persian Gulf, with the aim of producing relevant information, calibration model got access to work on the tidal fluctuations records related to the Jask port for the whole year of 2011 and consequently, the tidal fluctuations were simulated for one year in Persian Gulf. [Fig.7] is an example of the water level fluctuations of tidal modeling that is publicized by the comprehensive model in both flow and reflows in Persian Gulf.

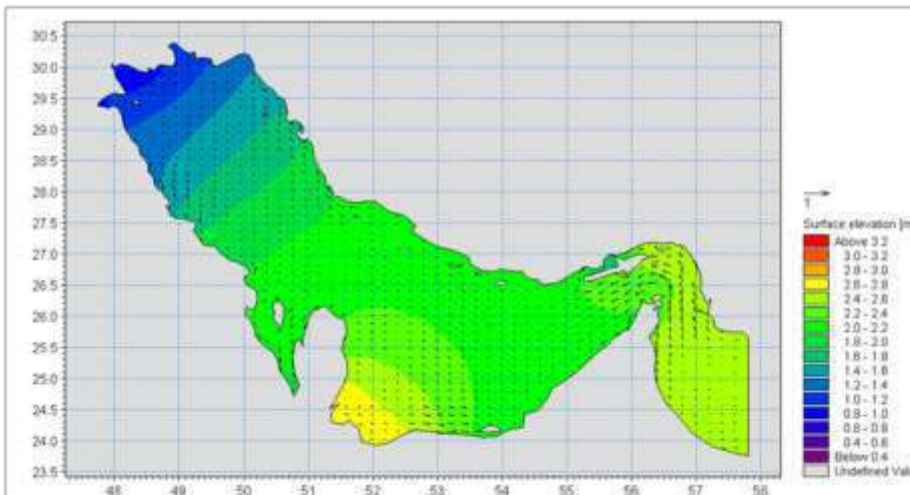
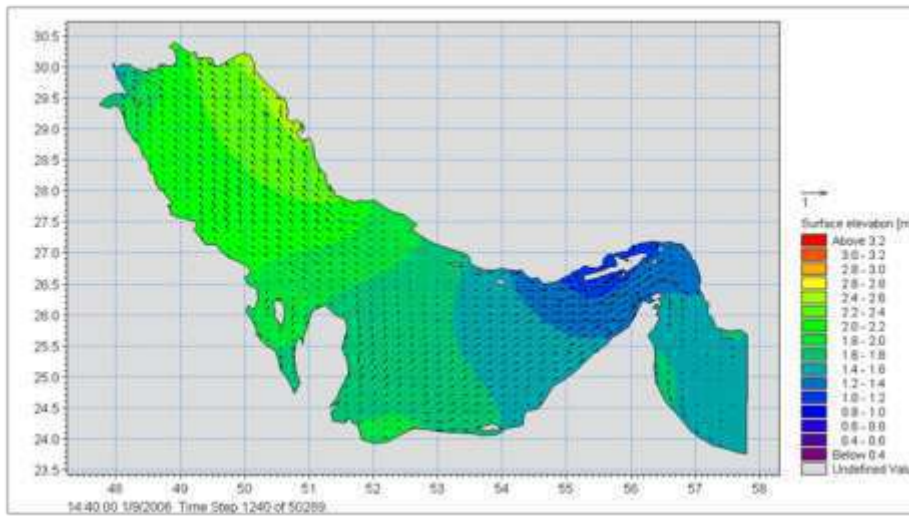
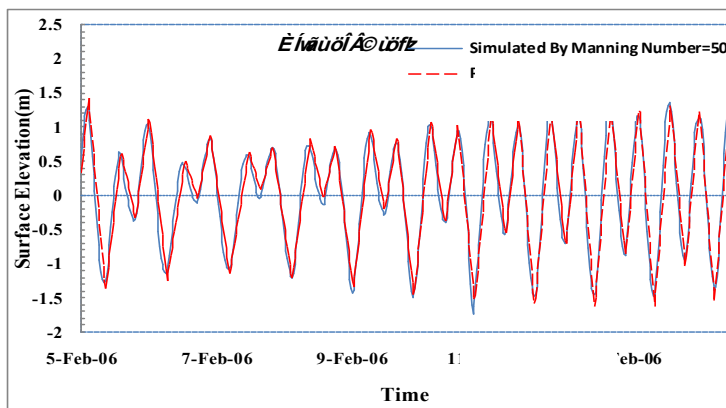


Fig. 7: Water level fluctuations and flow of the tide modeling.

At this stage, and so as to evaluate the results of the calibrated simulation model, again the water level fluctuations values were calculated by the model at the ports of Shahid Rajaei, Lengeh and Kangan and later they will be compared with the corresponding predicted values in another period of time [Fig. 8].



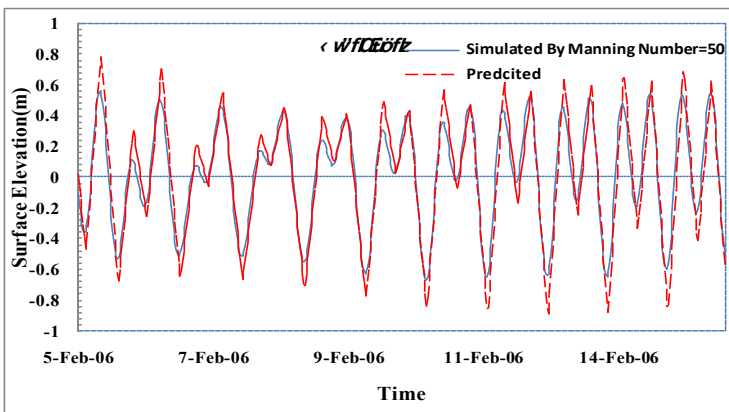
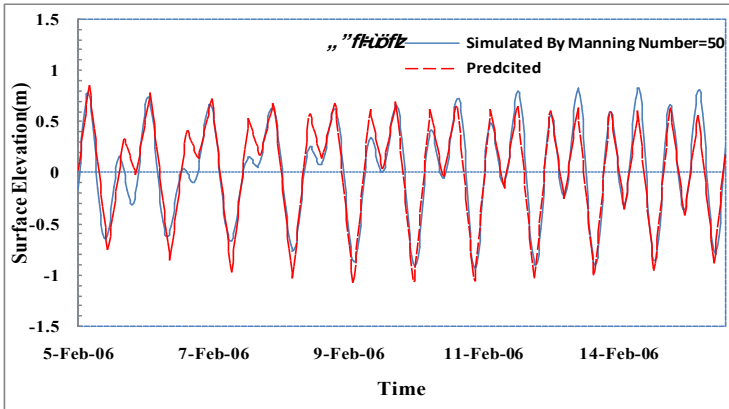


Fig. 8: Comparing the simulated water level with corresponding predicted values in February.

As seen in [Fig. 8], the results show noble correspondence.

DISCUSSION AND CONCLUSION

Results from the tidal Modeling in Persian Gulf show that flow and inflows of the tide can be easily calculated and predicted according to the mentioned modeling.

CONFLICT OF INTEREST

There is no conflict of interest.

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None

FINANCIAL DISCLOSURE

None

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ARTICLE

PRODUCTION OF CARBON NANODOTS IN THE DETECTION OF MICROBIAL AGENTS

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ABSTRACT

Today, nanotechnology is one of the modern sciences and has affected all human life. This knowledge has been used in different fields such as the food industry. Since human beings are in dire need for food daily and permanently, any change in the food industry will have an important role in changing the quality of human life. One of the most useful tools in nanotechnology is the production of nanodots which are useful in different fields including the food industry in areas such as packing, molecular foods, labeling and monitoring, food additives, foods having a special releasing in body, and enzymes encrusting. Most researchers believe that nanotechnology is one of the foundations of the independence consolidation and national security of the country. Nanotechnology can be studied in two aspects of food safety and nutrition as well as overt and covert anti-hunger fighting. One of the most important different structures in nano-carbons is Dotted carbon clusters (carbon nanodots), and there are different ways to produce them. In this study, which has been conducted by the use of microwave method for producing carbon nanodots and then, it has used the Bioluminescence properties to verify microbial spoilage or destruct food vitamins in packed foods, the size of carbon nanodots in the nano dimension shows different qualities of light, and the survey found that the nanodots production by the mentioned methods can be useful in the visual detection of microbial contamination in food ingredients and vitamins or in labeling and monitoring in food additives and foods having a special emission in body and in enzymes encrusting.

INTRODUCTION

Carbons at the quantum level have passivating surfaces that are very stable, and are highly regarded due to the properties of immunoreactivity before light, biocompatibility, low toxicity, cost-effectiveness and abundance of its raw materials in the nature. Carbon nanodots have a very good solubility in water because of the existence of a lot of carboxylic acid on their surfaces, and this has caused them to be functionalized by the use of organic, polymeric, inorganic, and biological materials. These nano-structures have attracted a considerable attention due to their very small dimensions and uniform structure, diversity of simple production methods, the ability to functionalize them, and specially the ability to replace them with toxic metal quantum dots. Carbon dots are a new generation of carbonic photoluminescents containing oxygen which are spherical and their size is less than 10 nm [1]. These nanodots were obtained by chance in 2004 when purifying single-walled carbon nanotubes via electrophoresis. Nanodots are special superior than organic pigments in terms of high solubility in water, bioavailability and biocompatibility properties, simplicity in surface functionalizing, low toxicity, the ability to fluorescence, and high stability against fading. Carbon dots are known as fluorescent carbons due to their strong fluorescence properties [2]. This characteristic of nanodots has led to complex catalyst systems based on carbon nano-dots in order to provide the cost-effective use of all sunlight spectrums. But it should be noted that in these nanodots, their less than 10 nm dimensions have a special optical catalyst, and their larger sizes have little or no optical activity [3]. Various materials including graphitic masses and carbonic materials such as nanodiamonds [4], carbon nanotubes [5], soot (Chen, Dou et al. 2016), activated carbon [4], and graphite oxide [10] are used to produce these carbon nanodots by employing simple and inexpensive methods such as laser avulsion (Sonthanasy, Ahmad et al. 2016), arc discharge [6], chemical oxidation [7], combustion oxidation [17], and microwaves and ultrasound [16].

METHODS

In this study, the synthesis of nanoparticles was made using the thermal effect of microwaves and a combination of polyethylene glycol and a sugar compound such as glucose or fructose. In this way, different amounts of polyethylene glycol and polysaccharide were solved in distilled water and the resulting clear solution was placed in a 500W microwave oven for 10 to 19 minutes, and after functionalizing agents and neutralizing to detect microbial agents cultured in TSI culture medium, it has been used.

RESULTS

With increasing the reaction and shelf life, the solution color was changed to yellow and finally to dark brown [Fig. 1].

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KEY WORDS
Nanodot, microbial,
photolytic

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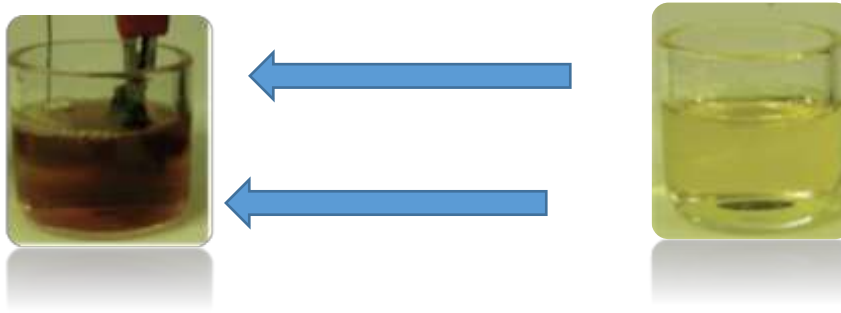


Fig. 1: The color change of the solution containing raw materials from yellow to dark brown with a higher irradiation time represents the generation of carbon nanodots.

Due to the reaction prolongation under microwave conditions, the generated nanoparticles become slightly larger and find the ability to have light emitting at higher wavelengths as well. In this way, after 5 to 10 minutes irradiation, microwave of carbon nanodots with sizes from 2.65 nm to 2.75 nm were obtained. Finally, the generated nanodots were resulted after removal of ethylene glycol by using the flooded concentrated sulfuric acid, and the generated carbonic mass were resulted by using distillation in 2M citric acid, and then by neutralization through sodium carbonate and removal of salt by the use of dialysis bag of 5 nm carbon nanodots [12]. The nanodots were deactivated through reaction with 4, 7, and 10-trioxo, 1 and 3-tridecan ethylene diamine, olein amine, or polyethylene glycol (PEG) at 120°C for 72h under a nitrogen atmosphere, and finally, by creating a level agent binding to bacteria, they led to the nanodot binding to bacteria and finally, identifying the microbial agent. Infrared spectroscopy showed the Fourier transformation of a tensile band in the area of 1572 cm^{-1} in accordance with carbon-carbon doubled bond and a vibratory band in the area of 1375 cm^{-1} in accordance with carbon-hydrogen bond. From the images of Transmission Electron Microscopy (TEM), the existence of crystal structure consisted of a similar network space was demonstrated. Elemental analysis proved the existence of carbon nanodots rich of carbon and oxygen with 57 wt% carbon, 7.5 wt% hydrogen, 8.5 wt% nitrogen, and 27 wt% oxygen [Fig.2].

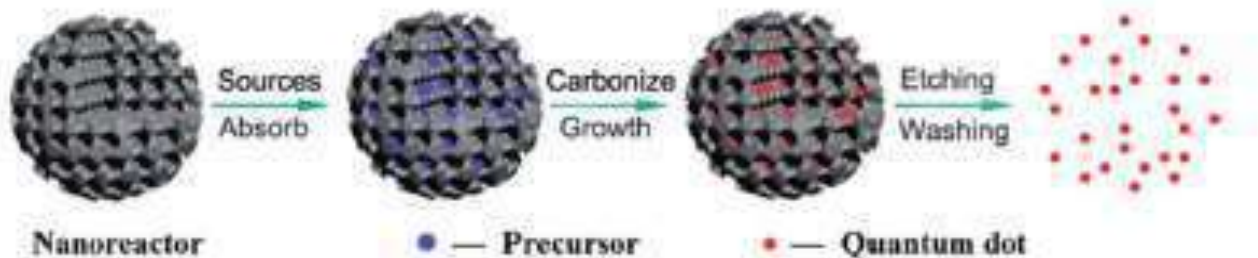


Fig. 2: Generation of carbon nanodots by absorbing microwave irradiation.

Nanodots generated in this way have absorption bands at about 320-260 nm. Carbon nanodots have an optical absorption with end stretching up to visible light range in the ultraviolet light range [Fig. 3].

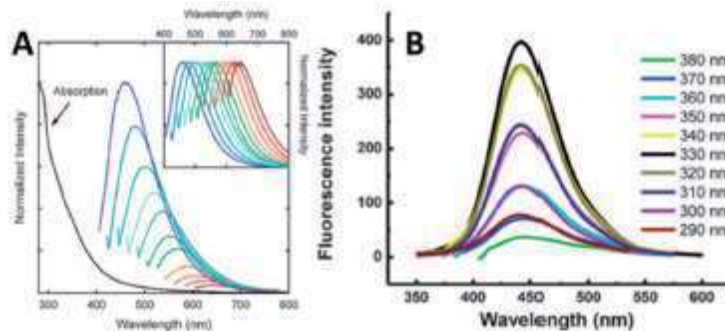


Fig. 3: The optical absorption on carbon nanodots in the visible to ultraviolet light spectrum.

Since the surface agents groups attached to nanodots are effective across absorption wave of nanodot, the nanodot absorption band increases into longer wavelengths after being functionalized with TTDDA or

Organosilane [9]. Two main optical characteristics of nanodots are based on the emission by surface energy traps and the effect of quantum size, so that the blue emission (shorter wavelengths) is resulted from the effect of quantum size and the green emission (longer wavelengths) is resulted from the effect of surface energy traps [15]. It should be noted that the exited optimal property of nanodots depends on the existence of the surface agents in the relevant nanodots and the nanodot size, so that according to the investigations conducted by Gang, Hu et al (2014), nanodots with a small size of 1.2 nm are dispersed in the ultraviolet area and nanodots with the size of 1.5-3 nm are dispersed in the area of visible light and the types with the size larger than 3.8 nm are dispersed in the area near infrared [Fig. 4&5].

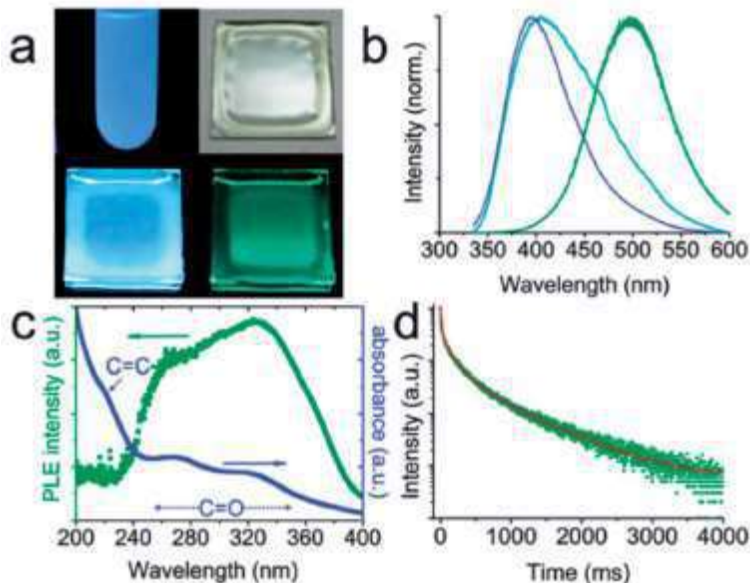


Fig. 4: Fluorescence property of carbon nanodots with absorbing the ultraviolet light .

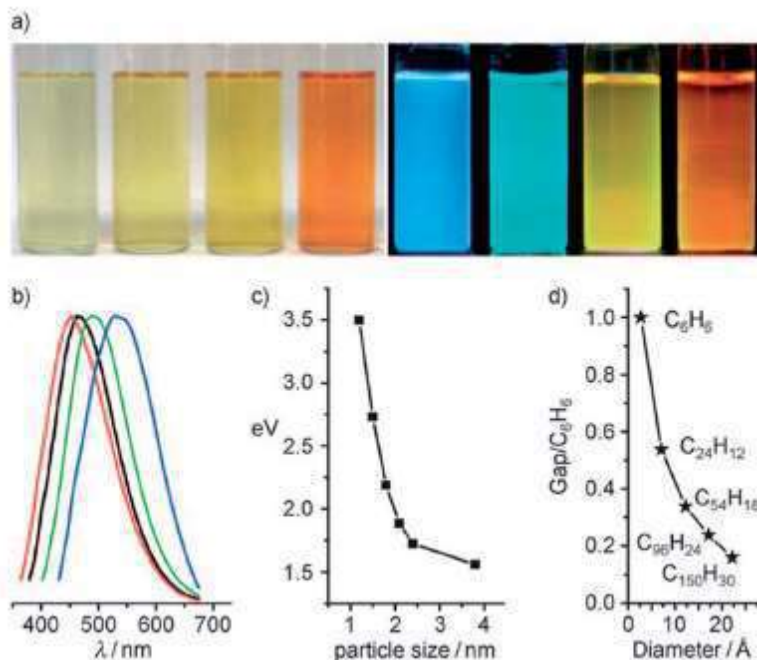


Fig. 5: Different emission spectrums of nanodots with different sizes.

Since agent groups have different energy levels, which can lead to produce a group of emission traps, when a light at a special wavelength is provoked, it causes the brightness of carbon nanodot, and in this case, the surface state of emission traps will determine the dispersion; now if the related carbon nanodot surface is neutralized through oxidation and other reactions of surface modification by the use of specified organic groups, then the light emission will simply be seen through shifting into red. Usually, surface-counteractive materials are agents having amine groups or polymers such as octadecylamine and/or polyethylene glycol. Research shows that different oxidation of nanodots surfaces leads to the emission of different optical colors [13]. In the investigations, it was indicated that carbon nanodots are used due to

their unique light induction properties and the excellent ability of electron diffraction as a choice for photovoltaic and optimal catalyst applications. Therefore, by creating targeted surface agents on these nanodots and then by oxidation of the relevant surface agents through oxidizing agents that are created in bacteria – considered as agents of food spoilage – or oxidizing agents that are created as a result of physical destruction of nutrients including vitamins, carbon nanodots can be dispersed, and accordingly, by the use of optical imaging process from such a exited nanodots in the mentioned state, the contaminated food sample can be immediately identified, and even if the surface-oxidizing agent can be designed in such a way that it is exclusively produced by a special bacteria, a novel method for the detection of the relevant bacteria can be conducted. In this study, exclusively by creating surface agents bonding to bacterial antigens, the ability of optical identification of bacteria has been gained [Fig. 6.a &b).

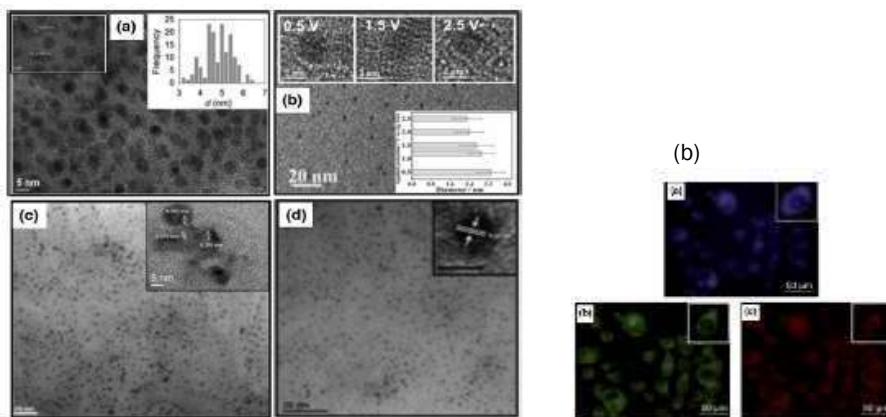


Fig. 6(a): different images of transversal electron microscope from generated carbon nanodots; **(b)** fluorescence property of carbon nanodots employed in the detection of bacterial samples and vitamin agents or animal food agents.

DISCUSSION AND CONCLUSION

As expressed, due to the prolongation of the reaction under microwave conditions, the generated nanodots become slightly larger and gain the ability to have optical dispersion across longer wavelengths. In this way, after 5-10 min irradiation, carbon nanodots microwave waves in the size of 2.65-2.75 nm are resulted. This process in Liu & He experiments showed that 5 nm carbon nanodots have photoluminescence strength. Also, as expressed, the nanodots were deactivated through reaction with 4, 7, and 10-trioxo, 1 and 3-tridecan ethylene diamine, olein amine, or polyethylene glycol (PEG) at 120°C for 72h under a nitrogen atmosphere, and finally, by creating a level agent binding to bacteria, they led to the nanodot binding to bacteria and finally, identifying the microbial agent. Infrared spectroscopy showed the Fourier transformation of a tensile band in the area of 1572 cm^{-1} in accordance with carbon-carbon doubled bond and a vibratory band in the area of 1375 cm^{-1} in accordance with carbon-hydrogen bond. The existence of longer wavelengths after functionalizing carbon nanodots according to Gang experiments was completely clear. In the investigations, it was indicated that carbon nanodots are used due to their unique light induction properties and the excellent ability of electron diffraction as a choice for photovoltaic and optimal catalyst applications. Therefore, by creation of targeted surface agents on these nanodots and then by oxidation of the relevant surface agents through oxidizing agents that are created in bacteria – considered as agents of food spoilage – or oxidizing agents that are created as a result of physical destruction of nutrients including vitamins, carbon nanodots can be dispersed, and accordingly, by the use of optical imaging process from such a exited nanodots in the mentioned state, the contaminated food sample can be immediately identified, and even if the surface-oxidizing agent can be designed in such a way that it is exclusively produced by a special bacteria, a novel method for the detection of the relevant bacteria can be conducted. In this study, exclusively by creating surface agents bonding to bacterial antigens, the ability of optical identification of bacteria has been gained.

CONFLICT OF INTEREST
There is no conflict of interest.

ACKNOWLEDGEMENTS
None

FINANCIAL DISCLOSURE
None

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ARTICLE

CASE REPORT OF BILATERAL EPIDURAL

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ABSTRACT

Background: epidural hemorrhage is a surgical emergency that in most cases can be a source of arterial and occurs mostly in the temporal region. **Methods:** This study is a report on the work of bilateral epidural hemorrhage patient records and clinical history of the patient was sick with preclinical findings. **Results:** A 19-year-old male patient trauma caused by the accident with loss of consciousness and was taken by ambulance to the emergency department Tarmac. The level of consciousness of the patient in the emergency department 9/15 respectively. The patient was intubated and under sedation brain CT scan and a diagnosis of bilateral epidural hemorrhage was left for them. The patient was taken to the operating room under sedation after surgery and was transferred to the intensive care unit. Estimation stopped sedation and after, the pupils were active and conscious patients admitted with respiratory distress was the fifth day of the re-intubation and after complete resolution of respiratory distress, the patient is transferred to the ward and was discharged on day 11 with full health. **Discussion and conclusion:** Epidural bleeding a decline in the level of consciousness and life-threatening and when this threat is greater bilaterally to be patient and medical emergency be assessed as soon as possible.

INTRODUCTION

Sequentially developed bilateral epidural hematoma have been rare and sporadic, therefore the incidence rate cannot be calculated based on the available literature (1, 2, 3). Epidural hemorrhage is arterial origin often, often in the form lense and an injury occurs, and when trauma is more common in young people (4, 5). The most common symptoms of epidural bleeding, including loss of consciousness, drowsiness, seizures, symptoms of neurological impairment such as impaired vision, headache, nausea and vomiting (6,7). Sometimes, in patients with epidural hemorrhage, improve alertness temporarily after a period of loss of consciousness can be seen it will be remembered as the distance light again after the interval level of consciousness drops (8, 9, 10).

CASE

19-year-old male patient in the trauma caused by the accident with loss of consciousness on 19/09/93 at 22:50 minutes by ambulance for medical emergency trauma hospital emergency department immediately moved Shahid Beheshti Yasouj. On initial examination, the patient pressure 110/80, patient's pulse 116, breathing 28 and level of consciousness were 15/9, pupils mydriasis, tachycardia and tachypnea was sick. Abdominal solography revealed normal internal organs and fluid in the pelvic cavity was seen. The patient was intubated under sedation and then ensure hemodynamic stability, a CT scan of the brain was performed and the diagnosis of bilateral epidural bleeding and fractures, depression was laid for them [Fig. 1].

The patient was transferred to the surgery room at 23:30 hours after craniotomy, 100 cc of blood discharge and after surgery, patient under sedation in the ICU and the ventilator.

After 24 hours, the patients in the intensive care unit, the patient was interrupted sedation and after having estuation conditions, the patient was intubated separated from the ventilator that time, pupils were active and alert of the patient slowly and on the third day the patient's level of consciousness 15/15 receipts. But on the fifth day of hospitalization the patient under sedation, respiratory distress that re-intubation and the ventilator was and after complete resolution of respiratory distress symptoms and the patient's breathing returned to normal, Nero surgery transferred the patient to the hospital after full recovery on day 11, the patient was discharged with his feet.

The patient was alert and active pupils slowly on the third day, the patient's level of consciousness 15/15 receipts. But on the fifth day of hospitalization the patient was under sedation, respiratory distress following the re-intubation and mechanical ventilation was after complete resolution of respiratory distress symptoms and the patient's breathing returned to normal, the patient is transferred to the Neurosurgery and on day 11 of hospitalization after full recovery, the patient was discharged with his feet.

KEY WORDS

bleeding, bilateral epidural, decreased level of consciousness, traditional medicine, Mus musculus, Toxoplasmosis.

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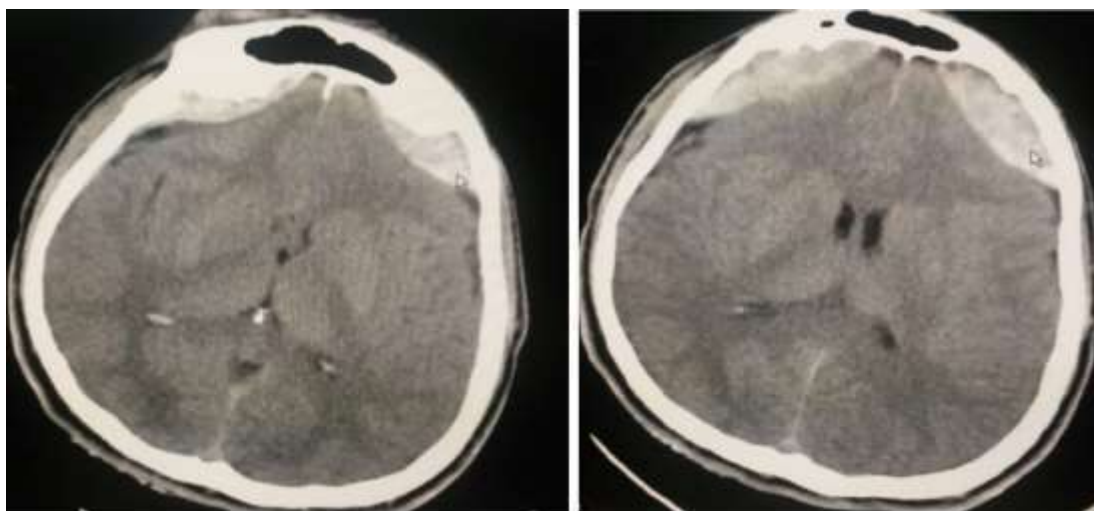


Fig. 1: CT scan of brain showing bilateral epidural bleeding and fractures

CONCLUSION

Although bilateral epidural hematomas are rare, but we must be considered in the management of this patients. Also epidural bleeding common in young adults and is associated with loss of consciousness but when that happens bilaterally could worsen the situation back level of consciousness and later and more serious problems with it. The most important thing evaluated in this patient early diagnosis and subsequent treatment by surgery above all in cases necessitating emergency measures too quickly do the right thing and emergency fortunately, thereby saving the lives of patients..

CONFLICT OF INTEREST

There is no conflict of interest.

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Of all those who in any way participated in collecting and compiling this article is appreciated. All ethical codes, including permission to use the data file, privacy and confidentiality of patient information confidentiality and integrity of the records and used only for research paper was observed.

FINANCIAL DISCLOSURE

None

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FUNCTIONAL METHOD OF USING THE NANO LIME IN THE PROPERTIES OF RECYCLED COLD ASPHALT MIXTURE WITH BITUMEN EMULSION

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ABSTRACT

The additives that are in micro dimensions have been mostly used so far in the preparation of emulsion asphalt in Iran. The use of nanoparticles has been less examined in asphaltic mixtures. The urgent need to prepare asphalt from recycled materials can be felt due to limited resources of the materials required for the production of asphalt. On the other hand, the use of cold asphalt with bitumen emulsion has been more considered in recent decades because of high price of fuel and decrease of the amount of environmental pollutants and energy resources limitation. We should inevitably use additives to enhance the quality, durability and strength of the prepared mixture because of applying recycled materials and bitumen emulsion in the preparation of cold asphaltic mixtures. The possibility of using lime nanoparticles in the prepared mixture of emulsion asphalt were examined in this research according to the results of a research laboratorial work and use of Marshall modified design method.

INTRODUCTION

Roads network constitutes a significant part of the national wealth of each country. Road plays a major role in the field of communications that are tool of economic, cultural and social development of human societies. Building and construction of new roads, as well as repairing and maintaining the existing roads allocates significant amounts of cost to itself every year. The topics of study, design, implementation, control and maintenance of roads pavement has a particular importance in advanced industry of road-construction. If each of above factors are not considered appropriately pavement will be quickly damaged against atmospheric factors and loading caused by traffic. It will cause on the one hand a depreciation of the initial investment. It will increase the repair and maintenance costs and on the other hand decrease of safety and driving comfort and imposition of additional costs because of the vehicles depreciation. So some measures should be always considered to increase the durability, quality and life of pavement and prevent early failures. Asphaltic mixtures of the final layer of pavements are flexible and under the direct influence of destructive effects of atmospheric conditions and stresses caused by traffic loads etc. Therefore, the use of factors to improve the mechanical and functional properties of asphaltic mixtures, as well as reducing the cost of building and maintaining them seems logical affair. Today, the use of nano materials in asphaltic mixtures to increase their strength and durability against atmospheric conditions and loading conditions in developed countries for optimal use of resources and national capitals is a customary affair.

Increase of durability and improvement of the function of asphaltic mixtures because of significant costs that annually are spent from the country's construction budget to repair and maintain the existing roads is essential affair according to the above cases. For this purpose, examination of strategies that can lead to improvement of function of asphaltic mixtures and increase of their durability, reusing the existing old surfaces and modifying their bitumen can greatly help to solve the problem. Also, the creation of permanent deformations on the route of the wheels passing that is terminologically called groove is also of the common destruction in asphalt pavements. This causes problems for road users and reduces quality of road and quality of driving, and also causes the accumulation of water in them and creation of hydroplaning phenomenon and reduction of the level of road safety.

So if the existing asphaltic surfaces that have been destroyed can be recycled and improve the final resistance of asphaltic mixture by using additives, we have highly helped to improvement of quality of the existing surfaces, increase of safety and saving in construction costs and preservation of the existing resources. It has been tried in this research to evaluate the role of nano lime substance and bitumen emulsion in improving Marshall Resistance of recycled asphaltic mixtures, and thus improving its function against destructions by using Marshall Resistance measurement device.

Objectives and definitions

The aim of this research is to find a strategy for preparation of asphaltic mixtures with better function and longer useful life by using additives that firstly are produced domestically and secondly are consistent with the asphaltic mixture. If nano lime effect is positive on improving function of asphaltic mixture, it can be used as an option for recycling and reconstructing asphaltic pavement layers in areas with heavy traffic loading cause early destructions in asphaltic surface layers or for the areas that there is no access to suitable stony materials for reconstruction of the existing surfaces.

Also, adding lime to asphalt nano if it has positive effect can be economical in terms of cost of roads repair and maintenance and also be effective in preserving the country's natural resources that are non-renewable resources given that the costs of roads repair and maintenance have a high figure in most

KEY WORDS
cold recycling, bitumen emulsion, nano lime, asphalt mixture

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countries. The main objective of this research is to evaluate the effect of two independent variables: bitumen emulsion and nano lime on the function of the dependent variables of recycled cold asphalt mixtures.

Bitumen emulsion

Bitumen emulsion is obtained by mixing bitumen and water with an emulsifier substance. Bitumen is floating in the water in this mixture with dimensions of 1 to 10 microns. Water constitutes the continuous phase and bitumen constitutes the suspended and discontinuous phase of this mixture. Bitumen emulsifiers create an electric charge (positive or negative) in the surface of bitumen particles. The repulsive force resulting from namesake charge prevents interconnection of bitumen particles in bitumen emulsion.

The amount of bitumen in bitumen emulsions is from 55 to 65%; amount of water from 35 to 45%, and bitumen emulsifiers constitutes maximum 0.7% of bitumen emulsion weight. Bitumen emulsions can be used for the preparation of a variety of hot and cold factory asphalt and / or mixture in place, superficial asphalt, bituminous coatings, crack filling and sealing asphaltic surfaces, soil and sand stabilization, dusting, etc.

It does not usually need to heat bitumen emulsions for using them, so they are superior to other types of bitumen in terms of economy and safety. Bitumen emulsions mixing with wet aggregates and / or spreading bitumen emulsion on wet sandy and / or asphaltic bottom of road does not have a negative effect on bitumen emulsions' function. Bitumen emulsions are considered the best and most economical alternative for dissolved bitumen environmentally and economically, because:

- * Energy consumption for heating them is far less than the dissolved bitumen.
- * Only water evaporates in bitumen emulsions instead of evaporation and sublimation of petroleum solvents existing in dissolved bitumen and their dissemination in the environment that cause severe pollution.
- * Cost about 20 to 50% weight of petroleum solvents existing in dissolved bitumen is far greater than the cost of emulsifier substance in bitumen emulsions in the current situation of energy crisis.

Bitumen emulsions are divided into two main groups and other sub-groups as follows according to the particles created in the surface of bitumen floating particles:

The bitumen particles' surface is negatively charged by using emulsifiers of organic acids' alkaline salts type. These bitumen emulsions are called anionic. They are divided into four types of fast setting, rapid setting, medium setting, and slow setting as following [Table 1] that each has subdivisions:

Table 1: Subgroups of anionic bituminous emulsions

Rapid setting (RS)	Medium setting (MS)	Slow setting (SS)
RS-1	MS-1	SS-1
RS-2	MS-2	SS-1h
HFRS-2	MS-2h	
	HFMS-1	
	HFMS-2	
	HFMS-2h	
	HFMS-2s	

The above suffixes and prefixes have the following meanings:

- (A) HF prefix represents the bituminous coating with greater thickness on aggregates.
- (B) Suffixes 1 and 2 represent the percentage of less and more pure bitumen in bitumen emulsions, respectively.
- (C) H suffix represents the use of harder pure bitumen (less penetration grade) in bitumen emulsions.
- (D) S suffix in HFMS-2s medium setting bitumen emulsion is the indication of diluted pure bitumen with a minimum penetration grade of 200 in bitumen emulsion.

MATERIALS AND METHODS

Marshall modified method is used according to ASTM-D1559 or AASHTO T245 that is different from hot asphalt design method for cold recycling asphalt plan with bitumen emulsion. The scope of using this guideline is limited to the mixtures that bitumen emulsion or rejuvenating emulsions conforming to ASTM-D5505 specifications, RAP materials (Reclaimed Asphalt Pavement) and, if necessary, new stony materials are used for preparing them.

The amount of emulsion used in this method ranges usually from 1% to 2% and rejuvenating emulsions from 0.5% to 1.25% compared to bituminous mixture weight. The greater values are for the mixtures that the percentage of its crushed stony materials is high and the amount of bitumen existing in it is less. The low percentages are used for the mixtures with high amount of fine grain and round-corner.

The rejuvenating emulsions are not used while the percentage of bitumen emulsion should be increased when new stony materials are added to RAP.

Marshall Test

(A) Samples are placed in an electric furnace and with temperature heat test of 25 degrees for 2 hours. Avoid placing the samples in bath water.

(B) Marshall resistance of the samples is measured according to the relevant clauses in ASTM-D1559 and / or AASHTO T245.

(C) Maximum weight specific for recycling mixture designed by using AASHTO-T209 method is measured for each of the percentages of bitumen emulsions and / or rejuvenating emulsion and / or ASTM-D2041 and the samples' empty space is calculated.

(D) Four series with three samples, each series with a total amount of water of 2, 2.5, 3, 3.5, 4% follow as equal calculation in row (C) of sub clause (3-4-4) are prepared in optimum bitumen percentage. Then the empty space is calculated follow as the above row (C). Thereby optimum water percentage is obtained in optimum bitumen percentage.

(E) Sensitivity test of the designed mixture against moisture in optimum bitumen and optimum mix water is performed according to AASHTO-T283 method. Ratio of saturation resistance to dry resistance is calculated.

Stony materials and bitumen emulsion tests used in research

The used tests of gradation, technical specifications, percentage of bitumen and bitumen emulsion that are needed for designing recycled asphaltic mixture were performed on bit-asphalt samples obtained from milling machine as well as MS1 medium setting anionic bitumen emulsion.

Tests conducted on RAP materials include

- Sand Equivalent Test was conducted by using standard AASHTO- T176. The result of this test was obtained 70%.
- Determination of fracture percentage was done by considering at least two broken aspects of grains remained on sieve of $\frac{3}{8}$ inch. The used RAP materials had fracture of 76%.
- Los Angeles abrasion test was conducted in 500 rounds according to ISO AASHTO- T96 to determine estimation of aggregates' resistance against abrasion. The level of grains' abrasion in 500 rounds is 31%.
- Materials water absorption test was conducted in AASHTO-T104 method. The amount of water absorption of materials was obtained 2.15%.
- Weight loss test with sodium sulfate in 5 cycles that its amount was obtained 3.4% for the used materials.
- It was specified that these material do not have plastic properties to determine the plasticity indication of the used materials according to standard AASHTO-T89 and AASHTO-T90.

RESULTS AND DISCUSSION

Results of the tests conducted on RAP materials have been summarized in the following [Table 2].

Table 2: Test results of technical specifications of lathed asphalt

Test	Specifications-Percentage	Results obtained from lathed asphalt
Sand Equivalent	Minimum 35	70%
Abrasion with Los-Angeles test in 500 rounds	Maximum 40	31%
Fracture	Minimum 50	76%
Water absorption	Maximum 3	2.15%
Weight loss with sodium sulfate in 5 cycles	Maximum 12	3.4%

RAP materials gradation was done by using AASHTO-T27 after washing. Its results are as the following [Table 3].

Table 3: Results of lathed asphalt gradation test

Sieves	Bit-asphalt materials	Allowed tolerance according to Table (3-4)
38 mm	100	100
25 mm	100	
19 mm	97.5	
12.5 mm	96	
9.5 mm	92.6	
4.75 mm	81.5	25 – 85
2.36 mm	54.5	
1.18 mm	36.3	
0.3 mm	15.5	
0.15 mm	12	
0.075 mm	7	3 – 15

Table 4: Test results of bitumen extracted from lathed asphalt

Test	Implementation method	RESULTS
Penetration grade bitumen at 25 ° C (0.1 mm)	AASHTO T 49	10
Softening point (C)	AASHTO T 53	71
Bitumen viscosity (cm Stax)	AASHTO T 201	7.5

Table 5: Test results of MS1 medium setting anionic bitumen sample

Test	Standard	Results	
Bitumen remained from distillation (percentage)	ASTM D6697	72.3	
Gradation Test (percentage)	ASTM D6933	0.07	
Coating capability of dry stony materials (visual description)	ASTM D244	Average	
Coating durability of dry stony materials coated against water (visual description)	ASTM D244	Average	
Coating capability of wet stony materials (visual description)	ASTM D244	Average	
Coating durability of wet stony materials coated against water (visual description)	ASTM D244	Average	
Molecular charge determination test	ASTM D244	Negative	
Stability against sedimentation at 24 hours (percentage)	ASTM D6930	1.6	
Viscosity test at 50 ° C (second)	ASTM D244	265	
Test on bitumen remained from distillation	Bitumen insoluble materials determination test (solubility) (percentage)	ASTM D2042	99.9
	Bitumen ductility determination test (plasticity) (cm)	ASTM D133	20<
	Bitumen penetration grade determination test (0.1 mm)	ASTM D5	91

In this research, the plan of recycled cold asphalt mixture was extracted with emulsion bitumen. Asphaltic samples with different percentages of additives were made and tested according to the existing guidelines; so that the optimum percentages to be obtained for each additive including water, bitumen emulsion and nano lime. Since the type of the produced asphalt is cold and with bitumen emulsion, therefore, this type of pavement has low initial resistance and Marshall Resistance. So, the additives must be used inevitably to be able to provide Marshall Resistance of the produced asphalt. Therefore, the use of additives that can be effective in improving cold asphalt resistance is inevitable. Nano lime has been used in this research.

Medium setting was chosen because of the use of nano lime of anionic bitumen emulsion type and having enough time for proper mixing. Samples of 1150 g were prepared with bitumen emulsion of 2, 2.5, 3, 3.5 and 4 percentage and nano lime of 1, 2, and 3 percentages. 3 grinded samples and 1 non-grinded sample were prepared for each selected amount to determine the maximum special weight. The optimum bitumen emulsion percentage was determined based on Marshall Resistance in this method.

It can be also stated about theoretical maximum special weight of samples that theoretical maximum special weight of asphalt increases with the increase of bitumen emulsion percentage in cold asphalt mixture. The reason for this increase of special weight can be searched in more connection of fine grains with the coarse stony materials and mixture gradation becoming more connected.

The effect of use of nano lime on resistance of recycled cold asphalt mixtures that had been prepared with bitumen emulsion was evaluated by conducting Marshall Test according to standard ASTM- D1559 in this research. it was tried that the best method to be performed for proper mixing and avoidance of conglobating the substances despite the problem of uniform distribution of lime nanoparticles in the mixture in a way that mixing time does not last more than two minutes.

Since the type of the produced asphalt is cold and with bitumen emulsion, therefore, this type of pavement has low initial resistance and Marshall Resistance according to the type of research and the conducted work of "Effect of nano-lime in properties of cold recycled asphalt mixture with bitumen emulsion".

So, the additives must be used inevitably to be able to provide Marshall Resistance of the produced asphalt in the initial ages and / or higher ages. Therefore, the use of additives that can be effective in improving resistance of cold asphalt is inevitable.

As mentioned above, in the preparation of emulsified asphalts are from the additives that have been used in micro dimensions and before this study, in Iran the possibility of using nanoparticles in a mixture of emulsified asphalt have been less studied. Based on problem assumptions in case of using nano-lime instead of active filler in cold recycled asphalt mixture Marshall Stability sample should be improved and percentage of empty space of the mixture reduced so be able to reach an Impermeable layer. It is anticipated that the use of nanoparticles instead of active filler improves the efficiency of mixture and causes the homogenization of asphalt mixture. In this way and due to being indigent of laboratory that is available, the samples were built and were tested by using Marshall method in accordance with AASHTO and ASTM and to obtain percentage of empty space and specific gravity samples the aforementioned values were calculated and analyzed by using standards of AASHTO and ASTM.

CONFLICT OF INTEREST

There is no conflict of interest.

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None

FINANCIAL DISCLOSURE

None

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IMPROVEMENT OF WHEAT (*TRITICUM AESTIVUM* L.) YIELD BY APPLICATION OF PACLOBUTRAZOL

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ABSTRACT

In Iran, wheat is considered as a valuable crop to achieve political and economic stability, and also it is considered as an important factor in improving the income of many farmers. The objective of the present study was the effect of priming and foliar application of Paclobutrazol at different concentration of it on increasing wheat production and higher yield per unit area. This experiment was carried out as factorial in a Randomized Complete Block Design with 16 treatment and three replications in the research farm of Department of Agriculture, Maragheh University, in 2013-2014 years. The first factor included priming at 4 levels (Control, hydro-priming, priming with 25 and 100 mg. lit⁻¹ PBZ); and the second factor included foliar application at 4 levels (distilled water (Control), 30, 60 and 90 mg. lit⁻¹ PBZ). The characteristics of plant height, number of fertile tillers per plant, peduncle length, penultimate length, days till heading, spike number per m², seed number per spike, 100-seed weight, spikelet number per spike, seed yield, biological yield and harvest index (HI), protein percentage and protein yield were measured. The obtained data were subjected to a statistical analysis using SPSS, MSTAT.C; Statistical Analysis System. The analysis of variance showed that seed priming had significant ($p \leq 0.01$) effects on number of spikelets per spike, grain number per spike, biological yield, protein yield and was ($p \leq 0.05$) significant on the plant height and stem length, spike length, 100-seed weight and grain yield. The interaction of seed priming and foliar had significant ($p \leq 0.05$) effect on Penultimate length and Harvest Index. The means of the collected data from the different treatments during both PBZ applications were compared using Duncan's test, with $P \leq 0.05$ and $P \leq 0.01$ as significant. The analysis of variance showed that the effects of seed priming and the interaction of priming and foliar had significant effect ($p \leq 0.01$) on the number of plants per m². Consequently, seed priming PBZ application could be suggested as one effective ways to the seed yield improvement and increase.

INTRODUCTION

Wheat (*Triticum aestivum* L.) grain is a major staple crop in many parts of the world (Titouan et al., 2015). In Iran, wheat is considered as a valuable crop to achieve political and economic stability, and also it is considered as an important factor in improving the income of many farmers (Naqizadeh and Gholami Turanposhti, 2014). Although wheat production per unit area in Iran has significantly increased during the past year, it still does not supply enough amount for annual domestic demand. Therefore, finding a way to increase this crop's production is one of our country's research priorities; and its higher production can be a factor in reducing food import dependency (Ismailpoor, 2007). Wheat averagely provides 60 percent of humans' energy intake; and as being the world's major agricultural crop, most of the world's farmlands is devoted to wheat cultivation (Kayden et al., 2006). In recent years, due to some limitations regarding increasing the area under wheat cultivation, efforts have been made to increase wheat production through increasing its yield per unit area. But statistics show that Iran's average wheat yields is far less than global average. Plant growth regulators have plentiful applications in agriculture such as delaying or accelerating the maturation, stimulation of flowering and so on (Frantes et al., 2004). Plant growth regulators are widely used in modern agricultural systems and in main inputs (Sainio et al., 2003). These materials are used naturally or as synthesized substances. They alter life process of the plant or improve plant's morphology; and in some cases, they increase yield. The main purpose of these substances' application in agriculture is improving the production via modifying plant growth and increasing the quantity and quality of the production under various conditions, especially under stressful conditions. The triazoles are the largest and most important group of systemic compounds developed in the 1960s for the control of fungal diseases in plants and animals. The triazole compounds are chemicals belong to a group of compounds known as ergosterol biosynthesis inhibitors and are used as fungicides and also as plant growth regulator (Jaleel et al., 2007). It is noteworthy that these chemicals are very active group of chemical plant growth inhibitor compounds and are the most important commercial regulators of plant growth (Fletcher et al., 1986). Inhibition of gibberellin (GA) biosynthesis is the most salient feature of triazolic growth regulators (Jalil et al., 2007; Jalil et al., 2008). In fact, the triazoles are the most active group of growth inhibitors which inhibit stem elongation; an obvious response of the plant to these compounds is the reduction of internode elongation, and as a result, the plant length will be decreased (Fletcher et al., 1986). The ability of triazoles in regulation of plant growth lesser than others and also their lack of toxicity are two advantages of this group over other plant growth inhibitors (Fletcher et al., 1986). Compared to other growth regulators, the triazoles are more effective in lower doses and are non-toxic (Davis et al., 1998). A vast domain of growth regulation features of triazoles becomes possible via altering the balances of gibberellic acid, abscisic acid and cytokinins. However, in the mentioned condition, auxin amount remains intact (Fletcher and Hofstra, 1985). Some of growth inhibitors- such as triazoles, pyrimidines and ammonium compounds- inhibit stem elongation by preventing sterols and gibberellin biosynthesis (Arteca, 1996). Foliar application of PBZ at five week decreased internode length and dry-weight of aerial organs of tomato (*Lycopersicon esculentum* L.) (Jafari et al., 2006). PBZ increased root diameter of Soybean (*Glycine max* L.) by increasing the size of cortical parenchymal cells (Barnes et al, 1989). PBZ treatment of potato plants which were grown under greenhouse conditions, resulted strong plants with thicker and dark-green leaves, and with thicker stem and roots (Tekalign and Hammes, 2004). The leaves of treated plants showed increased amount of chlorophyll a and b, thicker epicuticular wax, longer and thicker epidermis, spongy mesophyll cells. PBZ application significantly increased starch grains accumulation in cells of stem central parenchymal tissue, and cortical dermal cells of stem and root. Like other related experiments, this study reported the increase of leaf, stem and root thickness (Tekalign and Hammes, 2004). The objective of the present study was the effect of priming and foliar application of Paclobutrazol

KEY WORDS

Paclobutrazol, Wheat, Priming, Foliar application

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at different concentration of it on increasing wheat production and higher yield per unit area. Consequently, seed priming PBZ application could be suggested as one effective way to the seed yield improvement and increase.

MATERIALS AND METHODS

This experiment was carried out as factorial in a Randomized Complete Block Design with 16 treatment and three replications in the research farm of Department of Agriculture, Maragheh University, in 2013-2014 years. The first factor included priming at 4 levels (Control, hydro-priming, priming with 25 and 100 mg. lit-1 PBZ); and the second factor included foliar application at 4 levels (distilled water (Control), 30, 60 and 90 mg. lit-1 PBZ).

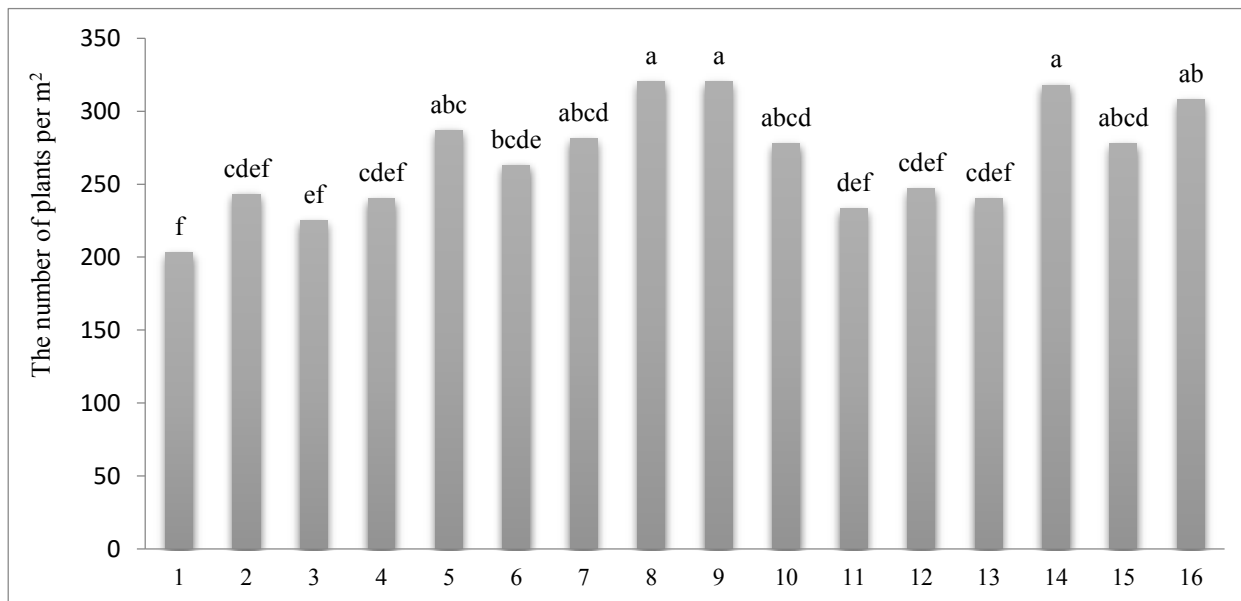
For making seeds ready for priming and protecting them against fungal infections, seeds disinfected with a 2% sodium hypochlorite for 5 minutes. To prevent the disinfectant harm on the seeds, they were rinsed three times with distilled water. After the aforementioned processes, the seeds became ready for pretreatment. For hydropriming, the seeds were soaked in distilled water for 6 hours in germinator at 20°C. After passing the mentioned time, the seeds were dried at room temperature for 48 hours to reach their original weight. For PBZ priming, 4 g solid NaOH was dissolved in 100CC distilled water and 1 normal NaOH solution was made. To prepare our desired solutions, 2 different weights of PBZ, a plant growth inhibitor, i.e. 25 mg (50 ppm) and 100 mg (200 ppm) of PBZ were weighed by precise balances; then each one of these weights of PBZ was separately dissolved in 10CC of NaOH 1 normal; and after complete dissolution, 10CC HCl was added to each one of these solution to neutralize the effect of NaOH. After complete combination of HCl and NaOH in the solutions, 980CC distilled water was gradually added to each one of these solutions; and by adding distilled water, the solutions reached the desired volume (1lit.). Prepared seeds were soaked in the separate solutions (25 and 100 mg. lit-1 PBZ.) and were maintained in a germinator for 6 hrs at about 20°C. After passing the mentioned time, pretreated seeds were rinsed three times with deionized distilled water and then they were dried at room temperature for 48 hours to obtain their original weight.

Prior to planting, soil preparations such as deep plowing in the autumn and surface plowing in the spring, disc plow at two stages, and land leveling were done. The total number of available plots was 48 and the area of each plot was 5.4 m². In each plot, there were 5 planting lines with a distance of 20cm. supplement such as irrigation and manual control of weeds were done. Foliar application of PBZ and distilled water (control) with the concentrations of 30, 60 and 90 mg.lit-1 PBZ. and distilled water were done at the end of tillering stage (at the beginning of jointing stage). Finally at harvesting stage, 1m² of harvest were taken, and the characteristics of plant height, number of fertile tillers per plant, peduncle length, penultimate length, days till heading, spike number per m², seed number per spike, 100-seed weight, spikelet number per spike, seed yield, biological yield and harvest index (HI), protein percentage and protein yield were measured. With the help of SPAD-502, chlorophyll content were also determined during wheat growing stage. The obtained data were subjected to a statistical analysis using SPSS, MSTAT.C; Statistical Analysis System (2013[20]). The means of the collected data from the different treatments during both PBZ applications were compared using Duncan's test, with $P \leq 0.05$ and $P \leq 0.01$ as significant.

RESULTS AND DISCUSSION

The number of plants per m²

The analysis of variance showed that the effects of seed priming and the interaction of priming and foliar had significant effect ($p \leq 0.01$) on the number of plants per m² (Data not shown). The mean comparison of interaction of priming and foliar on the number of plants per m² showed that those priming which sprayed with different levels of Paclobutrazol and priming mostly had more plants per m as compared to control (Fig. 1). Under normal and stress conditions, priming seeds with plant growth hormones not only improved germination and emergence index, but also increased growth and the final yield (Ahmad et al, 1995). In application of Paclobutrazol- the growth regulator- as seed priming, most of its intensifying effects emerge in wheat seedling and plant's primary growth. Application of other substances as seed priming often had the same effects of Paclobutrazol. For instance, increased speed of emergence and the final percentage of emergence was observed in the most primed wheat genotypes (Abutalebian, 2005).



- | | |
|--|--|
| 1. Control, Control | 9. Seed priming with 25 mg.lit ⁻¹ PBZ, Control |
| 2. Control, foliar with 30 mg.lit ⁻¹ PBZ | 10. Seed priming with 25 mg.lit ⁻¹ PBZ, foliar with 30 mg.lit ⁻¹ PBZ |
| 3. Control, foliar with 60 mg.lit ⁻¹ PBZ | 11. Seed priming with 25 mg.lit ⁻¹ PBZ, foliar with 60 mg.lit ⁻¹ PBZ |
| 4. Control, foliar with 90 mg.lit ⁻¹ PBZ | 12. Seed priming with 25 mg.lit ⁻¹ PBZ, foliar with 90 mg.lit ⁻¹ PBZ |
| 5. Hidroprime, Control | 13. Seed priming with 100 mg.lit ⁻¹ PBZ, Control |
| 6. Hidroprime, foliar with 30 mg.lit ⁻¹ PBZ | 14. Seed priming with 100 mg.lit ⁻¹ PBZ, foliar with 30 mg.lit ⁻¹ PBZ |
| 7. Hidroprime, foliar with 60 mg.lit ⁻¹ PBZ | 15. Seed priming with 100 mg.lit ⁻¹ PBZ, foliar with 60 mg.lit ⁻¹ PBZ |
| 8. Hidroprime, foliar with 90 mg.lit ⁻¹ PBZ | 16. Seed priming with 100 mg.lit ⁻¹ PBZ, foliar with 90 mg.lit ⁻¹ PBZ. |

Fig. 1: The interaction of seed priming and foliar PBZ application on the number of plants per m

Plant height and stem length

The analysis of variance showed that the effect of seed priming was ($p \leq 0.05$) significant on the plant height and stem length (Data not shown). According to the results of mean comparison of seed priming, the highest length of plant and stem was observed in the priming with 25 mg. lit⁻¹ solution which were 41.568 and 34.991 respectively, and their lowest length was observed in control which were 38.246 and 31.811 respectively (Fig. 2 & 3). In priming the seed with Paclobutrazol solution, increasing the concentration of Paclobutrazol (100 mg. lit⁻¹) had less effect on the plant and stem length as compared to the priming with 25 mg.lit⁻¹ Paclobutrazol solution; however, these concentrations did not show significant differences. The results showed that although spraying Paclobutrazol solution in the late tillering stage had not significant effect on the aforesaid characteristics (Data not shown), it partially reduced the plant and stem length as compared to Hydroprime. And spraying the seed with 60 mg.lit⁻¹ Paclobutrazol solution caused less increase of the plant and stem length as compared to spraying with 30 and 90 mg.lit⁻¹ Paclobutrazol solution.

Since Paclobutrazol decelerates GA biosynthesis, plant growth will be affected and again this will change the partitioning of assimilate (El-Khashab et al, 1997). Paclobutrazol application could reduce the number of cells and their length in Safflower (*Carthamus tinctorius* L.) stem (Potter et al, 1993). In fact, unlike the main effect of Paclobutrazol which is obtained in its direct application, most of its intensifying effects emerge in seedling and primary growth of the plant in its application as seed priming. By investigation of Barrett and Bartoska (1982) it becomes clear that those plants which Paclobutrazol was sprayed on their stem were shorter than those plants which Paclobutrazol was sprayed on their leaves (Barrett and Bartoska, 1982). This matter can be one of the reasons which caused Paclobutrazol foliar on canopy at the late tillering stage be insignificant in the final report of our experiment.

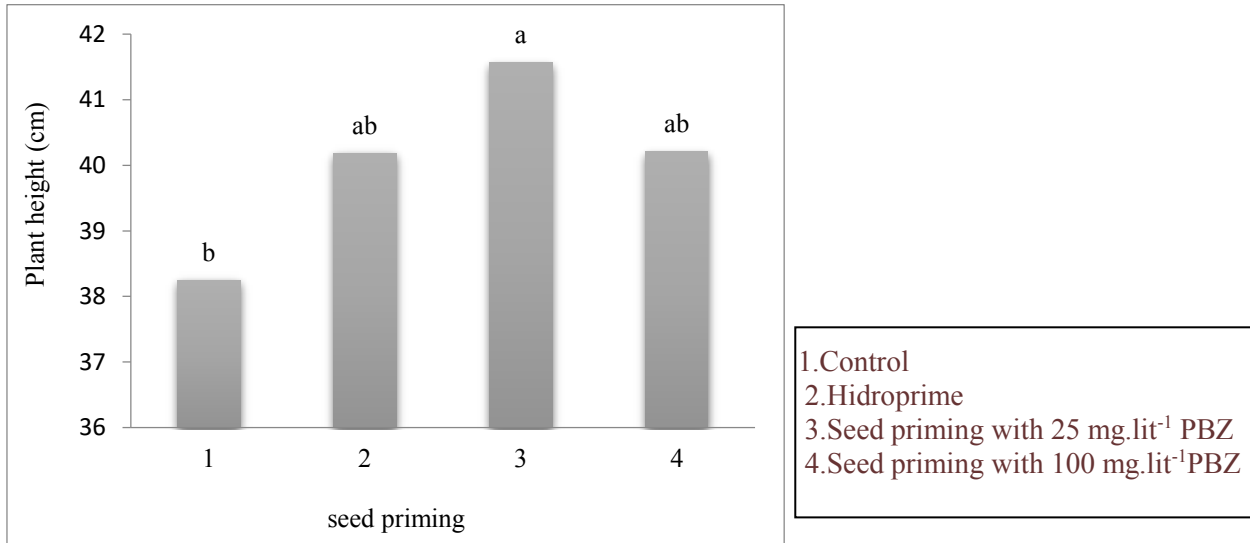


Fig. 2: Influence of seed priming PBZ application on the plant height.

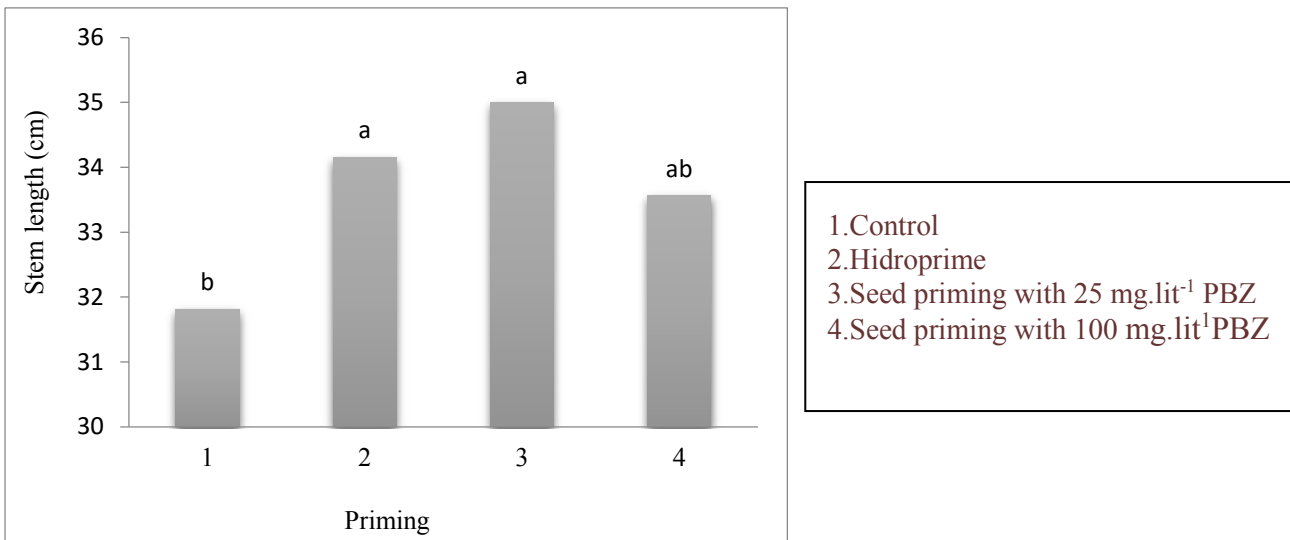


Fig. 3: Influence of seed priming PBZ application on stem length.

Penultimate length and Peduncle length

The analysis of variance showed that the main effects of priming and foliar was not significant on Penultimate and Peduncle lengths, but the interaction of seed priming and foliar had significant ($p \leq 0/05$) effect on Penultimate length. The mean comparison results of Penultimate length showed that those priming which contained foliar with different levels of Paclobutrazol had longer Penultimate as compared to control [Fig. 4].

Stored carbohydrates are known as one the sources for supplying photosynthetic materials (Yang and Zang, 2006). When production of photosynthetic materials is more than sinks requirement, these carbohydrates are stored in different parts of the plant such as various internodes of stem; these carbohydrates will be transferred to the seeds at the final stages of growth when request for photosynthetic materials is more than their availability (Joodi et al, 2010). In recurrence of cereals' stored carbohydrates, Peduncle (the first internode from the top of stem), and Penultimate (the second internode from the top of stem) play more important role than lower internodes (Ehdaie, 1996). Wardlow and Wilenbrink (1994) declared that in wheat, Penultimate and Peduncle internodes stored the highest amount of carbohydrates. In this respect, Daniel and Elkoca et al (2006) pointed to the higher amount of storing soluble sugars in upper internodes of barley as compared to its lower internodes. The results of our experiment oppose those of Fletcher et al (2002) who reported that by preventing GA biosynthesis,

triazoles cause the reduction of internodes' length; and also our findings oppose those of Fletcher et al (2002) where they claimed that PBZ is a preventer of GA biosynthesis and it slows down growth rate of wide range of crops that it happens due to shortening of internodes and stopping the growth for a long time.

Some of the reasons which caused contradiction between our experiment and the results given by other researchers can be the concentration of growth moderators, application method, application time, application number, the formula of used substance, and components of the soil.

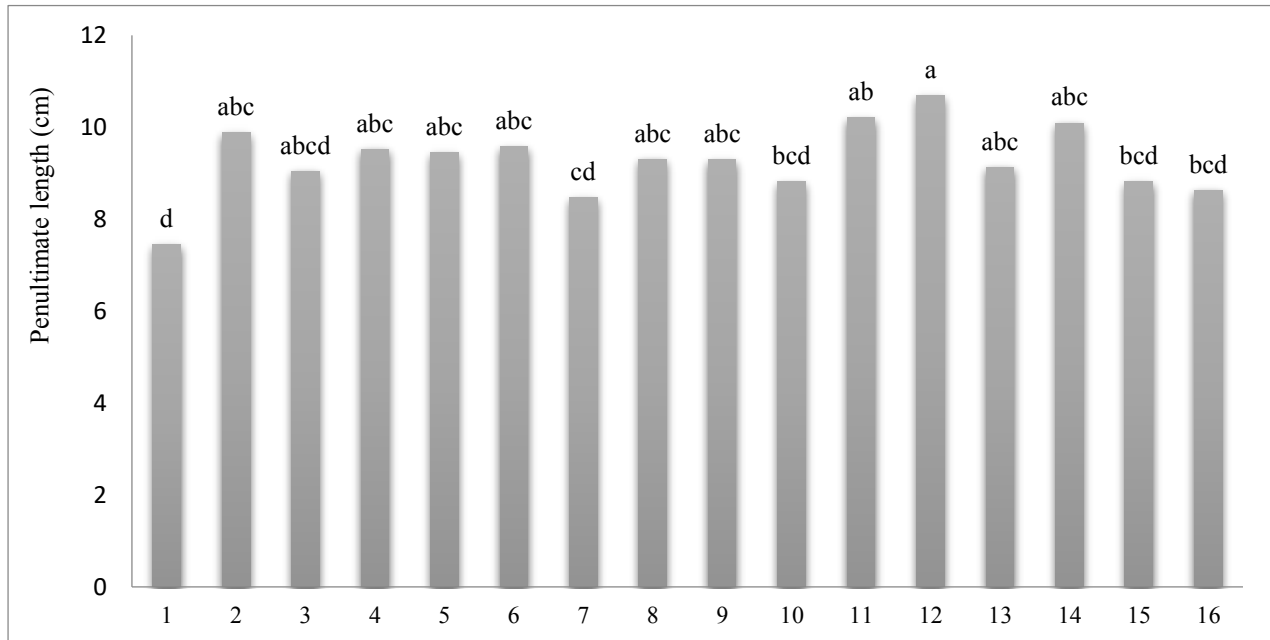


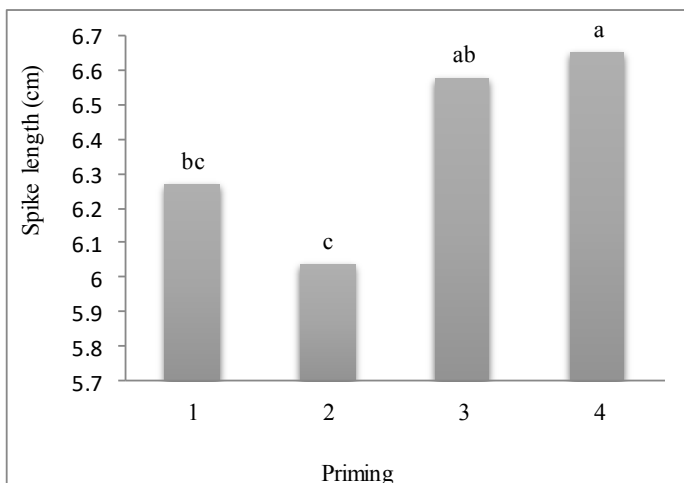
Fig. 4:The interaction of seed priming and foliar PBZ application on Penultimate length.

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| 1. Control, Control | 9. Seed priming with 25 mg.lit ⁻¹ PBZ, Control |
| 2. Control, foliar with 30 mg.lit ⁻¹ PBZ | 10. Seed priming with 25 mg.lit ⁻¹ PBZ, foliar with 30 mg.lit ⁻¹ PBZ |
| 3. Control, foliar with 60 mg.lit ⁻¹ PBZ | 11. Seed priming with 25 mg.lit ⁻¹ PBZ, foliar with 60 mg.lit ⁻¹ PBZ |
| 4. Control, foliar with 90 mg.lit ⁻¹ PBZ | 12. Seed priming with 25 mg.lit ⁻¹ PBZ, foliar with 90 mg.lit ⁻¹ PBZ |
| 5. Hidroprime, Control | 13. Seed priming with 100 mg.lit ⁻¹ PBZ, Control |
| 6. Hidroprime, foliar with 30 mg.lit ⁻¹ PBZ | 14. Seed priming with 100 mg.lit ⁻¹ PBZ, foliar with 30 mg.lit ⁻¹ PBZ |
| 7. Hidroprime, foliar with 60 mg.lit ⁻¹ PBZ | 15. Seed priming with 100 mg.lit ⁻¹ PBZ, foliar with 60 mg.lit ⁻¹ PBZ |
| 8. Hidroprime, foliar with 90 mg.lit ⁻¹ PBZ | 16. Seed priming with 100 mg.lit ⁻¹ PBZ, foliar with 90 mg.lit ⁻¹ PBZ. |

Spike Length

The analysis of variance showed that seed priming had significant ($p \leq 0/05$) effects on spike length (Data not shown). As far as the spike length concern, an obvious advantage was observed among those priming which their seeds were pretreated by Paclobutrazol as compared with the Hydroprime and the control. The results of mean comparison of priming effect showed that seed priming with 100 mg.lit⁻¹ Paclobutrazol. had the longest spike and the lowest rate of this characteristic was observed in Hydroprime (Fig. 5). Generally with increasing the concentration of paclobutrazol in seed priming, the length of spikes also increased; however there were not significant differences between the two concentrations of 25 and 100 mg.lit⁻¹ Paclobutrazol solution. The effect of foliar on canopy at the final stage of tillering was not significant on the spike length.

Giry and Schlinger (2003) reported the same results that the plants produced by pretreated wheat seeds had more and longer spikes due to favorable germination and rapid growth. The conducted researches show that Paclobutrazol application decreases inflorescence length and increases the number of inflorescence and flower in inflorescence (Jamalian et al, 2007); and these results are in opposition of our research's results.

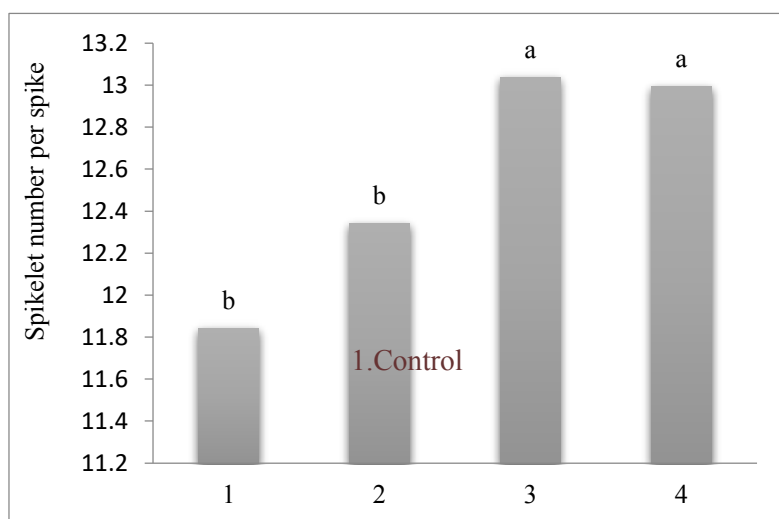


- 1. Control
- 2. Hidroprime
- 3. Seed priming with 25 mg.lit⁻¹ PBZ
- 4. Seed priming with 100 mg.lit⁻¹ PBZ

Fig. 5: Influence of seed priming PBZ application on spike length.

spikelet number per spike

The analysis of variance showed that seed priming had significant ($P < 0/01$) effect on the number of spikelets per spike (Data not shown). In terms of spikelet number per spike, the seeds primed by Paclobutrazol solution had an obvious advantage over Hydropriming and the control. According to the results of mean comparison, priming with 25 and 100 mg.lit⁻¹ Paclobutrazol had the highest number of spikelets per spike and Hydropriming had the lowest number (Fig. 6). The analysis of variance showed that spraying on canopy at the final stage of tillering had not significant effect on the number of spikelet per spike (Data not shown). However, spikelet number per spike reduced by increasing the concentration of Paclobutrazol, and priming with 30 mg.lit⁻¹ Pacloburazol. had the highest number of spikelets per spike. The interaction of seed priming and spraying was not significant on spikelet number per spike. The conducted researches show that Paclobutrazol application cause the reduction of inflorescence length and increases the number of inflorescence and flower in inflorescence (Jamalian et al, 2007); the results of the mentioned research is in agreement with the results of the present study.



- 1. Control
- 2. Hidroprime
- 3. Seed priming with 25 mg.lit⁻¹ PBZ
- 4. Seed priming with 100 mg.lit⁻¹ PBZ

Fig. 6: Influence of seed priming PBZ application on the number of spikelets per spike.

Grain Number per Spike

The analysis of variance showed that seed priming had significant ($p \leq 0/01$) effect on grain number per spike (Data not shown). The seeds primed by Paclobutrazol solution had an obvious advantage over Hydropriming and the control in terms of grain number per spike. According to the results of mean comparison, priming with 25 and 100 mg.lit⁻¹ Paclobutrazol had the highest number of grain per spike and Hydropriming and the control had the lowest number of grain per spike (Fig. 7). Generally in seed priming, grain number per spike increased by increasing the concentration of Paclobutrazol; however there was not significant differences between the two concentration of 25 and 100 mg.lit⁻¹ PBZ. The analysis of variance showed that spraying on canopy at the final stage of tillering had not significant effect on the grain number per spike (Data not shown).

Using various methods of priming in Safflower (*Carthamus tinctorius* L.) seed improved plants number per square meter, number of head per plant, grain number per head, and finally grain yield (Movahedi Dehnavi et al, 2012). In corn, Paclobutrazol spraying caused significant increase of grain number per row, i.e. 1.27 percent as compared to the control (Sepehri and Bayat, 2014). It is reported that grain number per cluster and 1000-seed weight were increased in plants grown from pretreated seeds, and this increase finally led to improvement of grain yield in rice (Farooq et al, 2006). Using osmo-priming, hardening priming, and matric priming in Canola (*Brassica napus* L.) increased grain yield via improvement of indicators such as the number of grains per pod and 1000-seed weight (Afzal et al, 2004).

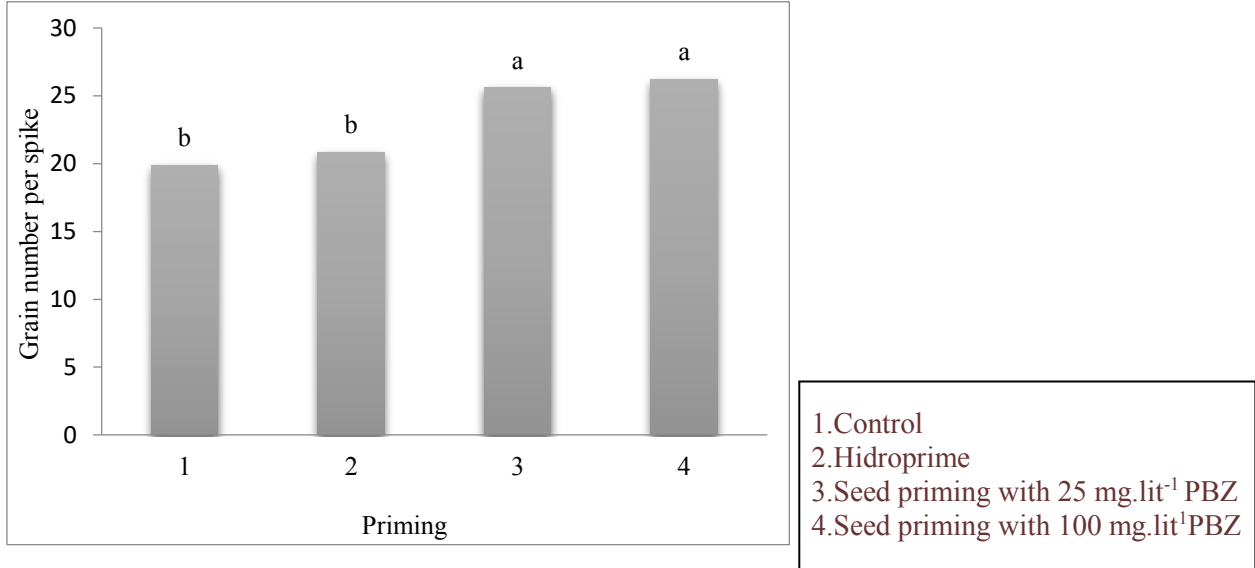


Fig. 7: Influence of seed priming PBZ application on grain number per spike.

100-seed weight

The analysis of variance showed that seed priming had significant ($p \leq 0/05$) effects on 100-seed weight (Data not shown). In terms of 100-seed weight, seed primings had an obvious advantage over the control. By increasing PBZ concentration, 100-seed weight was reduced, but significant differences were not observed between two concentrations of 25 and 100 mg.lit⁻¹ PBZ. The results of mean comparison showed that priming with 25 mg.lit⁻¹ Paclobutrazol had the highest 100-seed weight and the control had the lowest 100-seed weight [Fig. 8]. The analysis of variance showed that spraying on canopy at the final stage of tillering had not significant effect on 100-seed weight (Data not shown). However, foliar with PBZ solution increased 100-seed weight as compared to the control. Priming with 30 mg.lit⁻¹ PBZ had the highest 100-seed weight; and by increasing PBZ concentration, 100-seed weight decreased.

The most salient morphological feature of PBZ is reducing vegetative growth; and then by changing the distribution manner of materials obtained from photosynthesis, it leads these materials to reproductive parts; and as a result, more flower buds will be produced, consequently fruit production will be increased (Lever, 1986). Generally, triazoles decrease vegetative growth and reduce competition between vegetative and reproductive organs for gaining photosynthetic materials. Most of the available reports indicate that PBZ priming increases fruiting and flowering percentages (Sedighi et al, 2007). The effect of PBZ on the plants' reproductive organs shows itself in different ways. According to Abraham et al. 2008, in priming with PBZ, Sesame seed weight increased under drought stress.

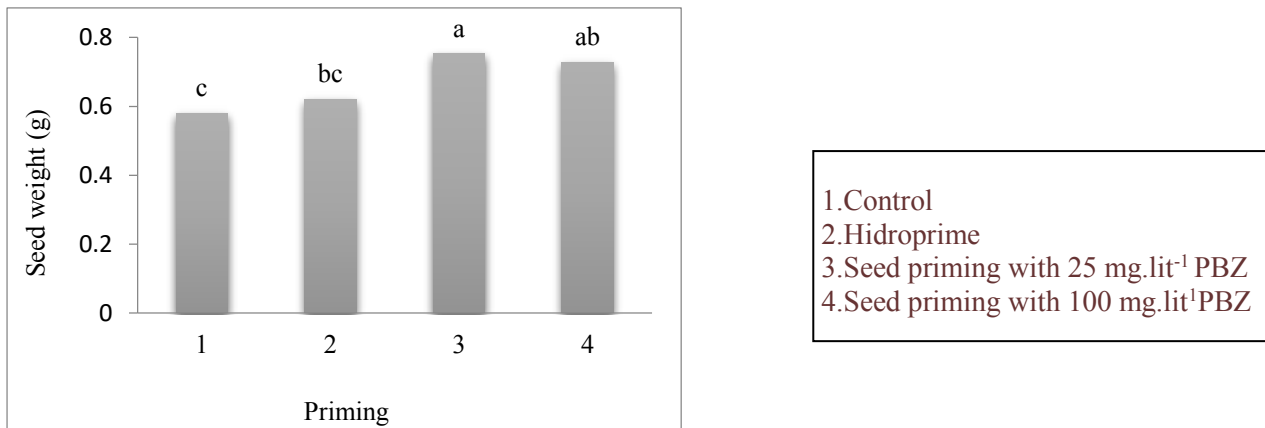


Fig. 8 : Influence of seed priming PBZ application on 100-seed weight.

Biological Yield (Total dry-material)

The analysis of variance showed that seed priming had significant ($p \leq 0/01$) effects on biological yield (Data not shown). The mean comparison showed that priming with 25 mg.lit-1 PBZ had the highest biological yield, i.e. 191.891 g, and the control had the lowest biological yield, i.e. 140.406 g [Fig. 9]. In terms of biological yield, seed primings had an obvious advantage over the control; seed priming with PBZ increased biological yield as compared to Hydropriming. Although increasing the concentration of PBZ (100 mg.lit-1) decreased biological yield as compared to priming with 25 mg.lit-1 PBZ, there were not significant differences between these two concentrations 25 and 100 mg.lit-1 PBZ).

There are some reports which show that priming with proper concentrations of plant growth hormones effectively increase yield in various crops under water stress and normal condition (Harley et al, 1991; Lee et al, 1998; Pakmehr, 2009). Spraying PBZ in the stem elongation stage of Canola (*Brassica napus* L.) increased dry weight of plants. Also in various cultivars of winter Canola, Mixatole and PBZ primings significantly increased plant dry-weight (Mohammadi et al, 2011). Faroogh et al, (2008b) reported that seed priming increased the number of tillers, grain yield, biological yield and harvest index of wheat under late cultivating condition, but had no effect on plant height, spikelet number, grain number and 1000-seed weight. It is reported that the activity of acid Invertase was increased in meristem tissues of pea plants grown from primed seeds, and its increased activity caused increase of plant growth and biomass (Kaur et al, 2005). Also there are some reports which indicate that seed priming involves in increasing the activity of those enzymes which participate in metabolism such as sucrose synthase and sucrose phosphate synthase; also by raising chlorophyll content and increasing photosynthesis, it increases the source power and availability of photoassimilates, and by doing so, it improves yield and biomass (Kaur et al, 2005). Amin et al (2008), Faroogh et al (2008b), Mirsadeqhi et al (2010) reported an increase of biological yield due to salicylic acid application.

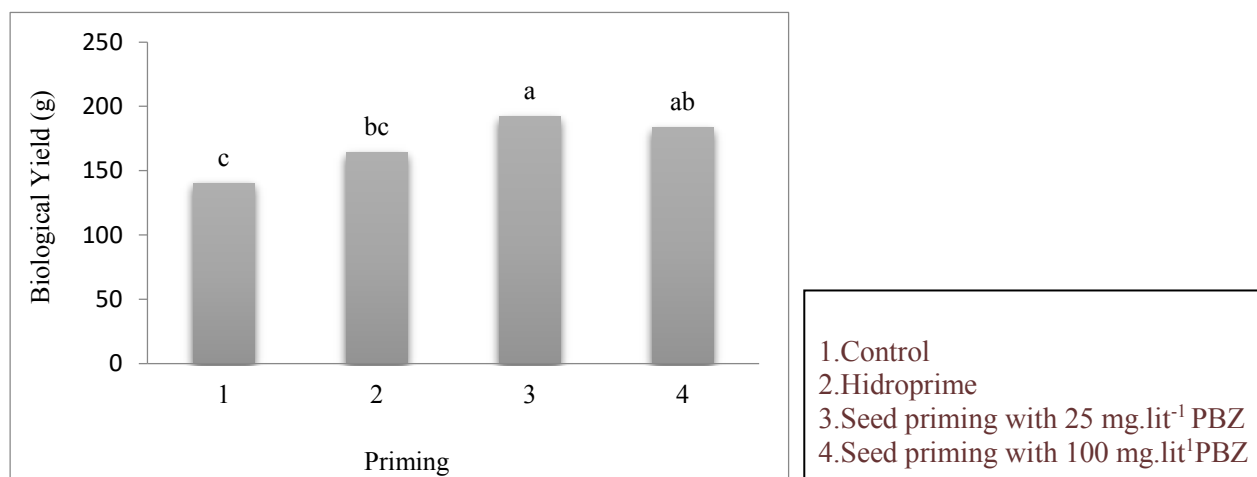


Fig. 9: Influence of seed priming PBZ application on biological yield.

Grain Yield

The analysis of variance showed that seed priming had significant ($p \leq 0.05$) effects on the grain yield (Data not shown). The mean analysis showed that priming with 25 mg.lit-1 produced the highest grain yield (63.35), and the control had the lowest amount of grain yield (42.28) (Fig. 10). In terms of grain yield, primed seeds had an obvious advantage over the control. Although grain yield was reduced by increasing PBZ concentration, seeds priming with PBZ increased grain yield as compared to Hydropriming and the control. The analysis of variance showed that foliar application (of PBZ) at the final stage of tillering didn't have significant effect on grain yield (Data not shown). However, foliar application of PBZ increased grain yield as compared to the control (foliar application of distilled water); and foliar with 30 mg.lit-1 PBZ, produced the highest grain yield. Increasing PBZ concentration did not increase the grain yield.

Application of plant growth stimulators had useful effects on wheat grain yield (Logendra et al, 2004). priming of seeds with PBZ solution increased the grain yield of rainfed wheat (Azar2) (Karami et al, 2014). There are some reports which indicate that seed priming increased grain yield under rainfed conditions (Rajabi, 2011). Application of plant growth regulators at any level increases grain yield (Heidari and kavousi, 2013). In field experiments, application of growth regulators at mid-tillering stage increased grain yield of spring barley 10 to 17 percent and increased grain yield of winter barley 12 to 18 percent. The reason of this increase in grain yield was the increase of spike number per unit area (Heidari and kavousi, 2013). Some other researchers claim that this increase in grain yield happens due to the increase of physiological source power (Waddington and cartwright, 1986). The researches done by Shokofa and Imam (2005) shows that growth regulators significantly increased grain yield of wheat due to the increase in grain number per spike, spike elongation, and the number of spikes per unit area. Under moderate and

severe drought stresses, PBZ can be effective in reducing drought effects on plants; and foliar application of PBZ, under moderate and severe drought stresses, significantly increased grain yield as compared to those primings which PBZ did not applied on them under the same conditions. During two stages of tillering and stem elongation, foliar application of rooting (rhizogenic) hormones such as PBZ and Daminozide, Absciscic acid and Atifen, and using Twin as a surfactant did not have significant effects on straw yield and dry seed of rainfed wheat. The reduction of yield with foliar application of PBZ under favorable moisture conditions can be related to an increase in concentration of Absciscic acid hormone. The mentioned hormone (Absciscic acid) reduces grain yield via reducing the number of endosperm cells, followed by decreasing grain size and also stimulating for embryonic loss, and decreasing grain number (El-Khallal et al, 2009). According to our reports, and Smith's (1992), growth stimulators don't accumulate dry matters in cereals, rather they affect the distribution patterns of dry matters which depending on the environmental conditions, cause positive or negative effects on grain yield. During particular period, the plant growth regulators in assimilate distribution show its effects in bush, leaves and tillers more than roots (Rajala and Peltonen-Saninio, 2001).

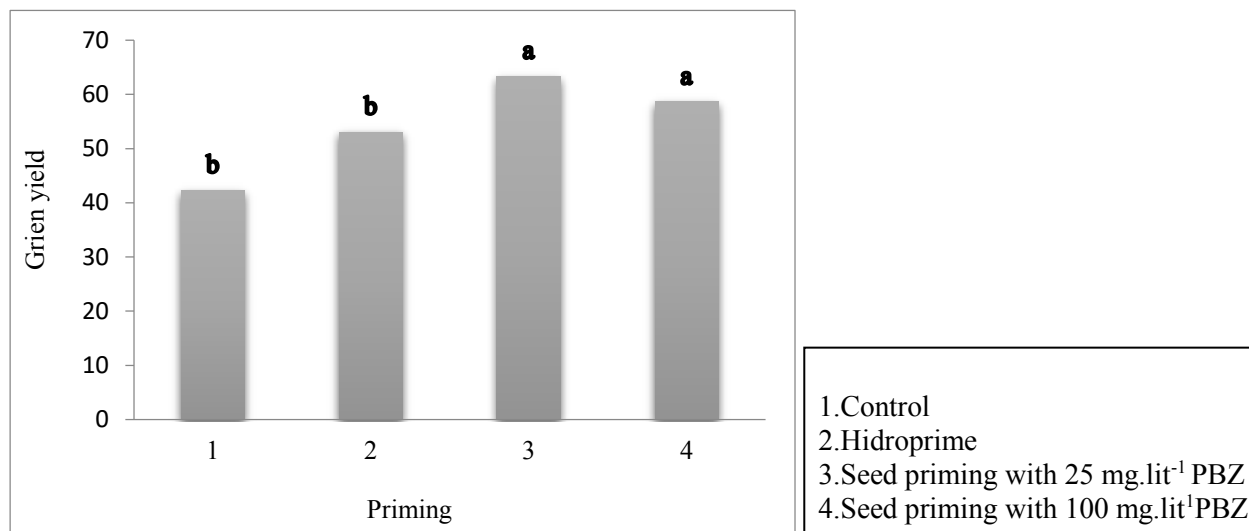


Fig. 10: Influence of seed priming PBZ application on the grain yield.

Harvest Index

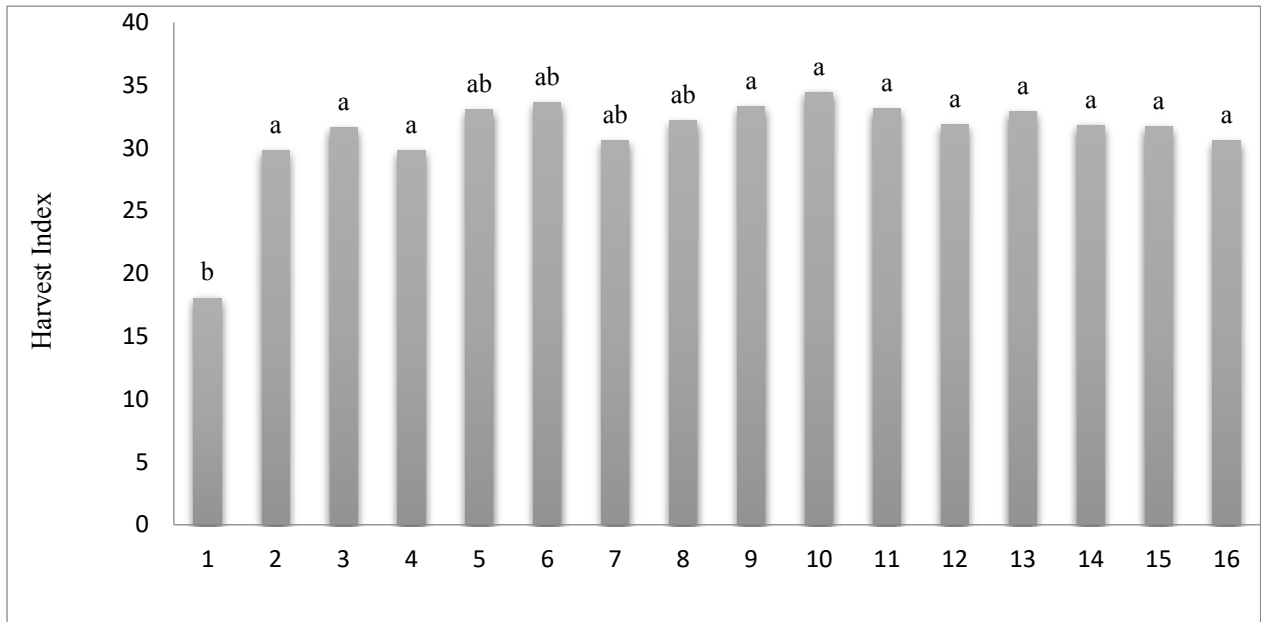
The analysis of variance showed that the effects of seed priming were significant ($p \leq 0.01$) on harvest index, and the interaction of seed priming and foliar application had significant ($p \leq 0.05$) effects on harvest index (Data not shown). The mean comparison of the interaction of seed primings and foliar application on harvest index showed that the interaction of all seed primings along with foliar application had the highest harvest index (Fig. 11). In recent years, what has been reported about the high yielding wheat varieties show that harvest index (HI) is the main factor in increasing wheat yields per ha. The average of wheat HI is 50 percent and many agricultural experts believe that it can be increased up to 65 percent; while in Iran, wheat HI is about 47 percent (Rashed-Mohassel, 1998; Rahnama et al, 2000). There is a similar report which indicates that seed priming with PBZ solution could increase grain yield and HI of rainfed wheat (Azar2) (Karami et al, 2013). In the experiments of Hussain et al. (2009), and Setia et al. (1995), foliar application of PBZ did not have significant effects on HI of the plants under their studies, and this result is in agreement with our experiment. It is reported that priming of Sunflower seeds changed the distribution manner of dry matters in favor of the grains, and increased its HI and grain yield (Hussain et al., 2009).

Protein yield

The analysis of variance showed that seed priming had significant ($p \leq 0.01$) effects on protein yield (Data not shown). The mean comparison showed that seed priming with 25 mg. lit⁻¹ PBZ had the highest protein yield (907.3216 g/m²) and its lowest amount (536.0181 g/m²) was observed in the control (Fig. 12). Primed seeds with PBZ had an obvious advantage over Hydroprime and control. Seed priming with PBZ increased protein yield, though increasing PBZ concentration reduced its amount. However, significant differences was not observed between 25 and 100 mg. lit⁻¹ PBZ.

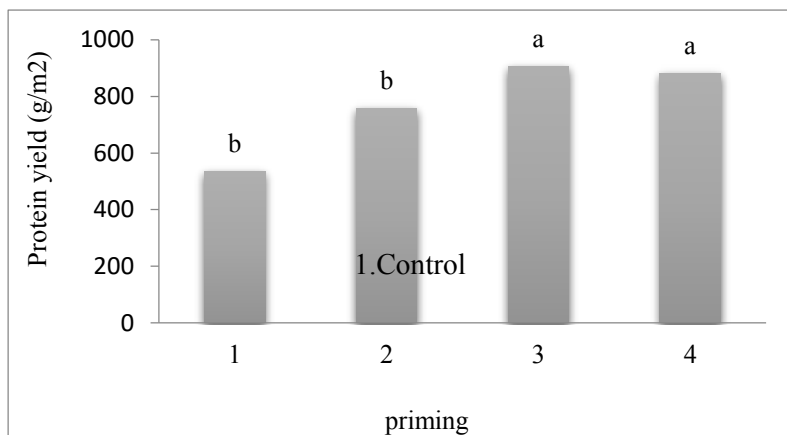
One of the primary effects of growth regulators is that they affect GA, Sterols and Absciscic acid biosynthesis, and they indirectly affect starch percentage; and as a result, protein yield will be increased (Sawan, 2008). It is reported that increased amount of amino acids in primed seeds may be happens due to releasing these amino acids from protein storages. Various experiments show that protein synthesis is increased while priming and germination of primed seeds of lettuce, tomato, pepper, leek, wheat and corn is improved (Harris 1999, 2001, 2002). Proteins concentration is increased while priming and their amount remains high even after dryness of the seeds (Harris 1999, 2001, 2002). There are similar reports which indicate that priming wheat seeds with PBZ increases the amount of proteins (Nouriyani, 2012). Also, there are other similar results which show that PBZ application increases the amount of proteins under stress and non-stress conditions (Razavizadeh and Amu Beigi, 2013). Foliar application of PBZ on onion, Texas Early Grano variety, caused a 65 percent

increase in protein amount of aerial organs as compared to control, however its foliar application did not cause significant differences in protein amount of root as compared to control. Protein amount of onion primed by PBZ was significantly increased as compared to control. Both concentrations of PBZ significantly increased protein amount in onion and the concentration of 2000 mg. lit-1 increased its amount up to 238 percent as compared to control. PBZ primings didn't cause any difference in the protein amount of roots (Arvin et al, 2003).



- | | |
|--|--|
| 1. Control, Control | 9. Seed priming with 25 mg.lit-1 PBZ, Control |
| 2. Control, foliar with 30 mg.lit-1 PBZ | 10. Seed priming with 25 mg.lit-1 PBZ, foliar with 30 mg.lit-1 PBZ |
| 3. Control, foliar with 60 mg.lit-1 PBZ | 11. Seed priming with 25 mg.lit-1 PBZ, foliar with 60 mg.lit-1 PBZ |
| 4. Control, foliar with 90 mg.lit-1 PBZ | 12. Seed priming with 25 mg.lit-1 PBZ, foliar with 90 mg.lit-1 PBZ |
| 5. Hidroprime, Control | 13. Seed priming with 100 mg.lit-1 PBZ, Control |
| 6. Hidroprime, foliar with 30 mg.lit-1 PBZ | 14. Seed priming with 100 mg.lit-1 PBZ, foliar with 30 mg.lit-1 PBZ |
| 7. Hidroprime, foliar with 60 mg.lit-1 PBZ | 15. Seed priming with 100 mg.lit-1 PBZ, foliar with 60 mg.lit-1 PBZ |
| 8. Hidroprime, foliar with 90 mg.lit-1 PBZ | 16. Seed priming with 100 mg.lit-1 PBZ, foliar with 90 mg.lit-1 PBZ. |

Fig. 11: The interaction of seed priming and foliar PBZ application on harvest index.



- | |
|---------------------------------------|
| 1. Control |
| 2. Hidroprime |
| 3. Seed priming with 25 mg.lit-1 PBZ |
| 4. Seed priming with 100 mg.lit-1 PBZ |

Fig. 12: Influence of seed priming PBZ application on protein yield.

CONFLICT OF INTEREST
There is no conflict of interest.

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None

FINANCIAL DISCLOSURE

None

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ARTICLE

A CONVOLUTIONAL NEURAL NETWORK WITH A NEW ARCHITECTURE APPLIED ON LEAF CLASSIFICATION

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ABSTRACT

In this research, an application of Convolutional Neural Networks (CNNs) on the task of leaf classification is presented. Nowadays, CNNs have become well known methods in object recognition to generate learned feature representations and classification, and gradually have been dominating on various image domains. There exists few works that applied CNNs on leaf recognition and classification which mostly used existing CNN architectures and pretrained models. In this paper, a new CNN architecture is proposed and applied on leaf classification task. The use of recently introduced Exponential Linear Unit (ELU) instead of Rectified Linear Unit (ReLU) as the non-linearity function of CNN is also experimented. The model is examined on Flavia and Swedish leaf datasets and the classification results show that the proposed CNN is effective for leaf classification and closely compete with the current state-of-the-art.

INTRODUCTION

Plants play an important role in the life cycle of nature. With the rapid progress of information technologies, many works [2, 3], have been dedicated to applying the technologies of pattern recognition and image processing to plant identification. Rapid and accurate plant identification is essential for effective study and management of biodiversity, as well as contributing to biosecurity measures. Therefore, automated systems for plant identification are a very important although challenging task.

Leaf is an organ of plant which is the basic feature that can be used in identification of plants. Types of leaf can be described in terms of leaf shape, leaf margin, leaf venation, leaf texture, leaf vein, leaf color, leaf tip and leaf base. Leaves are available for longer duration and in abundance and happen to be a suitable choice for automatic classification of plants. Since leaves of the same specie tend to subtly differ in size and shape due to the phenotypic plasticity, identification of plant species or leaf groups within a population is a challenging task.

The traditional approach for image classification tasks has been based on hand-engineered features such as SIFT [6], HoG [7], SURF [9], etc., and then to use some form of learning algorithm in these feature spaces. This led to the performance of all these approaches depending heavily on the underlying predefined features. In the literature of plant identification, different leaf features are used for classification like aspect ratio, circularity, eccentricity, roundness and others. Fourier descriptors [10], wavelets [11], saw tooth pattern, vein structure, color, texture and shape of a leaf [12] and centroid contour distance [13] are also used for leaf identification. Feature engineering itself is a complex and tedious process which needed to be revisited every time the problem at hand or the associated dataset changed considerably.

The performance of Convolutional Neural Networks (CNNs) in object recognition and image classification has made tremendous progress in the past few years [14, 15]. CNNs have emerged as a powerful framework for feature representation and recognition for a variety of image domains. A CNN is able to learn basic filters automatically and combine them hierarchically to enable the description of latent concepts for pattern recognition. The absence of the labor-intensive phase of feature engineering and the generalizability of the solution makes them a very promising candidate for a practical and scalable approach for various vision problems.

In this paper, a CNN architecture is proposed to apply on the leaf classification task. It is tried to suggest a simple but powerful CNN that in addition to achieve a valuable classification accuracy, the learning time of the CNN remains affordable to train in the CPU mode without need for especial hardware like GPU. In the architecture, the usage of Exponential Linear Unit (ELU) [16] as the non-linearity function instead of commonly used Rectified Linear Unit (ReLU) [14] is examined to speeds up learning and achieve higher classification accuracies. Also the simple reflection augmentation is applied to both datasets to improve the final results compared to the results obtained from the original datasets. The experiments, applied on Flavia [17] and Swedish [18] leaf datasets, show the effectiveness of the proposed model in leaf identification in comparison with current state-of-the-art.

RELATED WORKS

In this section, some latest works on leaf recognition are reviewed. Started with some conventional methods, the recent deep models applied on leaf classification are summarized.

KEY WORDS

Leaf, Classification, Recognition, Convolutional Neural Network, Exponential Linear Unit

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Since shape of leaves vary between different species, provides valuable information for plant identification. The existing methods for shape representation and identification can be classified into contour-based and region-

Table 1: The proposed CNN architecture

Attributes	L1		L2		L3		L4	L5
Type	Conv	Pool	Conv	Pool	Conv	Conv		SoftMax
Filter Size	5×5	5×5	5×5	5×5	5×5	1×1		
Stride	2	5	2	2	2	1		
Number of Filters	100	100	250	250	100	100		
Output Size	78×78	37×37	17×17	7×7	1×1	1×1		

based methods [19]. In the former one, the shape features are extracted only from the contour, while in the latter one, the shape features are extracted from the whole shape region. Up to now, many contour-based descriptors and region-based descriptors have been proposed for leaf shape recognition. Recently, [13] presented a contour-based approach to describe shape of leaves called Centroid Contour Distance (CCD). CCD calculates the distance between the midpoint and the points on the edge corresponding to interval angle. These features was used to feed a Probabilistic Neural Network to classify the leaf shapes. In another work [5], the method, termed multi-scale arch height (MARCH), was proposed to use hierarchical arch height features at different chord spans extracted from each contour point to provide a compact, multi-scale shape descriptor. This algorithm was aimed to effectively capture the global and detailed features and provide a coarse-to-fine shape description of the leaf. The classification rate was calculated using the 1-nearest-neighbor classification rule and a prototype system for online plant leaf identification was developed for use on a mobile platform. In [4], an evolutionary optimization methodology was proposed to support parameter adjustment of a multi-scale shape descriptor for feature extraction and representation of leaf shapes in a high dimensional space.

The most recent works, have extensively analyzed the various features of leaf images. For example in [8], the invariant recognition of 2D binary images of tree leaves was considered. Two methods for invariant pattern recognition based on 2D Fourier power spectrum with guaranteed translation invariance were proposed. The first method introduced the features invariant to translation, scaling, rotation and mirroring (TSO invariance) and the second, presented the features invariant to general affine transform (A invariance). Harmonic analysis of power fluctuations around paths generated Fourier coefficients and their square absolute values were used as TSO/A invariant descriptors. After TSO/A invariant processing of thresholded digital images, kernel Support Vector Machine or self-organizing neural network was used for leaf categorization. In another work [1], an approach for the classification of leaf, based on the characterization of texture, shape, and color properties was proposed. An original plant leaf was preprocessed initially using the cellular automata (CA) filter to minimize the noise. For enhancing the contrast and quality of the image, the histogram equalization and ROI segmentation were applied respectively. The proposed feature extraction techniques overcome the difficulties faced by the existing GLCM and LBP methods. The descriptor comprised of Haralick texture based features, Gabor features, shape features, and color features. Subsequently, the kernel-based PSO was presented to overwhelm the issue of time complexity of selecting the optimum features. Finally, the Fuzzy Relevance Vector Machine (FRVM) was employed to recognize the type of leaves.

Convolutional Neural Networks (CNNs) are multi-layer supervised networks which can learn features automatically from datasets. For the last few years, CNNs have achieved state-of-the-art performance in almost all important classification tasks. It can perform both feature extraction and classification under the same architecture. However, latest studies have shown that state of the art performance can be achieved with networks trained using generic data.

A few papers have suggested the use of CNNs on the leaf identification task in recent years. [20] developed an application which classifies the type of a tree, based on a picture of one of its leaves. The system, utilized a CNN in an android mobile application to classify natural images of leaves, trained on the ImageCLEF 2012 plant identification task training set. The proposed architecture was consisted of one convolutional layer followed by a pooling layer and two fully connected layers applied on input images of size 60×80 pixels. AlexNet [14] is a deep convolutional neural network model poposed to detection of objects in large-scale datasets. [3] suggested a reduced version of AlexNet for leaf identification. They used Parametric Rectified Linear Units (PReLU) instead of ReLUs and gray-scale images as input in their model. In [21], a one-to-one connection layer, named as single connected layer (SCL), was added into the proposed CNN architecture to make some improvements. This method was experimented on ICL leaf database, and the results reflected the rise of the precision.

Plant disease recognition is another field of research that mostly include the leaf identification process. [22], was concerned with a new approach to the development of plant disease recognition model, based on leaf image classification, by the use of deep CNNs. The developed model was able to recognize 13 different types of plant diseases out of healthy leaves, with the ability to distinguish plant leaves from their surroundings. The dataset used in this paper, gathered by authors and assessed by agricultural experts.

CONVOLUTIONAL NEURAL NETWORKS

Convolutional Neural Network (CNN) is an effective identification method, developed in recent years, that caused widespread attention. Now, CNN has become one of the most efficient methods in the field of pattern classification and recently, has been used more widely in the field of image processing [14, 23], and it can reach a better performance than traditional methods [24] through wide verification.

CNN consists of one or more pairs of convolutional and max pooling layers. A convolutional layer applies a set of filters that process small local parts of the input where these filters are replicated along the whole input space. A max-pooling layer generates a lower resolution version of the convolutional layer activations by taking the maximum filter activation from different positions within a specified window. This adds translation invariance and tolerance to minor differences of positions of objects parts. Higher layers use more broad filters that work on lower resolution inputs to process more complex parts of the input. Top fully connected layers finally combine inputs from all positions to do the classification of the overall inputs. This hierarchical organization generates good results in image processing tasks.

EXPONENTIAL LINEAR UNIT

All neurons in a neural network usually have nonlinear activation units associated with them that convert input space to a linearly separable space. The most common nonlinear activation in shallow neural networks is sigmoid function but in deep neural networks, ReLU is the favorite one because of the practically better results. Recently [16] have introduced Exponential Linear Unit (ELU) which have improved learning characteristics in deep neural networks compared to the units with other activation functions. Like ReLUs, ELUs alleviate the vanishing gradient problem via the identity for positive values but in contrast to ReLUs, they have negative values which allows them to push mean unit activations closer to zero with lower computational complexity. The formulation of ELU with $\alpha > 0$ is as follows.

$$f(x) = \begin{cases} x & \text{if } x > 0 \\ \alpha(\exp(x) - 1) & \text{if } x \leq 0 \end{cases}, \quad f'(x) = \begin{cases} 1 & \text{if } x > 0 \\ f(x) + \alpha & \text{if } x \leq 0 \end{cases}, \quad (1)$$

The ELU hyper-parameter α controls the value to which an ELU saturates for negative net inputs.

THE PROPOSED CNN MODEL

CNN architectures vary with type of images and especially when input image sizes are different. In this paper, the size of input images is considered to be 160×160 pixels. The proposed architecture is described in [Table 1]. After each Conv layer a ReLU or ELU activation function is used and for each pooling layer, MaxPooling approach is applied. The fully connected layers are defined as convolutional layers with the filter size of 1×1 as it is conventional in MatConvNet [25]. The final layer has 32 or 15 output units corresponding to 32 and 15 category of leaves in Flavia and Swedish leaf datasets. After all layers, a SoftMax loss is placed.

EXPERIMENTS AND RESULTS

The proposed method is applied on Flavia [17] and Swedish [18] leaf datasets . Flavia dataset contains leaves of 32 plant species with 1907 samples. All the input leaf images are 1600×1200 which are resized to the later dimension. Swedish dataset contains 15 species of Swedish tree leaves with 75 samples in each. Some

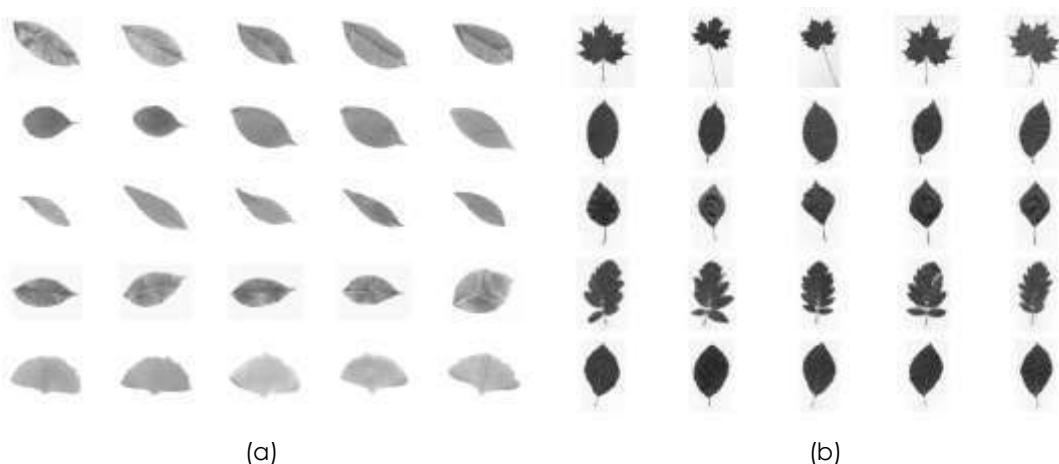
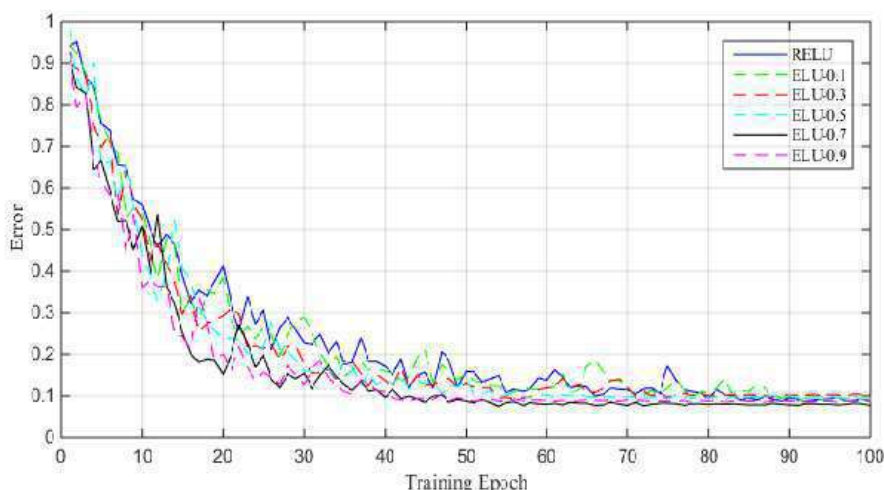


Fig. 1: Sample of datasets prepared for the experiments: (a) Flavia Dataset (b) Swedish Leaf Dataset.

samples of these datasets are showed in [Fig. 1].



curves of validation errors of experiments of the different values of the parameter of ELU applied on Flavia dataset without augmentation

In the first step, leaf color images are converted to grayscale by extracting the green channel of colors because this channel is better represent the pattern of leaves. Then the values of pixels are mapped from [0, 255] to [0, 1]. To resize images to the desired size of 160×160 pixels, first images are resized such that the larger dimension of them are equal to 160, then the smaller one are padded with pixels having the value of 1. In the next step, the data augmentation methods are applied to dataset. Data augmentation, is a method to generate extra samples from a given image which is commonly used in CNNs. The proposed model is compared in the cases of datasets without augmentation and datasets with simple horizontal reflection augmentation. After augmentation, datasets are separated to 70%, 10% and 20% as training, validation and test sets, respectively.

CNNs have hyper-parameters which are the parameters that will not be learned, thus commonly are specified intuitively. Aside from the model itself, hyper-parameters include the learning rate, momentum (if used), weight decay, Initial weights, mini-batch size and the maximum number of epochs. In this work those hyper-parameters are set as, fixed to 0.001, 0.9, 0.0005, randomly selected from standard normal distribution multiplied by 0.01, 100 and 100, respectively. The model is trained by stochastic gradient descent with momentum. For the parameter of ELU, some values including 0 (which equals to ReLU), 0.1, 0.3, 0.5 and 0.8 are experimented and it is observed that the value of 0.7 results better convergence and classification accuracy among them. [Fig. 2] illustrates the curves of validation errors of experiments of the different values of the parameter of ELU applied on Flavia dataset without augmentation.

The leaf classification accuracies (the mean average precisions) of the proposed CNN on Flavia and Swedish leaf datasets, are reported in [Table 2]. For each experiments on a dataset with specific augmentation, top 1 and top 5 accuracies in the cases of original and augmented (with reflection augmentation) datasets are presented. The classification accuracies of conventional methods, experimented on both datasets are represented in [Table 3]. Among the recent methods, applied on these datasets, none of them have used CNNs for feature representation and classification; existing few works [3, 20, 21], applied their methods only on ICL dataset which it was not accessible during the experiments of this work.

In [Table 2], it is observed that ELU-based CNNs slightly outperforms ReLU-based ones but it must be noted that the use of ELUs, slows down the process of training in comparison to ReLUs because of the relative complexity of the function of ELU. [Table 3] shows that CNN-based feature learning and classification is easily compete with the current results of conventional approaches. Regardless of very extensive methods such as [1] that almost approached to 100% accuracy on these datasets, the proposed method outperforms current state-of-the-art, without need to devise multiple feature types and descriptors that may not work well on different inputs. Also this method is a learner which its learned model can be matured by feeding new inputs.

Table 2: The classification accuracies of the different experiments of the proposed CNN

Dataset	Augmentation	Type of function	Top1	Top5
Flavia	No	ReLU	96.33	99.74
		ELU	96.85	99.74
	Yes	ReLU	96.46	100
		ELU	97.24	100
Swedish	No	ReLU	96.00	100
		ELU	96.89	100
	Yes	ReLU	98.00	100
		ELU	99.11	100

Table 3: Comparison of classification accuracies on Flavia and Swedish leaf datasets

Flavia leaf dataset		Swedish leaf dataset	
Method	Accuracy	Method	Accuracy
[1]	99.87	[1]	99.50
The proposed CNN	97.24	The proposed CNN	99.11
[4]	95	[5]	97.33
[2]	91	[8]	96.53

CONCLUSIONS

In this paper a novel CNN architecture was designed for leaf classification task. The model is based on 160×160 grayscale input images that obtained from Flavia and Swedish leaf datasets. The green channel of colorful leaf images was selected as grayscale version of them. The effect of horizontal reflection augmentation of datasets were presented but further augmentations such as shift and rotation was not applied because of the already good performance of the model but in object recognition literature the use of multiple augmentation (including shift and rotation) is also common to further improve the results. The substitution of well-known ReLU activation functions with newly suggested ELUs was also experimented that showed that although ELUs, slightly improved the quality of classification, but increased the learning time thus the use of ReLU in deep architectures seems more effective than ELUs. The results showed that the proposed architecture for CNN-based leaf classification is closely compete with the latest extensive approaches on devising leaf features and classifiers.

CONFLICT OF INTEREST

There is no conflict of interest.

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FINANCIAL DISCLOSURE

None

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ARTICLE

BINARY SHAPE CLASSIFICATION USING CONVOLUTIONAL NEURAL NETWORKS

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ABSTRACT

Recognizing objects by their shapes, has been an interesting problem in image understanding, and has attracted researchers' attention. The superiority of Convolutional Neural Networks (CNNs) in various object recognition tasks have been proven in recent years. But CNNs has been rarely used in binary shape classification. In this paper, a CNN architecture is proposed specifically for the task of binary shape classification. Two already known CNN architectures along with the proposed one are trained to recognize category of binary shapes. The effect of simple types of augmentations on the final classification accuracy is presented too. The comparison of the final results with the latest best results on Animal and Mpeg7 shape datasets reflects the effectiveness of CNNs on shape recognition task even on the relatively small datasets.

INTRODUCTION

Shape is a remarkable cue for human to understand objects in images. It can be used in image [1] and shape retrieval [2]. Shapes do not have brightness, color and texture information and are only represented by their silhouettes. In fact, shapes are stable to the variations in object color and texture and light conditions. Due to such advantages, recognizing objects by their shapes has been an interesting problem for researchers to investigate. Shape recognition is usually considered as a classification problem where a classifier is trained with a set of inputs and labels, and the trained model is tested to recognize the categories of unseen inputs. The main challenge in shape recognition is the large intra-class variations induced by deformation, articulation and occlusion. Therefore, a variety of research efforts have been made in the recent years to form an informative and discriminative shape representation.

Current approaches related to shape representation, mainly have focused on designing low-level shape descriptors which are aimed to be robust to rotation, scaling and deformation of shapes. A good shape descriptor should be invariant under rigid motion, and robust to noise and occlusion. There are two main groups of shape descriptors [3]: region-based and contour-based. The region-based method considers the information of the pixels within the shape. In contrast, the contour-based method considers the information obtained from the shape contour.

Discriminative feature learning from large datasets provides an alternative way to construct feature representations. This method has been widely used in computer vision and image processing. Bag of words (BoW) models represent images as a collection of local features. These models have shown a remarkable performance in multiple domains including object and scene recognition [4], image retrieval [1] and shape classification [5], in past decade. The major drawback of bag of words method is the lack of spatial information in the histogram representation.

While the performance of conventional, handcrafted features have plateaued in recent years, new developments in deep compositional architectures have kept performance levels rising [6]. The strong attention to deep learning is due to its capacity to create multilevel representations of data and permit for a possibly more efficient way to solve some problems. Several approaches have been presented in this area: deep auto-encoder [7], convolutional neural network [6, 8] and restricted Boltzmann machine [9] are among some of these.

CNNs have been shown to be particularly adapted to process image data, since they are inspired in the way the human visual system works [10] and are discriminatively trained via back-propagation through layers of convolutional filters and other operations such as rectification and pooling.

Although deep neural networks have attracted enthusiastic interest within various vision problems, there exists some domains that are still rarely used these powerful networks. While some recent works have used CNNs in various closely related tasks such as 3D shape recognition [11] and sketch classification [12, 13], the direct use of CNNs in binary shape classification still have not been presented. In this paper, the use of CNNs in this area is examined and is demonstrated that how CNNs can outperform current state of the art in 2D shape category recognition. In order to carry out these, various experiments on already used CNN architectures, is conducted to apply on shape datasets including Animal [14] and MPEG7 [15]. Also a new architecture is proposed and evaluated on these datasets. Steps are as follows. First, the images of dataset are padded and resized to fit into 32×32 pixels, then regular augmentation types including reflection and shift are applied. After splitting to train, validation and test sets, on each train set with specific augmentation type, two well-known CNN architectures, LeNet [16] and MNIST-CNN [17], as well as the proposed one, are trained. The results are compared with the recent achievements of conventional methods. It is observed that CNNs not only outperforms current methods but can be used to work with small sized shape datasets with help of regular augmentations.

KEY WORDS
Shape, Classification,
Recognition,
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Network

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RELATED WORKS

In this section, the recent improvements in 2D shape classification using conventional methods and deep learning approaches were reviewed. Prior to renovation of deep neural networks and domination of these methods in object recognition tasks [6], the bag of words method has been the dominant method for summarization of large amount of local features to use in discrimination of objects and scenes. One of the applications of this method on shape classification was presented in [5], where the log-polar transform (LPT), after applying the Fourier transform modulus to enforce scale and rotation invariance, was used as a local descriptor and the bag of words framework with some novelties was used to generate feature vectors to train SVM classifier. And a method was presented to construct a low-dimensional histograms of bi-grams using the spatial co-occurrence matrix, as well as a metric to select an appropriate codebook size in the bag-of-words model and methods to estimate codebook size and maximum radius of the log-polar transform.

Contour [18] and skeleton based [19] descriptors have been among the favorite shape representations in recent years. In [18], a shape representation called Bag of Contour Fragments (BCF) was developed, inspired by classical Bag of Words (BoW) model. In BCF, a shape is decomposed into contour fragments, each of which then individually is described using a shape descriptor, and is encoded into a shape code. Finally, a compact shape representation was built by pooling shape codes in the shape. Shape classification with BCF also requires an efficient linear SVM classifier. Another work [2] proposed a skeleton-based algorithm for 2D and 3D shape retrieval. The algorithm starts by drawing circles (spheres for 3D) of increasing radius around skeletons. Since each skeleton corresponds to the center of a maximally inscribed circle (sphere), this process results in circles (spheres) that are partially inside the shape. Computing the ratio among pixels that lie within the shape, the total number of pixels was considered to distinguish shapes with similar skeletons. Complementary, in [19], a shape descriptor, named Skeleton-associated Shape Context (SSC), was proposed using combination of contour and skeleton, according to the correspondence between and associating skeletal information with a shape contour. The Bag of Features framework was applied to the SSC descriptors and finally, the shape feature vectors was fed into a linear SVM classifier to recognize the shape. This method was called Bag of Skeleton-associated Contour Parts.

Some other papers used different approaches in shape-based object recognition and classification. For example, in [20] the interaction between pattern recognition and bioinformatics, was considered to address the 2D shape classification problem. In the paper, three methods were proposed to encode a shape as a biological sequence and standard biological sequence analysis tools was employed to derive a similarity of those encodings, which then was exploited in a nearest neighbor framework. And in [21], the authors tried to apply graphical models to learn a shape representation and proposed a pipeline of shape-based object recognition. First, a Bayesian Network was used to represent the shape knowledge of a type of object. Second, an evidence accumulation inference with Bayesian Network was developed to search for the area of interest which is most likely to contain an object in an image. Finally, a spatial pyramid matching approach was used to verify the hypothesis to identify objects and to refine object locations.

Despite the enormous success of deep learning as a technique for feature learning in images, very few techniques based on deep learning have been developed for learning shape features. Specifically, no paper was found in which the researchers used CNNs to 2D shape classification, but a few endeavors have done on closely related topics including DNN-based 3D shape object recognition and sketch classification.

In 3D shape representation literature, a few works can be found in which deep learning frameworks were utilized in 3D shape recognition. In [11], a set of algorithms and techniques was developed for learning a deep shape descriptor (DeepSD) based on the use of a multi-layer perceptron (MLP). In the paper, a heat shape descriptor (HeatSD) was developed based on point based heat kernel signature (HKS), and new definitions of Eigen-shape descriptor (ESD) and Fisher-shape descriptor (ESD) was proposed to guide the training of the MLP. In [7], an autoencoder was used for feature learning on 2D images obtained by projection of 3D shapes into 2D space, combining the global deep learning representation with local descriptor representation. Another work [22] used this method to address the problems of learning shape representation, denoising and completion in an unsupervised manner. The use of CNNs for solving object recognition tasks using RGB-D data, was presented in [23], where the possibility of making transfer learning while training CNNs was investigated. In the paper, four independent CNNs, were used for each channel, instead of using a single CNN receiving the four input channels, and these four independent CNNs were trained in a sequence, and the weights of a trained CNN was used as starting point to train the other CNNs that processed the remaining channels.

Sketch recognition task is another shape related domain where a few papers can be found that in which researchers used DNNs in sketch-based object classification. The major work on utilizing Deep CNNs for free-hand sketch recognition was Sketch-a-net [12] that aimed to exploit the unique characteristics of sketches, including multiple levels of abstraction and being sequential in nature. In the work, ensemble fusion and pre-training strategies were applied to boost the recognition performance. Another recent

attempt in this area is [13], where a deep convolutional neural network, similarly named SketchNet was proposed for sketch classification. But the main purpose of the paper was to automatically learn the shared structures that exist between sketch images and real images. In order to do this, a triplet was composed of sketch, positive and negative real image that was developed as the input of the neural network. The authors used SoftMax as lost function and ranked the results to make the positive pairs to obtain a higher score comparing over negative ones to achieve robust representation.

CONVOLUTIONAL NEURAL NETWORKS

A convolutional neural network (CNN) is a type of deep neural network (DNN) inspired by the human visual system, used for processing images. A CNN has several stages, each usually composed of two layers: the first layer does a convolution of the input image with a filter and the second layer down-samples the result of the first layer, using a pooling operation. These stages build increasingly abstract representations of the input pattern: the first might be sensitive to edges, the second to corners and intersections and so on. The idea is that these representations become both more abstract and more invariant as the pattern data goes through the CNN. The output of the last stage is usually a vector (not an image) that is fed to a multi-layer perceptron (MLP) that produces the final network output, usually a class label.

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Various CNN architectures were proposed to be used for object recognition. Among them LeNet [16] and AlexNet [6] have been considered as a baseline for various tasks. The former, was used to classify tiny images of hand-written digits (28×28 pixels) while the latter is somewhat complicated and has been considered as a breakthrough in object recognition on colorful medium sized images (256×256). Binary shape images have simple structures without color and texture cues, and are meaningful in very small sizes. Thus in this paper, shape images are considered as 32×32 pixels. In order to classify these images, the CNN architectures must be used that are suitable to work with this input size. Therefor in this paper, two already used CNN architectures, LeNet, MNIST-CNN [17], and a proposed architecture (for ease of reference this network is named BS-CNN stands for Binary Shape CNN) are trained to classify images of size 32×32 pixels. These architectures are described in [Table 1].

In all networks, the ReLU activation function [6] is used for each convolutional layer and MaxPooling for each Pool layer. A fully connected layer is defined as a convolutional layer with filter size of 1×1 as it is a convention in MatConvNet [24]. The final layer has 20 or 70 output units corresponding to 20 and 70 categories of Mpeg7 and Animal datasets, respectively. After all layers a SoftMax loss is placed.

EXPERIMENTS

In this section, the proposed CNN-based shape classifiers is tested on Animal [25] and Mpeg7 [15] datasets. The former consists of 2000 binary shapes of 20 animal categories with 100 shapes for each category, while the latter consists of 1400 silhouette shapes of 70 classes with 20 shapes in each class. A few samples of these datasets are depicted in [Fig. 1]. The proposed CNNs are designed for input size of 32×32 pixels but images of both datasets have variety of sizes. In order to convert them to squared scale, first, all black pixels around the shape in an image is removed, then new black pixels around the shape is added so that firstly, the resultant scale is squared and secondly, the minimum black margins to shift the

Table 1: The architecture of our CNNs

CNNs	Attributes	Layer 1		Layer 2		Layer 3		Layer 4
LeNet	Type	Conv	Pool	Conv	Pool	Conv		Conv
	Filter Size	5×5	2×2	5×5	2×2	4×4		2×2
	Stride	1	2	1	2	1		1
	Number of Filters	20	20	50	50	500		20,70
	Output Size	28×28	14×14	10×10	5×5	2×2		1×1
MNIST-CNN	Type	Conv	Pool	Conv	Pool	Conv	Pool	Conv
	Filter Size	5×5	2×2	5×5	2×2	3×3	2×2	1×1
	Stride	1	2	1	2	2	2	1
	Number of Filters	20	20	40	40	150	150	20,70
	Output Size	28×28	14×14	10×10	5×5	2×2	1×1	1×1
BS-CNN	Type	Conv	Pool	Conv		Conv		---
	Filter Size	5×5	5×5	5×5		5×5		
	Stride	1	5	1		1		
	Number of Filters	150	150	250		250		
	Output Size	28×28	9×9	1×1		1×1		

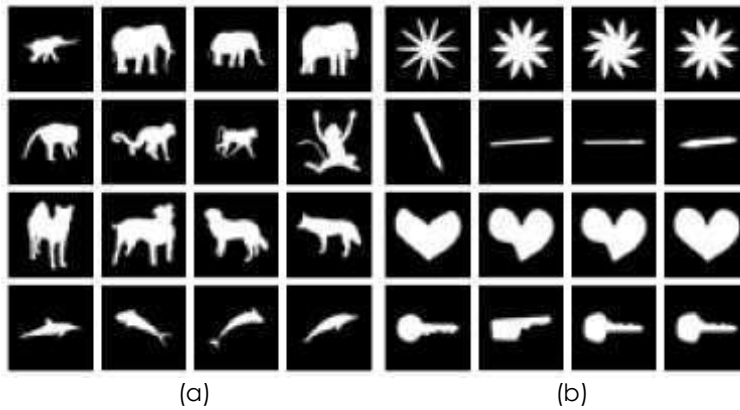


Fig. 1: Sample images of datasets: (a) Animal, (b) Mpeg7

image for augmentation is considered. Then the image is resized to 32×32 pixels and each pixel's value is converted to the range [0, 1].

Data augmentation, is a method to generate extra samples from a given image. It is the process of perturbing the image by transformations that change its appearance while leaving the high-level information intact. The simplest methods of data augmentation are reflection and shifting the image pixels. For the augmentation phase of experiments, four options are considered, including no-augmentation, reflection (X2), reflection plus two random shifts (X4) and reflection plus four random shifts (X6). The reflection is done horizontally and for the random shifts, first the side of the shift is selected randomly, then after applying the shift on the image, it is flipped with the probability of 50%. These conventional data augmentation strategies will increase the training data size by a factor of 2, 4 and 6 respectively. These resultant data are randomly split into 70% train, 10% validation and 20% test sets.

The hyper-parameters of the experimented CNNs are set as follows. In all experiments, networks are trained by stochastic gradient descent with 0.9 momentum. The learning rate is set to be 0.001. The weight decay parameter is 0.0005. Initial weights are selected randomly from standard normal distribution, multiplied by 0.01. The mini-batch size is set to 100 as well as the maximum number of epochs.

The shape classification accuracies (the mean average precision) of proposed CNNs on Mpeg7 and Animal datasets, are reported in [Table 2] and [Table 3], respectively. For each experiments on a dataset with specific augmentation, top 1 and top 5 accuracies are presented.

[Table 2] and [Table 3] show the superiority of the proposed CNN architecture (BS-CNN) in comparison with the already used models, LeNet and MNIST-CNN. The proposed CNN architecture is also simpler than LeNet and MNIST-CNN. These tables also show that how augmentations lead to improve the classification accuracy on both datasets. The resultant classification accuracies can be compared with the results of the recent paper, [19], where the average classification accuracy of the proposed method, Bag of Skeleton-associated Contour Parts (BSCP), on Mpeg7 and Animal datasets were stated as 98.41% and 89.04% respectively. It is observable that the proposed BS-CNN on Mpeg7 dataset with augmentation type X4 closely compete with BSCP (97.86%), and outperforms it on Animal dataset (92.00%). BS-CNN with augmentation type X6, outperforms BSCP on both datasets (98.99% and 96.51% respectively), especially on Animal dataset. The results suggest that CNN-based classifiers with help of regular data augmentations can easily outperform current shape classification approaches. It must be noted that training BSCP, as its

Table 2: The classification results of CNNs for shape recognition on Mpeg7 dataset

MPEG7	No Augmentation		Augmentation X2		Augmentation X4		Augmentation X6	
	Top 1 Accuracy	Top 5 Accuracy	Top 1 Accuracy	Top 5 Accuracy	Top1 Accuracy	Top 5 Accuracy	Top 1 Accuracy	Top 5 Accuracy
MNIST-CNN	86.43	95.00	91.43	96.96	91.16	97.86	94.70	98.69
LeNet	87.14	96.43	92.50	96.61	88.93	95.45	94.52	98.63
BS-CNN	89.64	95.71	93.75	97.86	97.86	99.82	98.99	99.76

Table 3: The classification results of CNNs for shape recognition on Animal dataset

Animal	No Augmentation		Augmentation X2		Augmentation X4		Augmentation X6	
	Top 1 Accuracy	Top 5 Accuracy	Top 1 Accuracy	Top 5 Accuracy	Top 1 Accuracy	Top 5 Accuracy	Top 1 Accuracy	Top 5 Accuracy
MNIST-CNN	61.75	89.75	70.00	92.88	78.44	95.13	88.58	97.71
LeNet	66.50	89.75	72.25	93.25	74.50	94.19	87.63	97.79
BS-CNN	70.25	94.25	78.88	96.75	92.00	98.81	96.51	99.79

authors had stated, was took about 8 hours on a workstation, but training of BS-CNN, with noted hyper-parameters, takes about half an hour on a regular PC. This denotes that training of the proposed method is very fast on such a small datasets.

In above experiments, the input size of CNNs is fixed as 32×32 pixels, because firstly, binary shapes have less details than color images and they well distinguishable even in small sizes. Secondly, CNNs can work faster on small inputs as in our experiments which the time of trainings on these small datasets is in the range of a few minutes to half of an hour on the regular PC with 3.30 GHz CPU and 8 GB RAM, using CPU mode.

CONCLUSIONS

In this paper a CNN architecture is proposed to classify binary shape images with small scales. Choosing tiny input size is rational because binary shapes have less details than color images and they easily are differentiated in small sizes and the training time of CNNs can be very low. With help of a little augmentation, better results in comparison with current best results , [19], are achieved. The main focus of this paper is the architectures of CNN and other hyper parameters are set to commonly best fixed values, thus it is not hard to believe that even better results can be achieved with further investigations on architectures and hyper parameters and applying recent modifications and discoveries on deep neural networks.

CONFLICT OF INTEREST

There is no conflict of interest.

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ARTICLE

HAND DRAWN SKETCH CLASSIFICATION USING CONVOLUTIONAL NEURAL NETWORKS

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ABSTRACT

Sketch-based object recognition and classification has become an important research topic in vision applications. In the recent years, Convolutional Neural Networks (CNNs), have emerged as a powerful framework for feature representation and recognition for variety of applications in image analysis. But there exists few works that utilized CNNs in sketch classification domain. In this paper, a few deep CNNs are trained to improve the accuracy of sketch image classification in comparison with current state of the art. The size of inputs in the architectures of CNNs that currently have used for sketch recognition, has considered to be greater than 200×200 pixels which has limited the accuracy of classification. In this paper, tiny images are used as inputs, thus the architecture of CNNs are simplified and can be trained in a reasonable time, in CPU mode. These simplified CNN architectures are used to recognize sketch categories of TU-Berlin sketch dataset. The results show that the proposed method can outperforms state of the art performance of sketch recognition in addition to increasing the speed of training.

INTRODUCTION

Sketches are very intuitive to humans and have long been used as an effective communicative tool. Sketch can be seen as abstract representation of variety of ideas. Moreover, sketch images can convey information that is hard to describe using text, without requiring a tremendous amount of effort. With the proliferation of touch devices, sketch has been attracted more and more researchers attentions in recent years. There exist a wide range of interesting applications including sketch recognition [1-3], sketch-based image retrieval [4, 5] and sketch-based shape [6, 7] and 3D model retrieval [7, 8].

Recognizing free-hand sketches is an extremely challenging task. This is due to a number of reasons [3]: (1) sketches are highly iconic and abstract; (2) due to the free-hand nature, the same object can be drawn with hugely varied levels of detail/abstraction; (3) sketches lack visual cues, such as color and texture information.

Traditional methods on sketch recognition generally follows the conventional image classification paradigm that is, extracting hand-crafted features from sketch images followed by feeding them to a classifier. Most hand-crafted features traditionally used for photos such as HOG [9], SIFT [10] and shape context [11], have been employed, which are often coupled with bag of visual words to yield a final feature representations that can then be classified. But these features are sensitive to the view perspectives and some appearance cues of drawn sketches. Furthermore, the ability of learning algorithms to train the classification models are also influenced by the handcrafted features and the capacity of classifiers like SVM to memorize feature information.

Learning robust and invariant representation has been a long-standing goal in computer vision. In comparison to hand-crafted visual features, features learned by deep neural networks (DNNs) have recently been shown more capable of capturing abstract concepts invariant to various phenomenon in visual world [12, 13]. In the recent years, Convolutional Neural Networks (CNNs), a specific type of DNNs, have emerged as a powerful framework for feature representation and recognition for a variety of image domains. A deep CNN is able to learn basic filters automatically and combine them hierarchically to enable the description of latent concepts for pattern recognition, and have successfully been applied to large image datasets such as ImageNet [12], MNIST [14], CIFAR-10/100 [15] for image classification. However, the domain of sketch images has been rarely explored. With emerge of large-scale sketch datasets such as TU-Berlin (Eitz, et al, 2012), using CNNs in sketch classification has attracted more attention [3, 16-18].

In this paper, a few deep CNNs are trained to improve the accuracy of sketch image classification, in comparison with current state of the art. The contribution of the paper is as follows: (1) Working with tiny input images: in the conventional methods, rather large scale images were used to extract feature vectors to feed them to a classifier as a descriptor of the original images to be categorized. But mining these raw images, in large numbers, using DNNs is a difficult and practically unefficient task. Therefore, in the case of DNNs, using smaller scales of images has been preferred, because the amount of information in the down-scaled image is often not changed in comparison with the original image. Currently a commonly used image scale as the input size of CNNs is 32×32 pixels. But in the current related works in sketch classification (that summarized in the next section), this input scale have not been considered. Thus in this paper, the input size is fixed as 32×32 to experiment more possibilities. (2) Fewer number of layers and neurons: the number of layers and neurons in DNNs, due to cover different levels of information, is very important. But excessive levels, slow down the learning process. On the other hand, the amount of information in sketch images are much lower that colorful, texturized natural images, and it seems that

KEY WORDS
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 Recognition,
 Convolutional Neural
 Network

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CNNs can process such images without need of very deep architectures like AlexNet [12]. Therefore this paper tries to use simple but powerful networks that can be trained in CPU mode (i.e. not to use GPU hardware to accelerate training process) in an affordable amount of time. (3) Accuracy of classification: it is found that these simple architectures outperforms state-of-the-art performance for sketch recognition, without the need for large scale input images, complicated augmentations, specific activation functions and response normalization. The recognition frameworks are evaluated on TU-Berlin [1], the publicly available benchmark dataset, containing thousands of freehand sketches.

The rest of the paper is organized as follows: first the related literature is reviewed in the second section. Then the trained CNN architectures, used in this work, are presented. The experiments and results are showed in fourth section and the paper is concluded in the final section.

RELATED WORKS

In the first attempt to utilize CNNs to recognize hand-drawn sketches and object categories, [16], two popular CNNs – AlexNet CNN [12] and a modified version of LeNet CNN [14] were used for experiments, and results showed minor improvements over the conventional state-of-the-art.

The major work on utilizing Deep CNNs for free-hand sketch recognition was Sketch-a-Net which firstly was introduced in [17] and further revised in [3]. Sketch-a-Net aimed to exploit the unique characteristics of sketches, including multiple levels of abstraction and being sequential in nature. In the work, ensemble fusion and pre-training strategies were applied to boost the recognition performance. Compared to the earlier version of Sketch-a-Net, a number of modifications were applied in the latest network. In the second version, the authors used stroke timing and geometry information to define a data augmentation strategy that synthesizes sketches at varying abstraction levels, and deformed them to achieve a richer training set and to alleviate the problem of over-fitting to scarce sketch data. They achieved 77.95% classification accuracy on TU-Berlin sketch dataset [1].

The very recent attempt in this area is [18], where another deep convolutional neural network, similarly named SketchNet, was proposed for sketch classification. But the main purpose of the paper is to automatically learn the shared structures that exist between sketch images and real images. In order to do this, a triplet was composed of sketch, positive and negative real image that was developed as the input of the neural network. The authors used SoftMax as lost function and ranked the results to make the positive pairs to obtain a higher score comparing over negative ones to achieve robust representation. To construct the auxiliary repository, the real images were collected from the web which covered all the sketch categories in the TU-Berlin sketch dataset. To extract the real reference images for each training sketch, first a preliminary model was trained based on AlexNet [12] following the fine-tuning process. Afterwards, the top K predicted category labels of each training sketch were extracted based on the pre-trained AlexNet model. For each training sketch, the most visual similar real images were found from the image sets of top predicted categories to construct the training pairs. Thus, the sketch with the real images which is in the same class was used to generate the positive image pair while the sketch with the real images which is in distinct classes was defined as negative image pair. SketchNet contained three subnets: R-Net was used to extract features from the real images. S-Net was applied on the sketch images. And C-Net was proposed to discover the common structures between real images and sketches. Finally, the predictions were merged together to achieve the final results. The best classification accuracy, achieved in the paper on TU-Berlin sketch benchmark, was 80.42%.

Another related paper that used CNNs in sketch recognition is [19], in which a CNN based classifier for 3D shapes using 2D image renderings of those shapes was proposed. In particular, a CNN was trained on a fixed set of rendered views of a 3D shape and was provided with a single view at test time. The authors used their method as a data augmentation method and applied in the context of sketch recognition on SketchClean dataset [2]. SketchClean is a simpler version of TU-Berlin sketch dataset [1] on which humans can achieve 93% recognition accuracy compared to 73% on original dataset. They achieved 87.2% sketch classification accuracy on this simplified dataset.

Table 1: The architecture of proposed CNNs

Layers	MNIST-CNN	CIFAR-CNN	TS-CNN
Input	32×32×1×20	32×32×1×64	32×32×1×96
L1	Conv - 5×5 - 1 Pool - 2×2 - 2	Conv - 3×3 - 1 Pool - 3×3 - 3	Conv - 5×5 - 1 Pool - 3×3 - 2
Input	14×14×20×40	10×10×64×128	14×14×96×192
L2	Conv - 5×5 - 1 Pool - 2×2 - 2	Conv - 3×3 - 1 Pool - 2×2 - 2	Conv - 5×5 - 1 Pool - 3×3 - 2
Input	5×5×40×150	4×4×128×256	4×4×192×192
L3	Conv - 3×3 - 1 Pool - 2×2 - 2	Conv - 3×3 - 1 Pool - 2×2 - 2	Conv - 3×3 - 1
Input	1×1×150×250	1×1×256×128	2×2×192×192
L4	Conv - 1×1 - 1	Conv - 1×1 - 1	Conv - 1×1 - 1
Input	1×1×150×250	1×1×128×250	2×2×192×250
L4	----	Conv - 1×1 - 1	Conv - 1×1 - 1
Loss	SoftMax		

In all above mentioned works, input images have considered greater than 200×200 pixels and extensive endeavors have been applied to achieve the results. But at the point of view of this paper, such a great size (for deep CNNs to work on) is not necessary, specifically on sketch datasets. It is possible to work with smaller sizes and achieve even better results with modification of current state-of-the-art CNN architectures.

TRAINED CNN ARCHITECTURES

Designing an architecture for CNN is an important step to achieve impressive results on vision problems. Architectures may vary with type of images and especially when input image sizes are different. In this paper, the size of input images is considered to be 32×32 pixels thus the CNN architectures, proposed in previous works, cannot be applied without modifications on these images (for example applying 15×15 filters in the first layer of the CNN, in the case of Sketch-a-Net, on input size of 32×32 pixels is not rational). Therefore the architectures that were used before (Sato et al, 2015) to classify images of size 32×32 pixels include MNIST-CNN and CIFAR-CNN and an architecture that inspired from [20] (for ease of reference, is named TS-CNN, stands for Tiny Sketch CNN) were trained to sketch classification task. These architectures are described in [Table 1].

In all networks, the ReLU activation function [12] was used for each convolutional layer and MaxPooling for each pooling layer. In the architectures, randomness to the networks, such as Dropout [21] or DropConnect [22] was not imposed during training. In [Table 1], records named “Input” specifies the map size and the number of inputs and output maps of the below and the above layer; the first and second elements are the width and height of the input (output) map of the layer below (above), and the third and fourth elements are the number of input (output) maps of the below (above) layer and the number of output (input) maps of the below (above) layer, respectively. Also, the definition of layers in [Table 1] consists of three parts; type of layer, filter size and stride length, respectively. The fully connected layers are defined as convolutional layers with the filter size of 1×1 as it is conventional in MatConvNet [23]. The final layer has 250 output units corresponding to 250 categories of the dataset, upon which a SoftMax loss is placed.

EXPERIMENTAL RESULTS

In this section, the results of the proposed methods on the task of sketch classification are presented. The

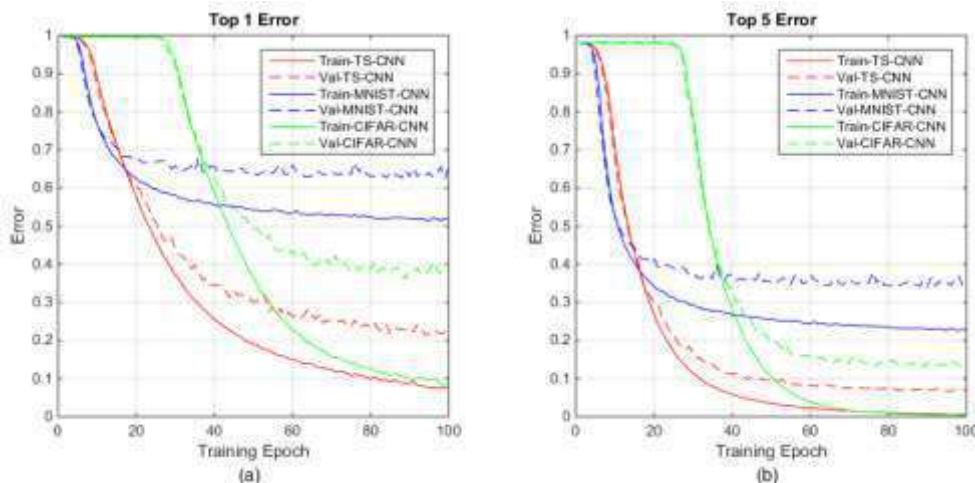


Fig. 1: Comparison of training and validation curves of the proposed networks.

Table 2: The classification results of the CNNs for sketch recognition on TU-Berlin sketch benchmark

Method	Top 5 Accuracy	Top 1 Accuracy
TSCNN	98.97	89.17
Sketch-a-Net	---	77.95%
CIFAR-CNN	86.42	62.70
SketchNet	80.42%	---
MNIST-CNN	63.93	35.01

networks are implemented using MatConvNet [23] on the TU-Berlin sketch dataset [1]. All images are down-scaled to 32×32 pixels and each pixel's value is converted to range [0, 1]. The conventional data augmentation methods are applied by replicating the sketches with a number of transformations. Specifically, for each input sketch, horizontal reflection and horizontal and vertical shifts (3 pixels) are done. These data augmentation strategies increase the training data size by a factor of 10. These 200000 images are randomly split into 70% train, 10% validation and 20% test sets.

In all experiments, the networks are trained by stochastic gradient descent with 0.9 momentum. The learning rate is set to be 0.001. The weight decay parameter is 0.0005. Initial weights are selected randomly from standard normal distribution, multiplied by 0.01. The mini-batch size is set to 100. All networks were trained up to 100 epochs. Overall training takes less than one day based on a PC with 3.30 GHz CPU and 8 GB RAM, using CPU mode. The training and validation curves of all three networks are depicted in [Fig. 1].

In [Fig. 1] the training process of CNNs can be compared. This figure demonstrates that TSCNN converges faster than the other CNNs. This quick convergence also lead to the better results after 100 epochs.

The sketch recognition results of the proposed CNNs, compared to the related works, are reported in [Table 2]. The results of SketchNet and Sketch-a-Net are stated as they were reported in corresponding works, (Zhang, et al, 2016) and (Yu, et al, 2016), respectively. In the case of SketchNet, only top 1 accuracy was mentioned in the original paper and for Sketch-a-Net the authors does not specified the type of accuracy thus it is considered as the top 1 accuracy. This table shows that TS-CNN significantly outperforms other methods, especially in comparison with SketchNet and Sketch-a-Net which specifically designed for sketch classification.

The results show that working with small size of input images, not only eliminates the need for additional layers but also increases the accuracy of learning. This phenomenon is reasonable because the sketches are so powerful in conveying information, even in small size and for CNNs working with small sized input is more convenient.

It must be noted that the architectures examined in this work were inspired from other related works and most of the hyper-parameters were set to the best common values. Thus, the results can be even better by applying recent modifications and discoveries on deep neural networks.

CONCLUSIONS

In this paper, a few different CNN architectures inspired by latest achievements on training DNNs were applied to sketch classification task with tiny input sketches. It is observed that small input size, dramatically improves the current classification accuracies on TU-Berlin sketch benchmark and simplifies the CNN architectures which also lead to increase in speed of training. Most of the hyper parameters in this work are set to common best fixed values, thus it is not hard to believe that even better results can be achieved with further investigations on architectures and hyper parameters and applying recent modifications and discoveries on deep neural networks.

CONFLICT OF INTEREST

There is no conflict of interest.

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FINANCIAL DISCLOSURE

None

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ARTICLE

NANOPARTICLES AS DRUG DELIVERY

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ABSTRACT

Controlled drug delivery systems (DDS) have several advantages compared to the traditional forms of drugs. A drug is transported to the place of action, hence, its influence on vital tissues and undesirable side effects can be minimized. Accumulation of therapeutic compounds in the target site increases and, consequently, the required doses of drugs are lower. This modern form of therapy is especially important when there is a discrepancy between the dose or the concentration of a drug and its therapeutic results or toxic effects. Cell-specific targeting can be accomplished by attaching drugs to specially designed carriers. Various nanostructures, including liposomes, polymers, dendrimers, silicon or carbon materials, and magnetic nanoparticles, have been tested as carriers in drug delivery systems. In this review, the aforementioned nano carriers and their connections with drugs are analyzed. Special attention is paid to the functionalization of magnetic nanoparticles as carriers in DDS. Then, the advantages and disadvantages of using magnetic nanoparticles as DDS are discussed.

INTRODUCTION

Drug targeting to specific organs and tissues has become one of the critical endeavors of the new century. The search for new drug delivery approaches and new modes of action represent one of the frontier areas which involves a multidisciplinary scientific approach to provide major advances in improving therapeutic index and bioavailability at site specific-delivery [1-4]. The hard to target tissues such as blood-brain barrier permeation limitation can now be overcome allowing the use of therapies otherwise excluded by conventional dosage forms [5]. These new systems can hinder solubility problems, protect the drug from the external environment such as photo degradation and pH changes, while reducing dose dumping by controlling the release profile [3,4]. Moreover, controlled targeting at the site of action and reduced time of exposure at non-targeting tissues increases the efficacy of treatments and reduce toxicity and side effects [6] thus improving patient compliance and convenience.

Biocompatibility is one of the major pre-requisites for pharmaceutical use, and designing a formulation to fit the physicochemical properties of the drug poses the challenge to new dosage forms. Nowadays, the versatility and biodegradability of polymers such as poly (D-L-lactide-co-glycolide) (PLGA) constitute a leading approach to new dosage forms to avoid physiological and pathological hurdles encountered in developing targeting strategies. This approach can improve the pharmacokinetic profiles of numerous drugs through the delivery of a higher dose at the site-specific organs by using ligands [7] while conferring a controlled release and degradation to non-toxic products. Meanwhile, oral administration is the most convenient route for drug delivery and the focus of recent research concerns the development of carriers that can cross biological barriers such as the gastrointestinal (GI) tract. In such a way it is necessary for the carrier to protect the drug against the hostile and degrading milieu of the GI tract while increasing the residence time (e.g. bioadhesion) and target specific cells to enhance absorption which will most likely require less frequency regimens .

A number of drug delivery systems are currently under investigation to circumvent the limitation commonly found in conventional dosage forms and improve the potential of the respective drug. On the other hand, there has been a focus on the microenvironment of the cells and their interaction with these new dosage forms [8]. As a result, these new technologies have prompted the old concept of the magic bullet proposed by Paul Ehrlich's vision [1].

Type of New Drug Carriers Systems

Microencapsulation has been important to the development of new therapeutics and has been used to produce microspheres containing both hydrophilic and hydrophobic drugs entrapped within biocompatible polymers [9]. The purpose of using these carriers is to obtain a controlled release thus maintaining therapeutic drug levels over a specified time period while reducing systemic absorption [9]. These systems have been used in food and cosmetic industry [4] and drug [10] and gene delivery [11]. Micro particles are a generic term to mention micro- capsules and microspheres which can be made of polymers or lipids (liposomes) with sizes ranging from 1 to 250 μm (ideally $<125 \mu\text{m}$ and exceptionally $1000 \mu\text{m}$) [12,13]. This technology is very important in drug delivery. Reduced doses due to higher absorption and prolonged absorption time by using adhesion properties of micro particles have been envisioned [14]. On the other hand, good *in vitro/in vivo* correlations have been observed [14]. Biodegradable micro particles are easily cleared by physiological systems thus avoiding the possible cytotoxicity caused by accumulation in cells and tissues. Active substances may be either adsorbed at the surface of the polymer or encapsulated

KEY WORDS

drugs delivery system ; nano carriers ; nanoparticles; magnetic nanoparticles.

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within the particle. Furthermore, controlled release can be achieved by pH- sensitive (especially useful in intravenous delivery) and/ or thermo-sensitive micro particles. Micro particles have been used to encapsulate several peptides (e.g. calcitonin and insulin), anesthetics, anti-viral drugs, hypertension and anticancer drugs [12,14], among others. There are several methods for the preparation of micro particles including the polymerization of synthetic monomers and synthesis from preformed polymers [14]. However, sub-micron size particles have shown to offer marked advantages over micro particles [15,16]. For example PLGA micro- and nanoparticles were compared for their uptake in caco-2 cells and revealed a higher up- take from nanoparticles (41% vs. 15%) [17]. Moreover, targeting to specific tissues such as inflamed and cancerous tissues may be limited only to nanoparticles [18].

Nanotechnology

The use of nanotechnology for drug delivery rapidly produced commercially available products and the term nano medicine emerged. Nano medicine is the application of nanometer scale materials in an innovative way to develop new approaches and therapies. At this scale, materials display different physicochemical properties due to their small size, surface structure and high surface area [2]. These properties allow nano particulate systems to overcome current limitations of conventional formulation as they facilitate the intracellular uptake to specific cellular targets. Thus, nanotechnology has been adopted in several fields such as drug/gene delivery [20,21], imaging [22] and diagnostics [23].

Nano carriers used in drug delivery system

According to the definition from NNI (*National Nanotechnology Initiative*), nanoparticles are structures of sizes ranging from 1 to 100 nm in at least one dimension. However, the prefix “nano” is commonly used for particles that are up to several hundred nanometers in size. Nano carriers with optimized physicochemical and biological properties are taken up by cells more easily than larger molecules, so they can be successfully used as delivery tools for currently available bio active compounds [145]. Liposomes, solid lipids nano particles , dendrimers, polymers, silicon or carbon materials ,and magnetic nanoparticles are the examples of Nano carriers that have been tested as drug delivery systems.

Drug release from nanoparticles

The nanoparticle is coated by polymer, which releases the drug by controlled diffusion or erosion from the core across the polymeric membrane or matrix. The membrane coating acts as a barrier to release, therefore, the solubility and diffusivity of drug in polymer membrane becomes the determining factor in drug release. Furthermore release rate can also be affected by ionic interaction between the drug and addition of auxiliary ingredients. When the drug is involved in interaction with auxiliary ingredients to form a less water soluble complex, then the drug release can be very slow with almost no burst release effect (Chen et al., 1994).

To develop a successful nano particulate system, both drug release and polymer biodegradation are important consideration factors. In general, drug release rate depends on (1) solubility of drug, (2) desorption of the surface bound/ adsorbed drug, (3) drug diffusion through the nanoparticle matrix, (4) nanoparticle matrix erosion/degradation and (5) combination of erosion/diffusion process (Mohanraj and Chen, 2006). Thus solubility, diffusion and biodegradation of the matrix materials govern the release process.

Liposomal nanoparticles as drug carrier

multi lamellar vesicles (MLVs, diameter >200nm), unilamellar vesicles (large unilamellar vesicles (diameter 100–400 nm), and small unilamellar vesicles (diameter <100 nm)), based on the number of layers (lamellarity) and diameter. Both synthetic and natural lipids can be used. Phosphatidyl choline, electrically neutral phospholipids containing fatty acyl chains of varying degrees of saturation and length are most widely used in liposomal formulation. Liposomes were used as antimicrobial agents since 1995 when FDA approved Doxil (doxorubicin liposomes) as the first liposomal delivery system to treat the AIDS associated Kaposi's sarcoma (Lian et al 2001). These are biodegradable, non-toxic and can encapsulate both hydrophobic and hydrophilic drugs in the aqueous core and the phospholipid bilayer respectively without any chemical target cell specificity, pH, reductive environmental and temperature sensitivity, which are achieved by selecting the appropriate lipid composition and surface modification for the liposomes (Lian et al.2001). Another remarkable feature of liposomes is the lipid bilayer structure that can easily fuse with the bacterial membranes, thereby releasing the drug within the cell membrane, or into the interior of the microorganism.

There are many successful examples of liposomal antimicrobial drug delivery. One such example is polymyxin B loaded liposomal formulation containing 1,2-dipalmitoyl-sn-glycero-3-phosphocholine (DPPC) and cholesterol showed dramatic improvement over free drug in terms of reduced side effect and enhanced antimicrobial activity. Liposomes are also widely used in the delivery of chemotherapeutic agents. Chan et al. (2009) synthesized core shell NPs consisting of PLGA (poly lactic-co-glycolic acid) hydrophobic core, soybean lecithin monolayer and PEG shell by modified nano-precipitation method combined with self-assembly. Docetaxal encapsulated nanoparticles showed that the amount of lipid coverage affected drug release kinetics.

SOLID LIPID NANOPARTICLES (SLN) AS DRUG DELIVERY CARRIER

SLN are a new generation of colloidal drug carriers, also called lipospheres. These submicron-sized particles in the range of 52-100 nm consist of physiologically biocompatible lipids, which remain solid at body and room temperature and remain dispersed in aqueous solution. SLN are mainly prepared from the lipids, waxes and surfactants for emulsification. Commonly used lipids in SLN formulation include fatty acids, triglycerides, steroids and surfactants. Emulsifiers for the stability of lipid dispersion are sodium cholate and sodium glycocholate. Methods employed to prepare the SLN include high pressure homogenization, emulsifier solvent diffusion, and multiple emulsion solvent injection. SLN have unique properties as potent drug carrier as they combine several advantages and avoid the disadvantages of other colloidal carriers such as lipid immersion, liposomes and polymeric NPs. They are made up of physiologically biocompatible and tolerable lipids, hence they are not toxic to the human body. Drug release can be controlled and targeted as immediate release or sustained release. SLN formulation also protects the sensitive drugs from any photochemical, or oxidative degradation as the drug is immobilized by the solid lipids and drug leakage is reduced when compared to liposomes. Both lipophilic and hydrophilic drugs can be encapsulated and delivered by the SLN with slight modification in SLN formulation. Urban-Morlan et al. (2010) synthesized the solid lipid NP containing cyclosporine by emulsification diffusion method. Differential calorimetric assay revealed that cyclosporin affected the lipid structure and entrapment efficiency was higher with relatively fast release of cyclosporine. Various examples of SLN based antimicrobial drug delivery targeted against the microorganism.

Polymeric-based NPs

Polymeric NPs can be formed as nano spheres, or nano-capsules depending upon the method of preparation. Nano-capsules are vesicular systems in which drug is confined to a cavity surrounded by a polymeric membrane and nano spheres are matrix systems in which the drug is physically and uniformly dispersed. In 1976, Langer and Folkman demonstrated the first use of polymeric based delivery of macromolecules. Since then, many synthetic and semi-synthetic, biocompatible and biodegradable polymers have been used extensively in the clinic for controlled drug release. The most commonly and extensively used polymeric NPs include poly-D, L-lactide-co-glycolide, polylactic acid, poly-ε-caprolactone, poly-alkyl-cyanoacrylates, chitosan and gelatin. Polymeric NPs also possess several remarkable properties making them a potential drug delivery vehicle. Firstly, they are structurally stable in the biological fluids under harsh conditions and can be synthesized with desired size distribution. Secondly, by manipulating the polymer length,

surfactants and organic solvent during synthesis, size, zeta potential and drug release profile of NP can be precisely tuned. Thirdly, the functional groups of polymers can be functionalized with desired ligands for the targeted delivery, e.g., lectin conjugated glycidine NP that selectively adhered to the carbohydrate receptors on the surface of microbes were studied for treating *Helicobacter pylori* infection (Umamaheswari et al. 2003). Due to obvious advantages such as improving the therapeutic effect, prolonging the biological activity, controlling the drug release rate and decreasing the administration frequency, a great deal of work has been done on polymeric NPs. For example, polybutylcyanoacrylate NPs was loaded with rifampicin and it showed antibacterial activity against *S. aureus* and *Mycobacterium avium* due to effective delivery of the drugs to macrophages both *in vitro* and *in vivo*. Cao et al. (2010) used, xyloglucan (polymer) was grafted with doxorubicin (DOX) and galactosamine and was used to target liver hepatocytes. This novel nano DDS showed improved transfection efficiency and hepatocyte specificity, which could be useful for tumor therapy.

Dendrimers as a drug carrier

Dendrimers are macromolecules with highly branched polymers with 3-D structures that provide a high degree of surface functionality and versatility (Nanjwadea et al. 2009). Fritz Vogtle and coworkers first introduced dendrimers in 1978 (Bhuleier et al. 1978). Dendrimers consist of three components: an initiator core, an interior layer composed of repetitive units and an exterior (terminal functionality) layer attached to outermost interior layers. To develop dendrimeric systems for delivering drugs, these are prepared from two synthetic iterative approaches: one divergent and another convergent. In the divergent approach, synthesis is initiated from the core and proceeds outward to the exterior through repetition of coupling and activation steps. In contrast, in the convergent approach synthesis starts from the periphery and proceeds towards the core (Gillies et al. 2005). Dendrimers possess several unique properties that make them efficient NP carriers for the antimicrobial drug delivery. The well defined highly branched 3D structure provides a large surface area to size ratio resulting in greater reactivity with microorganisms *in vivo*. The availability of many controlled functional surface groups, polydispersity and their ability to mimic cell membrane adds to their potency as drug carriers. Both hydrophilic and hydrophobic agents can be loaded at the same time either by encapsulating drug within the dendritic structure, or by interacting with the drugs at their terminal groups by electrostatic, or covalent bonds also due to the availability of functional groups. Dendrimers with specific and high binding affinity to a wide variety of viral and bacterial receptors can be synthesized (Sajja et al. 2009). Surfaces of dendrimers can be functionalized with PEG, which allows the delivery system to circulate in the body for prolonged time and thus maximizing the opportunity of the drug to reach the relevant site. PEGylated dendrimers are difficult to be detected by

defense mechanism there by slowing the process of breakdown (Bhadra et al. 2005). PAMAMs were the first and most popularly studied dendrimers, but because of the cytotoxicity caused by the terminal amines, its clinical use as a drug carrier was limited. However, by masking the terminal amine groups by some means like terminating their carboxylic, or hydroxyl group would not only overcome its limitation but also improve the efficiency by solubility enhancement and making it more biocompatible and less toxic (Gillies et al. 2005). A study has indicated that PAMAM dendrimers might be considered as the biocompatible carriers of quinolones (nadifloxin and prulifloxin) under suitable condition (Cheng et al. 2007). Dendrimer use resulted in increased aqueous solubility of these antibiotics. Table 5 summarizes more dendrimeric-based antibacterial drug delivery systems.

CONCLUSION

Nano carriers as drug delivery systems are designed to improve the pharmacological and therapeutic properties of conventional drugs. The incorporation of drug molecules into nano carrier can protect a drug against degradation as well as offers possibilities of targeting and controlled release. Due to small dimensions, nano carriers are able to cross the blood-brain-barrier (BBB) and operate on cellular level. In comparison with the traditional form of drugs, nano carrier-drug conjugates are more effective and selective. They can reduce the toxicity and other adverse side effects in normal tissues by accumulating drugs in target sites. In consequence, the required doses of drugs are lower. Although there are several nanoparticle-based therapeutic agents which are currently being developed and are under preclinical evaluation, only a handful of nanoparticle drugs are available on the pharmaceutical market, e.g., liposomal conjugates: Doxil® (doxorubicin) or DaunoXome® (daunorubicin).

It is due to the fact that nanoparticle based drug delivery systems do have a lot of drawbacks and limitations. Some of them arise from scaling up problems. For instance, small size and large surface area of nanoparticle-based targeting system can lead to an aggregation, making physical handling difficult. Nano carrier-drug conjugates can be phagocytosed by cells whereas their intracellular degradation may cause cytotoxic effects. Other issues include low drug loading capacity, low loading efficiency, and poor ability to control the size distribution of carriers. Furthermore, there is a lack of technological methods, which will lead to nano devices of approvable quality. Despite all the limitations and shortcomings, nano particle DDS which respond to slight changes in the local cellular environment have a potential to resolve many of the current drug delivery problems. However, before the ongoing research will bring a clinically useful drug delivery system, challenges which include developing toxicity testing protocols, improving biocompatibility, drug loading, targeting, transport and release, controlling interaction with biological barriers, detecting and monitoring exposure level and assessing the impact on the environment have to be met. Due to a number of functional groups on the surface of nanoparticles, the drug can be attached to the carrier only in a stoichiometric ratio. The oxidative stress and inflammation in different cell types have been often reported as toxic mechanisms of various types of nanoparticles. Nanoparticles of diameter 10 nm can remain in cells and induce chronic inflammatory response and fibrosis of tissue. An additional problem is the lack of knowledge concerning the distribution of drug carriers and the unpredictability of the process. Thus, in our opinion, the magnetic targeted drug delivery system is one of the most attractive strategy target therapy. Magnetic nanoparticles have their unique magnetic properties and they can be attracted by magnetic fields, thus, acting as drug carriers in a target therapy. In addition, inorganic magnetic nanoparticles containing the iron and gadolinium serve as an excellent contrast enhancing agents in MRI (approved by FDA – Food and Drug Administration a real therapeutic breakthrough can be achieved solely by carrying out painstaking studies in the field of nano-therapy. Using nano systems in therapies of diseases may contribute to achieving an effective cancer treatment. Moreover, immobilization of homing devices, such as folic acid, epidermal growth factor or antibodies, to the surface of nanoparticles, improves selectivity of drug carriers. The key applications of nano particles in medicine are diagnosis and target therapy, however, their wider use is still the future).

CONFLICT OF INTEREST

There is no conflict of interest.

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ARTICLE

THE STUDY OF CULTURAL FACTORS OF DRUG TRENDS IN STUDENTS OF PAYAME NOOR (UNIVERSITY OF PARS ABAD AND BILESAVAR)

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ABSTRACT

Background: This article, derived from research project which was conducted in Payamnoor of PARSABAD and BILESAVAR cities. The aim of this study is to test two essential hypotheses; 1- It seems that between the two universities there are differences in the tendency to abuse drugs. 2-It seems is different the relationship between cultural factors and trends in drug abuse in two universities. **Methods:** The type of this study is quantitative and use of questionnaires for the collecting data in level of descriptive analysis. Theoretical framework is use of theories of anomie and social solidarity of Durkheim and Merton, control of HIRSCHI. Reliability is in the three dimensions of drug trends in negative statements (/075), positive statements (/070) and items Social false justification (/073). Statistical tests used in this study is, the KMO, chi-square, regression and analysis of factor. **results:** Results about the first hypothesis showed that in the first dimension, 8 percent of students tend moderate to high, in the second dimension 26.7 percent above average, the third dimension; 17/4 percent moderate to high trend. PAYAM NOOR students of BILESAVAR in the drug trends in the first, second and third dimensions are less than PNU students of Pars Abad. The second hypothesis showed significant relationship in the household cohesion of students with three dimensions; academic activities with the third dimension, and family disorder with the second dimension of tendency to drug. **conclusion:** But there was no significant relationship between the collapse of the family and towards drug abuse and between economic - social status of person with tendency to drug, thus the hypothesis is rejected. furthermore being significant relationship, tendency of BILESAVAR Students is different and fewer in this regard than students Pars Abad.

INTRODUCTION

Nowadays preoccupy is the problem of widespread use and abuse of psychotropic substances and drugs, and communities many countries is The fact that avoids confrontation and less attention to it Due to adverse outcomes such as socio-economic degradation, threat to social security and the development of its deviants, will follow Disastrous consequences for any society. Drug abuse is a phenomenon that people initially consumes hidden from the eyes of society and the family. Addiction is a health, mental and social problem. Addiction age is dramatically reduced. That can be seen in students of university and even students. Classes of people seriously involved with this issue despite the lack of social acceptance in terms of opioid use [1]. The drugs Endangers individuals, families and society health and also cause mental, social and the individual decline [2]

MATERIALS AND METHODS

Problem

Drugs refers to materials that chemically defined substances have relaxant properties [3]. Tendency is the internal state which is high or easily taught the probability of occurrence of specific behaviors [4]. Drugs tendency one of the important components in issues related to substance abuse. Several hypotheses have been reported about the causes of drug abuse, but these hypotheses cannot explain the cause of tendency to drugs alone. In the social and cultural conditions and every person, some factors play a prominent role [5].

Drug addiction as psychological, social and historical problems is the one of the contemporary world problem that is threatening to collapse human societies. The basic symptom of substance dependence is the set of cognitive, behavioral and physiological symptoms, that person continues to use it despite having considerable problems associated with drugs and there is a repeated pattern of consumption usually leads to intolerance and compulsive behavior [6].

According to the latest data released by the United Nations Office on Drugs and Crime, trend of drug use is rising with gentle slopes. So that had used drugs at least once a year in the years 2010 - 2011 an average of 226 million, equal to 5% of the population 15 to 64 years in the world. In the most recent anti-drug headquartered has said consume drugs three million of the country's population.

KEY WORDS

cultural factors,
university of Payamnoor,
household cohesion,
academic activities

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In our society today, drugs have occurred in the face of an issue or social problem. This social harm are affected the large numbers of people and increasingly interacting with other social problems and become a threat to the foundation and build breaker. Then that our country has a young age structure (and most are the younger age groups) It is also seen as an opportunity, is also threatened. Because increased in terms of consumption of synthetic drugs rate of vulnerability with increases of young people. So that prevalence of drug addiction in student of university 6/2 per cent and students are one percent [7]. This imply double important of problem; So being infected young disrupt and wastes active force. And if students are affected, will fail the huge investments social, cultural and economic. On the other hand, for many years in all countries, drugs issue has become one of the most social issues and in recent years, was alarming proportions both at national level and at the global level [8]

One of the contexts that interact directly or indirectly with the issue of substance abuse is the cultural factors. Social institutions play the role of context. So this study has been done by appealing to the structural and cultural fields and focus on the dynamics of individual that is as creative this social institutions, attention to the alarming statistics about the prevalence of drug use among young people and college-educated.

Theoretical and empirical literature

Theoretical framework is use of theories of anomie and social solidarity of Durkheim and Merton, control of Hirschi.

- Social Cohesi and anomie Theory

First, Emile Durkheim (1858- 1917) used the term anomie to describe the abnormal status; Situation in which Social cohesion is undermined by crises such as economic downturn [9].

According to this theory, the addiction is of the characteristics social organization. Some people are not able to understand the goals of society or cannot be satisfied the desirable social goals as a result, resort to Drugs [10].

According to Durkheim, if the society of "social cohesion" is strong, its members probably are concordant with social norms and values. But if social cohesion is weak in society, people may be drawn into criminal behavior. So Addiction is connected with common sense (collective consciousness) seriously and drugs tendency be more in where there is not this sense. According to Alexander; would not be at risk of drug dependence, who succeeded in harmony with others and social structure [11].

- Social Control Theory

This theory emphasize on the socialization process more than punish in maintain order in the society and to explain about juvenile crime and offer practical recommendations for crime prevention benefits [12].

This theory is also called the social bond. It assumes that naturally people will commit a crime and deviance if they are left to their own. The basic assumption of this theory is that differences in crime among the people, by prohibiting or controlling social forces. Travis Hirschi argued that even if all the individuals potentially susceptible to crime and offenses are the norm, but they control for fear that the criminal act harm in their relationships with family, friends, neighbors, teachers and employers [13].

In fact, Hirschi, deviations caused by disruption or weakening of belonging to the society, he said. He has defined fourth element that makes the bond between the individual and society: Attachment, Commitment, Involvement, belief. He claimed, however, be employed, limiting the opportunities for criminal activities [14]. However the probability of delinquency is more when it is weak four mentioned elements.

Therefore, strong families and culture can prevent drug use basically and perhaps can lead to drug use the weakness and absence of families and adults [15]. In general, increases the likelihood of diversion, if one or more ring was poor communication [16,17,18].

- Hirschi four components of his theory tested on a sample of four thousand young California. The results showed that location and economic status - social parents belong to parents of children less effect on criminal behavior of young people.

- Chan and colleagues in their study (1964) found that anomie has a strong correlation with drug use [19].

- Bazzazian and colleagues in their study (2014) concluded that religious beliefs and family ties are negative with smoking, drugs and alcohol [20].

-Sheykhoh eslamzadeh and Kakouei in the research (2011) among subscales of attachment were significantly related to between drug dependence and abuse [21].

- Hezarjaribi and colleagues (2010) concluded that economic factors, mass media, reference groups, having an impact respectively in tendency teens to drug use [22].

- Molavi and Rasoulzadeh (2004) in their study concluded that divorce and family conflict, academic failure is as the most important factors in the tendency to use drugs [23].

METHOD

The type of this study is quantitative and use of questionnaires for the collecting data in level of descriptive_ analysis. The sample size was predicted 300 students with using Morgan table. Reliability (Cronbach's alpha) was calculated for the first dimension (75/0) the second (70/0) and third (73/0) whose test (ANOVA) It is significant.

RESEARCH HYPOTHESIS

- Seems there is a significant relationship between *household cohesion, academic activities, family turmoil* students and drug abuse.
- Seems there is a significant relationship between Social and economic status students and drug abuse.
- It seems that the relationship between cultural factors and trends of substance abuse is a significant difference between the two universities.

RESULTS

Descriptive Statistics

- University students of BILESAVAR less than Pars Abad, In the first dimension of drug trends.
- University students of BILESAVAR less than Pars Abad, In the high tendency to drugs -in the second and third dimension of drug trends.

Inferential statistics

Table [1]:KMO and Bartlett's Test

er-Meyer-Olkin Measure of Sampling Adequacy		.738
Bartlett's Test of Sphericity	Approx. Chi-Square	949.621
	df	105
	Sig.	.000

According to the test, KMO (fitness index factor analysis) and according to the level of significance at the table kmo test (sig: 0.00) reject the null hypothesis H0 and is confirmed

H1 is hypothesis. Solidarity statements of drug trends can be a factor and factor analysis extended to the population.

Table 2: Correlation between Cultural variables and Drug trends

Conclusion	significance	Value	Type of test	Level test	Cultural variables
H0	.543	- .010 B	R Square).07(Linear regression	Social and economic status students and drug abuse - first dimension .
H0	.825	- .006 B	R Square .004	Linear regression	second dimension
H0	.178	- .022 B	R Square .008	Linear regression	third dimension
H1	.016	- .217 B	R Square .019	Linear regression	household cohesion and first dimension
H1	.000	.380 B	R Square .040	Linear regression	And second dimension
H1	.027	- .199 B	R Square .016	Linear regression	And second third
H1	.050	- .159	Gamma	Ordinal by Ordinal	academic activities
H1	001·/	1.257 B	R Square .039	Linear regression	addict in the famil
H0	198·/	-.252 B	-	Linear regression	Death or separation of parents

CONCLUSION

The first hypothesis

The students tend to drugs

- In the present study, 3.3 percent of family of students consumes drugs once. 7% of students have smoked in their lifetime, 10 per cent of hookah, and 2 percent have used drugs. According to the consumption index smoke, 13% of students at least once have used of smoke materials.

- In the first dimension; 8% medium to high trend, 23/5 percent low-to-moderate trend, 50 percent too low tendency to low, 18/5 percent have not tendency. In the second dimension; 7.7 percent of students are favored, 19% of average tendency, 39 percent less tendency, 28 percent too low tendency, and 6/4% did not trend. In the third dimension; 4 percent high, 13.4 percent of average tendency, 38/3 percent less tendency, 44/3 percent of students do not trend. These findings are confirmed the findings of Taremiyan et al (2007) high prevalence of drug use, hookah (34%), smoking (24%) & Alcohol (17%).

Tendency in drug abuse is different among students of universities.

It was observed that two universities in the tendency to drugs are different. Payam Noor University students of BILESAVAR drug tendency in the first, second and third dimensions is less than PNU students Pars Abad.

The second hypothesis

A) Solidarity of students with the families in all three dimensions drug abuse had statistically significant relationship. Family Cohesion students who are less than strong family solidarity students is as factor that will draw person to the addiction. Low correlation tends to lead drug.

The above findings have a most correspondence with theories of social cohesion Durkheim and Merton's and social bonding theory Hirsch. Bazzazian et al (2014) in their study concluded that religious beliefs and family ties are negative with smoking, drugs and alcohol.

Yahyazadeh et al (2009)[24]. also concluded that are unfeeling relationship the primary families of addicts and this has increased trend to drugs likely. Consistent with our results, the results Hirschi also showed that children belong to parent greater influence on the youth criminal behavior. So this hypothesis, based on control theory, in general, if one or more link was poor communication, increases the likelihood of diversion [25, 26, 27].

B) Academic activities with the second dimension drug tendency showed a significant relationship.

This means that if was high the student activities in university, Students will be less tendency to drugs. The findings, social bonding theory Hirsch confirms with its four components. Consistent with the findings of this study, Saleh Abadi and Salimi Amanabad (2012) also concluded that leisure activities effect on tend to abuse the drug [28].

C) Family disorder has a significant relationship (variable addict in the family) with the second dimension towards drug abuse

That's mean if person have a high relationship with addicts it is possible that Will be more inclined to narcotics. These findings are consistent with theories of Mr. Bandura (social learning).

Sattari and et al (2002) Consistent with our findings concluded that the trend of drug abuse is higher in families with a history of substance abuse [29].

D) The collapse of the family (divorce, death, separation) and towards drug abuse there was no significant relationship.

So it can be said against the common argument that knows divorce as factor for tends to crime in general and in the tendency to addiction particular.

E) Between the economic – social status of person with a tendency to narcotics no Significant relation and that is rejected the hypothesis.

Consistent with our results, the results Hirschi also showed that economic - social status of parents than belonging children to parents is less effect on criminal behavior of young people.

3- The relationship between cultural factors with a tendency to drug abuse is different in two universities.

- Solidarity of students with the families in all three dimensions drug abuse;

The results showed that in addition to the relationship between the two factors, this relation between students of BILESAVAR in their attitude about the trends is different and less than Pars Abad students.

- Academic activities with the second dimension drug tendency;

The results showed that in addition to the relationship between the two factors also, this relation between students of BILESAVAR in their attitude about the trends is different and less than Pars Abad students. - Family disorder has a significant relationship

Such as the above case, the results showed that in addition to the relationship between the two factors also, this relation between students of BILESAVAR in their attitude about the trends is different and less than Pars Abad students.

CONFLICT OF INTEREST

There is no conflict of interest.

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None

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ARTICLE

STRUCTURE ENGINEERING OF FHUA AS A VACCINE CANDIDATE IN *ESCHERICHIA COLI*

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ABSTRACT

FhuA which is an integral membrane protein of *Escherichia coli* has the following functions: a) as the ferric hydroxamate uptake receptor which actively transports the siderophores ferrichrome and ferricrocin, the cyclic peptide antibiotic microcin J25, the siderophore-antibiotic conjugate albomycin, and the bacterial toxin colicin M across the outer membrane. *FhuA* also transports the semi-synthetic rifamycin derivative CGP 4832, although the chemical structure of this antibiotic differs markedly from that of ferric hydroxamates. b) as the primary receptor for bacteriophages T1, T5, ϕ 80, and UC-1. The transport is coupled to the proton motive force, which energizes *FhuA* through the inner-membrane protein TonB. Here we describe the topology and 3D structure of a novel antigen which was discovered by mining the bacterial genome and that is very effective in inducing bactericidal antibodies. This antigen is a very good candidate for inclusion in universal vaccines against *Escherichia coli*.

INTRODUCTION

The uptake of antimicrobial agents across the outer membrane of gram-negative bacteria is mediated by a family of transport proteins employing a variety of mechanisms [1].

FhuA which is an integral membrane protein of *Escherichia coli* has the following functions: a) as the ferric hydroxamate uptake receptor which actively transports the siderophores ferrichrome and ferricrocin, the cyclic peptide antibiotic microcin J25, the siderophore-antibiotic conjugate albomycin, and the bacterial toxin colicin M across the outer membrane [2]. *FhuA* also transports the semi-synthetic rifamycin derivative CGP 4832, although the chemical structure of this antibiotic differs markedly from that of ferric hydroxamates. b) as the primary receptor for bacteriophages T1, T5, ϕ 80, and UC-1.

The transport is coupled to the proton motive force, which energizes *FhuA* through the inner-membrane protein TonB [3, 4, 5]. The energy-transducing TonB-ExbB-ExbD complex couples the proton motive force of the cytoplasmic membrane to a family of diverse outer-membrane proteins, the TonB-dependent transporters [2].

Structural studies represented that albomycin is actively transported across both the outer and cytoplasmic membranes, indeed it is one of the most potent antibiotics against *E. coli* (minimal inhibitory concentration [MIC] of 0.005 μ g/ml). The three-dimensional structure of *FhuA* in complex with albomycin also confirmed that this antibiotic occupies the same ligand binding site as ferrichrome, ferricrocin, and phenylferricrocin. This similarity extends to the set of residues that are involved in ligand binding and which are essentially conserved among these hydroxamate-type siderophores, and it thereby provides a structural explanation for high-affinity binding. Moreover, this structural information provides a basis for the rational design of synthetic antibiotics that are actively transported by this receptor or by its homologs [5].

Here we describe the topology and 3D structure of a novel antigen which was discovered by mining the bacterial genome and that is very effective in inducing bactericidal antibodies. This antigen is a very good candidate for inclusion in universal vaccines against *Escherichia coli*.

METHODS

Sequence availability and homology search

The *FhuA* reference sequence with accession No NP_414692.1 acquired from NCBI at <http://www.ncbi.nlm.nih.gov/protein> was saved in FASTA format for further analyses. The sequence served as a query for protein BLAST at <http://blast.ncbi.nlm.nih.gov/Blast.cgi> against non-redundant protein database. Probable putative conserved domains of the query protein were also searched for, at the above address.

Template search

The query protein sequence was used as an input data for the PSI-BLAST against protein data bank (PDB) at <http://blast.ncbi.nlm.nih.gov/Blast.cgi> to identify its homologous structures.

KEY WORDS
Escherichia coli, *FhuA*,
Topology and 3D
structure

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Primary sequence analysis

ProtParam online software at <http://expasy.org/tools/protparam.html> was employed for estimation and determination of properties such as molecular weight, theoretical pI, amino acid composition, total number of negatively and positively charged residues, instability index and aliphatic index.

Subcellular localization

Subcellular localization of protein was predicted by CELLO at <http://cello.life.nctu.edu.tw/>

Homology modeling

In the process of modeling, default restraint settings were applied, and a rigorous relaxation protocol involved 2000 simulated annealing relaxation cycles (4.4 ps stepwise warming from 0–1000 K, followed by 19.2 ps stepwise cooling back down to 300 K, all done through Charm force field and charges). The loop regions geometry was corrected using MODELER/Refine Loop command. The SWISS-MODEL Workspace at <http://swissmodel.expasy.org/> is a web-based integrated service dedicated to protein structure homology modelling. Secondary structure of the protein was predicted by SWISS-MODEL too. It assists and guides the user in building protein homology models at different levels of complexity. Building a homology model comprises four main steps: identification of structural template(s), alignment of target sequence and template structure(s), model building, and model quality evaluation. These steps can be repeated until a satisfying modelling result is achieved. Each of the four steps requires specialized software and access to up-to-date protein sequence and structure databases.

Models evaluations

All 3D models of the proteins built, were qualitatively estimated by GMQE and QMEAN4 scores.

Topology and signal peptide prediction

SPOCTOPUS at <http://spoctopus.cbr.su.se/> was employed to determine protein topology and signal peptide. Prediction of the hydrophobic transmembrane regions in a protein sequence forming probable β -barrel could help determination of the 3D protein structure. Full-length protein served as input in topology prediction. PRED-TMBB at <http://biophysics.biol.uoa.gr/PRED-TMBB/> is a server that predicts transmembrane β -strands in protein sequences of Gram-negative bacteria. The web-server could find the topology of the loops in addition to localize the transmembrane strands

RESULTS

Sequence availability and homology search

The FhuA protein sequence with 747 residues obtained from NCBI and saved in FASTA format. Protein sequence serving as query for BLAST produced a set of sequences as the highest similar sequence. BLAST search revealed numerous hits to the FhuA sequence. All hits were of *Escherichia coli*. Putative conserved domains were detected within this sequence. Most of the sequences belong to OM_channels super family.

Porin superfamily. These outer membrane channels share a beta-barrel structure that differ in strand and shear number. Classical (gram-negative) porins are non-specific channels for small hydrophilic molecules and form 16 beta-stranded barrels, which associate as trimers. Malto porin-like channels have specificities for various sugars and form 18 beta-stranded barrels, which associate as trimers. Ligand-gated protein channels cooperate with a TonB associated inner membrane complex to actively transport ligands via the proton motive force and they form monomeric, barrels. The 150-200 N-terminal residues form a plug that blocks the channel from the periplasmic end.

TonB-dependent siderophore receptor. This subfamily model encompasses a wide variety of TonB-dependent outer membrane siderophore receptors. It has no overlap with TonB receptors known to transport other substances, but is likely incomplete due to lack of characterizations. It is likely that genuine siderophore receptors will be identified which score below the noise cutoff to this model at which point the model should be updated. [Transport and binding proteins, Cations and iron carrying compounds, Transport and binding proteins, Porins] Putative conserved domains have been detected within the sequence are shown in [Fig.1].

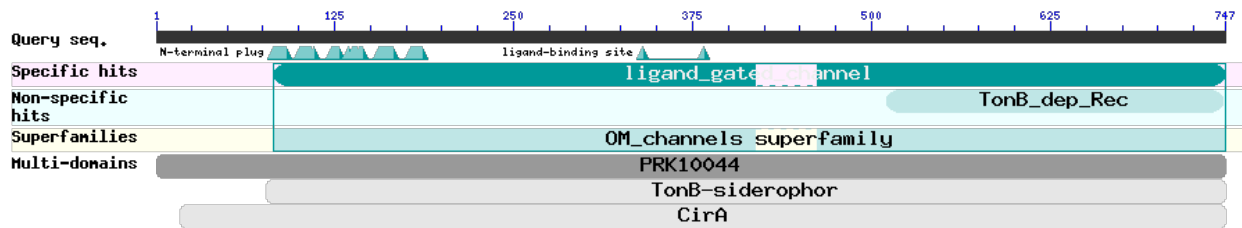


Fig.1: Putative conserved domains have been detected.

Template search

PSI-BLAST against protein data bank (PDB) result displayed several hits as homologous structures. The first hit possessing the highest score was selected as a template for homology modelling. This top hit for FhuA sequence blast results was a protein with PDB code 1BY3-A (99%identity, 95%query coverage, 1476 Max score and 1476 Total score, Chain A, Fhua From E. Coli).

Our BLAST results showed that FhuA exists in all pathogenic strains of *E.coli*. This protein antibodies cross-react with a range of *E.coli* isolates for high similarity reason.

In this regard, FhuA sequence served as a query for BLAST search against Protein Database (PDB) to find the best template for 3D structure prediction. In addition to E value, query coverage and Max. identity are also involved in Max. score definition. Lower E-value and higher query coverage and max. identity are appropriate criteria for the selection. Thus, a hit with the highest total score could be the most reliable template. The use of some sequence alignment methods to identify a relationship between the target sequence and one or more possible templates is the first step in structure prediction. Based on BLAST search and alignments generations, the predicted 3D model of the FhuA could be applied to all FhuA proteins in *E.coli*.

Primary sequence analysis

The protein sequence served as input for the computation of various physical and chemical parameters. The computed parameters included the molecular weight, theoretical pI, instability index, aliphatic index and grand average of hydropathicity (indicates the solubility of the proteins: positive GRAVY (hydrophobic), negative GRAVY (hydrophilic)) are listed below.

Number of amino acids: 747

Molecular weight: 82182.2

Theoretical pI: 5.47

Amino acid composition:

Ala (A) 69	9.2%	Leu (L) 46	6.2%
Arg (R) 33	4.4%	Lys (K) 40	5.4%
Asn (N) 43	5.8%	Met (M) 12	1.6%
Asp (D) 49	6.6%	Phe (F) 36	4.8%
Cys (C) 4	0.5%	Pro (P) 37	5.0%
Gln (Q) 33	4.4%	Ser (S) 54	7.2%
Glu (E) 35	4.7%	Thr (T) 58	7.8%
Gly (G) 62	8.3%	Trp (W) 9	1.2%
His (H) 8	1.1%	Tyr (Y) 42	5.6%
Ile (I) 17	2.3%	Val (V) 60	8.0%

Total number of negatively charged residues (Asp + Glu): 84

Total number of positively charged residues (Arg + Lys): 73

Atomic composition:

Carbon	C	3655
Hydrogen	H	5565
Nitrogen	N	987
Oxygen	O	1146
Sulfur	S	16

Formula: C₃₆₅₅H₅₅₆₅N₉₈₇O₁₁₄₆S₁₆

Total number of atoms: 11369

Extinction coefficients:

Extinction coefficients are in units of M⁻¹ cm⁻¹, at 280 nm measured in water.

Ext. coefficient 112330

Abs 0.1% (=1 g/l) 1.367, assuming all pairs of Cys residues form cystines

Ext. coefficient 112080

Abs 0.1% (=1 g/l) 1.364, assuming all Cys residues are reduced

Estimated half-life:

The N-terminal of the sequence considered is M (Met).

The estimated half-life is: 30 hours (mammalian reticulocytes, in vitro).

>20 hours (yeast, in vivo).

>10 hours (Escherichia coli, in vivo).

Instability index:

The instability index (II) is computed to be 30.04

This classifies the protein as stable.

Aliphatic index: 65.42

Grand average of hydropathicity (GRAVY): -0.481

Subcellular localization

FhuA Subcellular localization predicted by CELLO was OuterMembrane with the highest reliability (4.783).CELLO results are shown below [Table 1].

CELLO Prediction:	
OuterMembrane	4.783 *
Extracellular	0.124
Periplasmic	0.071
InnerMembrane	0.013
Cytoplasmic	0.008

3D structure prediction with homology medeling

The use of some sequence alignment methods to identify a relationship between the target sequence and one or more possible templates is the first step in structure prediction. Based on BLAST search and alignments generations, the predicted 3D model of the FhuA could be applied to all FhuA proteins. Accuracy of prediction depends on the degree of sequence similarity. If a structure template with sequence identity of >50% is found for a query protein, homology modeling could be chosen as the best *in silico* method with an accuracy equal to low-resolution X-ray predictions. When template and query sequences share 30-50% identity, more than 80% of the C-atoms can be expected to be within 3.5 Å of their true positions. Significant errors would occur in prediction when the sequences share less than 30% sequence identity. Since identity between the query and its template sequence was 35% (>30%) in our study, we assumed that homology modeling could be more powerful than threading.

Swiss modeler recruited for homology modeling introduced one model [Fig. 2]. Its model was selected for further scrutinizes and validation analyses.

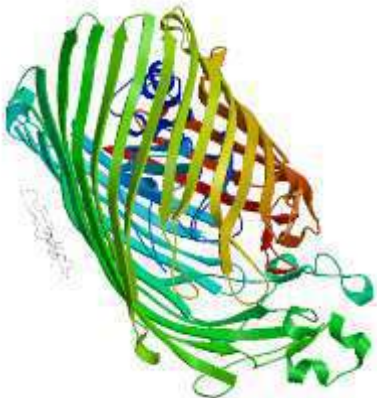


Fig.2. Swiss model 3D structure prediction.

Models evaluations

QMEAN is a composite scoring function for the estimation of the global and local model quality. QMEAN consisting of four structural descriptors: The local geometry is analyzed by a torsion angle potential over three consecutive amino acids. Two pairwise distance-dependent potentials are used to assess all-atom and C-beta interactions. A solvation potential describes the burial status of the residues. The pseudo energies returned from the four structural descriptors and the final QMEAN4 score get directly related to what we would expect from high resolution X-ray structures of similar size using a Z-score scheme.

The score of a model is also shown in relation to a set of high-resolution PDB structures (Z-score). The plot relates the obtained global QMEAN4 value to scores calculated from a set of high-resolution X-ray structures. Local estimates of the model quality based on the QMEAN scoring function are shown as per-residue plot. Each residue is assigned a reliability score between 0 and 1, describing the expected similarity to the native structure. Higher numbers indicate higher reliability of the residues.

GMQE (Global Model Quality Estimation) is a quality estimation which combines properties from the target-template alignment. The resulting GMQE score is expressed as a number between zero and one, reflecting the expected accuracy of a model built with that alignment and template.

Higher numbers indicate higher reliability. Once a model is built, the GMQE gets updated for this specific case by also taking into account the QMEAN4 score of the obtained model in order to increase reliability of the quality estimation. 3D structure validations are shown in [Fig. 3].

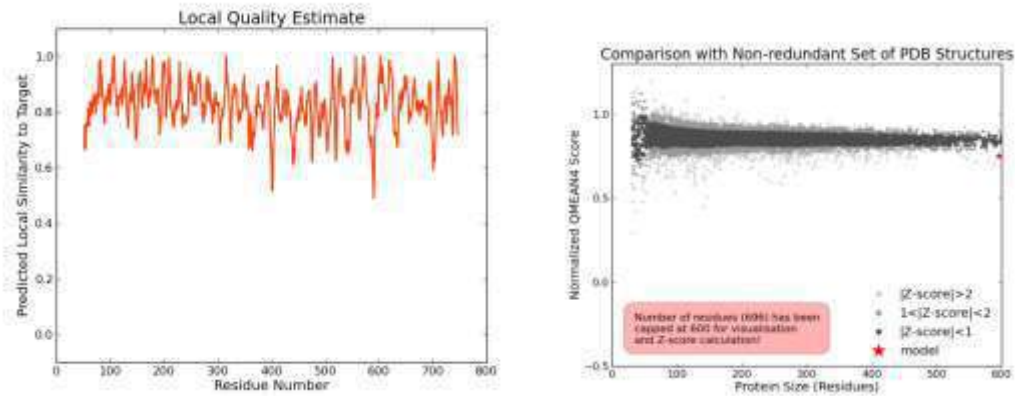


Fig.3: 3D structure validations.

Topology and signal peptide prediction

FhuA signal peptide cleavage site was predicted between positions 30 and 31 of protein sequence.

FhuA topology predicted by spoctopus server is shown in [Fig. 4].

A 2D topology model of protein was built based on predicted inside, transmembrane and outside regions of the protein [Fig. 5].

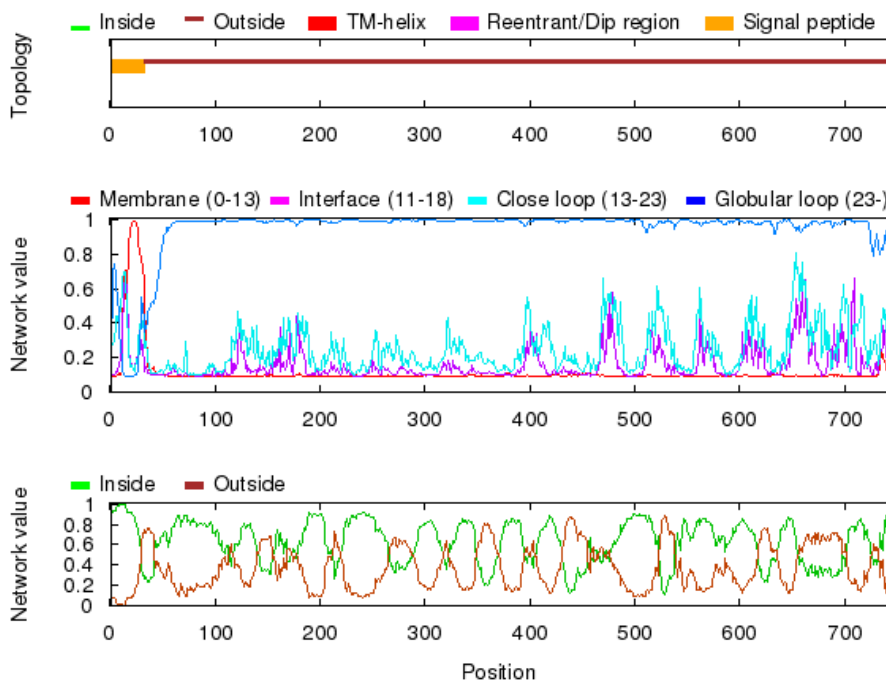


Fig. 4: FhuATopology and signal peptide cleavage site predicted by spoctopus server.

Topology output: This is a graphic representation of the most likely topology as predicted by SPOCTOPUS.

Network output: The two diagrams show the estimated preference for each residue to be located in different structural regions. The top diagram shows the preference of being either in:

- the hydrophobic part of the membrane, 0-13Å from the membrane center (M)
- the membrane water-interface, 11-18Å from the membrane center (I)
- a close loop region, 13-23Å from the membrane center (L)
- a globular region, further than 23Å from the membrane (G)

The bottom diagram shows the estimated preference of a particular residue to be located either on the inside (i) or on the outside (o) of the membrane.

The raw data underlying these two plots can be found in the SPOCTOPUS network file.

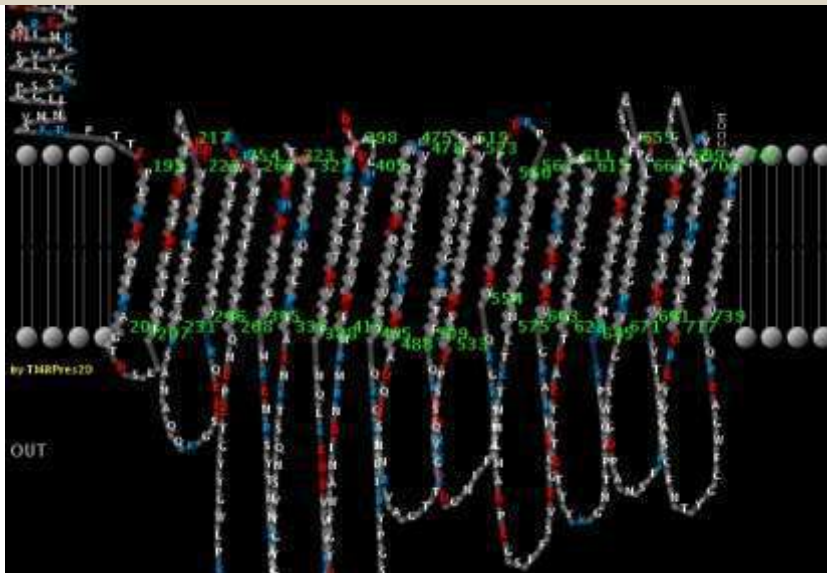


Fig.5: A 2D topology model of FhuA.

CONFLICT OF INTEREST

There is no conflict of interest.

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FINANCIAL DISCLOSURE

None

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ARTICLE

THE CONTEXTUAL ANALYSIS OF THE NATURAL SCIENCES LESSON BOOK OF THE SECOND PRIMARY GRADE AND THE COMPARISON OF THE IRANIAN NATIONAL EDUCATIONAL LESSON PLAN PURPOSES

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ABSTRACT

The lesson plan changes of the natural sciences training are one of the most sophisticated challenges of the countries educational system in all over the world. The main purpose of the present study was to investigate and analyze the natural sciences lesson book of the second primary grade and its comparison with aiming at the educational and learning issues in the Iranian national educational lesson plan trying to represent an active combinative learning-teaching approach in this study. The related study was an applied type of study purposefully and it also was a descriptive type of study regarding to gather the related data. The statistical population of the present study was included the national lesson plan, teacher's manual and the natural sciences book of the second primary grade during 2014-2015 that this was also investigated by William Roomy contextual analysis method. The obtained results from the contextual analysis of the natural sciences book of the second primary grade showed the challenging with text coefficient 0.98, challenging with pictures coefficient 1.25 and challenging with book questions coefficient 2.33 in this study. These degrees have been also established between 0.4 to 1.5 for learners' challenging with text and book pictures; according to William Roomy, this method had been also represented as an active method but the challenging with book questions coefficient had been represented as inactive (2.33 for the second primary grade). Based on the research results, there had been represented to reevaluate designing of all questions trying to challenge all learners with cognitive skills and lesson book questions as well as giving some learning-teaching approaches actively in this regard.

INTRODUCTION

The necessity of applying and using the modernized and scientific achievements as well as the new western scholars' theories regarding to the educational sciences are not negligible for everyone; for the reason, there have been established two approaches of the absolute acceptance (globalization theory) and the lack of absolute acceptance (problem-based localism) in confronting with the issue of applying the global theories generally. However, the most accurate analysis shows that these two related theories have been ignored regarding to its some parts because the first theory does not pay attention to the local realities and the second one make a kind of suspicious for the truths and common realities of the mankind over the mega-time and mega-location levels. In the national lesson plan, the learning fields' purposes are subjected to those purposes that these should determine the educational purposes regarding to every lesson and educational plan due to the related requirements and different circumstances of the learning fields such as coaches, trainers, facilitations, local conditions (national lesson plan, 2012, 19). But there has been little applied the practical approach in order to make the accessibility and operation of these higher purposes. In the field of representing a suitable pattern for the educational and natural sciences fields in the national lesson plan based on the experimental and practical methods, the recognition of the early phases of these educational formations should be also determined but there has been little carried out studies regarding to the educational affairs in Islamic training issues. Teachers' teaching manuals regarding to the natural sciences should represent some approaches that these should also be extracted from the different educational teaching systems because these will make the necessary coordination along with all cultural requirements and situations in Iranian educational system. One of the most sophisticated approaches regarding to the teaching-learning approaches and the representation of the lesson plan as well as the educational context is subjected to the sophisticated application of the modernized technologies regarding to the national lesson plan (national lesson plan, 2012). In our country's educational system, the lesson books are the main reference for the students' learning resource. Hence, it is necessary to design and represent some other related lesson plans in the framework of the different aspects in order to implement the most enriched lesson contexts in this pavement. When these references are not adapted with the lesson plan purposes, the implementation of the related process will be impossible. In other words, there should be required the most enriched context actively in order to reach to the natural sciences educational purposes [11]. [15] believes that the existence of the concentrated educational system along with a program and a one lesson book for all over the country, the unsuitability of the educational conditions such as the crowd of the classes and the lack of the experimental facilitations and testing methods with examination questions make some various problems for our educational system so that the lesson book will be allocated only the one resource for the teacher and student interaction regarding to the educational affairs; the preparation of the learning opportunities can be established only through the implementation of the general and minor educational purposes. Due to the importance and role of the book, the emergent attention towards the lesson contexts regarding to the thinking and nurturing the skill of the thinking should be potentially deepened among all students and the lesson book should be represented along with the problem-solving approach in this regard. Indeed, the lesson book through the teacher conduction towards teaching affairs can provide some opportunities for

KEY WORDS

national lesson plan,
contextual analysis,
natural sciences, second
primary grade, active
combinative approach

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practicing the problem-solving skills making a great background for all students to learn about the problem-solving issues [3]. Response to the requirement of a suitable educational pattern based on the Iranian educational system is mainly emphasized on the wisdom-based and deductive issues in the educational system and the extraction of the suitable scientific reasons along with the objective thinking should be also nurtured among the primary schools due to the growth of the learners' mentality in this age; due to the new modernized teaching-learning methods based on the recognition and consciousness and learning on the sensual and experimental aspects in the beginning days and then entering into the most accurate investigation discussions and the iteration of the experimentations and conclusion based on the deduction should be also potentially trained all the students; this is one of the most sophisticated issues that should be carefully paid attention in this study. The contextual analysis of the natural sciences lesson book of the second primary grade and its comparison with the learning and educational fields purposes in the Iranian educational system and the application of the modernized teaching methods in the contemporary world should be also allocated accurately in order to implement the suitability of the educational affairs in Iranian educational system. [10] in his study showed that the sciences teachers of the primary grade never pay attention to the mental change and growth of the children; the teaching method of the sciences teachers participated in teaching method courses does not have a significant difference with those ones not participated in this course. Also, the lack of teachers' consciousness from the new teaching methods and the lack of paying attention to nurture the creative mentality and the lack of enough suitability between the context and method are the other results of the related study. [2] in his study stated that more than 50% of teachers have suitable conscious and perception from the discussions and concepts of the natural sciences books using the teaching manuals regarding to the natural sciences but some other teachers have stated that they have got some problems for teaching the discussions and concepts of the natural sciences books in primary schools. Of 97 total teachers in natural sciences filed, about 77% had shown unsuitable conceptualization (very easy or very hard) and only 33% have considered the context of these books unsuitable. About 40% believed that the transformation of some contexts of the books has been taken place and about 50% have considered and evaluated the terms and words of the natural sciences books as hard. In the research of [2], it is specified that most teachers have considered the discussions and concepts of the natural sciences books as hard and they stated that the lack of contexts' adaptation and the purposes with the mental ability of students can cause to the lack of understanding the concepts and there is no paid attention towards the balance between the elements and skills, attitudes and knowledge. Also, the lack of some questions or other related homework will make students to confront with intriguing situations. [1] in his study titling "the investigation of the achieved programs adaptation in educational program of the primary grade" concluded that teachers are not still get familiar with the philosophical terms and concepts. The role and importance of the new teaching method in students' educational progression makes the necessity of applying these new methods in the natural sciences training issues; but due to the obtained results of some studies, the lack of using the active methods regarding to the sciences teaching manuals, the lack of suitability between the context and method, the lack of teachers' consciousness from new teaching methods and the application of the educational facilitations, discovery methods and participation in experimentations and the suggested methods should be potentially allocated in all educational plans. There have been established some other studies that these have also analyzed the lesson book. [13] in a study titling "the contextual analysis of the natural sciences books with William Roomy method" concluded that the pictures and diagrams of the natural sciences books in fifth primary grade do not challenge students sufficiently. [4] in a study titling "the comparative analysis of the lesson books and teacher's manual of the primary grade in Iran and the USA based on Bloom cognitive categorization, thinking actions dimension in Gilford intelligence structure and Merrill educational purposes categorization" concluded that although the lesson books purposes are 14% higher in Iran in compare to the USA but in the USA lesson books there have been established many various opportunities for making the practical-based issues for all learners and these have been also paid attention to nurture and grow the divergent thinking and other various situations. As an instance, the results of Teams in 2003 showed that the Iranian students in a collection of 286 functional test question are established in the superior level regarding to the memorization but they are also established in the lowest level regarding to these skills such as making theory, analyzing data, problem solving and applying the tool and scientific methods or research all about the environment and so forth. The investigation of the sciences training processes of the different countries shows that most countries such as the USA, the UK and Australia have carried out the most fundamental changes regarding to the educational policies; they also try to transform all paper-based natural sciences training into the active methods preventing the teacher-based educational affairs; they prefer to apply the function tests and measurements achieved based on Profile-Document case [7]. The lesson plan of the natural sciences is achieved very weak due to the lack of achieving the practical and experimental activities. Anyway, in the present the selection of the context from the produced mass knowledge is one of the most important challenges of the present era regarding to the countries' educational system. In the new lesson plan of countries, the attention towards the history of the science and its application for training the sciences concepts in the modernized lesson plans should be carefully achieved efficiently. Therefore, the main aim of the present study is to investigate how the lesson book of the natural sciences of the second primary grade based on William Roomy contextual analysis is written as the active method; how the pictures of the natural sciences lesson book can challenge students based on William Roomy method and how the manual and context of the related book has got suitability with educational aims in the national lesson plan.

MATERIALS AND METHODS

The related study is an applied type of study purposefully and it also is a descriptive type of study regarding to gather the related data. The descriptive method of the context analysis and the related questions are also applied in order to response to the national lesson plan document regarding to the educational field of the experimental sciences; then William Roomy method is also applied as a supplementary case in the rest of the study. In the descriptive method, the researcher tries to describe the conditions without any interventions. The statistical population of the study includes all documents, papers of the theoretical basics in the lesson plan, teachers' manual and the lesson book of the natural sciences of the second primary grade as well as all experts viewpoints in this regard. In this study, due to the dimensions of the study, the sample has been taken up from the statistical population as an available case and its volume includes all available resources that have been comprehensively applied and there is no taken up any choice in this pavement. Data gathering method is established based on the library type of data gathering including taking notes from the domestic and foreign resources as well as the experts' viewpoints regarding to the scientific field. The archive of the educational ministry and the lesson [8] books are also applied in order to collect the related information and data in this study; the documents and papers of the expert groups are also applied in order to analyze and investigate the national lesson plan. In this study, the main criterion of analyzing the related data is subjected to the wisdom and deduction; the descriptive statistic (grouping and categorizing the viewpoints and the common comments and distinctions) has been also applied in this study in order to analyze the context; the descriptive statistic includes the table, diagram, percent and the mean [9].

RESULTS

Investigation of the lesson book context of the second primary grade with William Roomy contextual analysis

In the context analysis, the context will be appeared as systematic and qualitative-based; this method can be considered as the main method of transforming the qualitative data into the quantitative data [6]. The statistical population includes the natural sciences book of the second primary grade during 2014-2015 educational years; this includes 92 pages but the introduction has been eliminated. Due to the restriction of the population volume, there is no required of sampling and all contexts of the book as the main population have been investigated in this study. As simple accidental sampling method, 10 pages for the text analysis, 10 pictures for pictures and 10 questions for analyzing the book questions have been allocated; for analyzing the text elements, the question and pictures of the book have been also evaluated. As a result, the analysis includes those processes that some of them have been subjected to the text, some other to questions and active pictures and others related to the text, questions and inactive pictures; and the main purpose of the method is that we should find out that how the mentioned processes can attract the learner towards the text, questions and pictures. For the reason, it should be get assisted of the analysis unit as the main regular basis of the results. In other words, the most important foundation of the text analysis is subjected to the analysis unit and this unit divides the context into some separate elements in one hand but on the other hand it is considered as the regular basis of the results analysis (the same). The data and information include the suitable descriptive methods as following: distribution, percent, measurement of challenging coefficient in every section of the book, questions and pictures and the relative coefficient measurement in every section and then the measurement of challenging coefficient of students with total text, total pictures and total questions.

Table 1: Challenging coefficient for total text regarding to natural sciences book of second primary grade

Category Page	A	B	C	D	E	F	G	H	Sum	Percent	Challenging coefficient
12	5	2	2	-	1	4	6	-	20	10/30	1/22
21	3	4	1	1	-	3	5	1	18	9/28	1
30	3	4	-	-	1	5	4	2	19	9/79	1/71
39	5	2	4	-	1	3	3	2	20	10/30	0/81
48	3	5	1	-	1	3	2	1	16	8/25	0/78
57	2	4	3	1	1	4	4	3	22	11/34	1/2
66	2	2	3	-	2	5	4	3	21	10/82	2
75	3	3	3	1	1	2	5	1	19	9/79	0/9
84	5	2	4	1	2	3	1	-	18	9/28	0/5
93	6	4	3	1	3	1	3	-	21	10/82	0/5
Sum	37	32	24	5	13	33	37	13	194	100	0/98
Percent	19.07	16.49	12.37	2.57	6.70	17.01	19.07	6.70	100	-	-

$$13+33+37+13 .37+32+24+5 = 96.98 = 98\%$$

This is the challenging coefficient of students regarding to the total text in natural sciences book of second primary grade

Because the challenging coefficient for text is 98% and this number is established between 0.4 and 1.5, for the reason, the text context of the book is represented as active forcing students to make their activity and homework.

Table 2: Challenging coefficient for picture of the natural sciences book in second primary school

Page	Category	A	B	Sum	Challenging coefficient in Text
12			*	1	∞
21			*	1	∞
30		*		1	0
39		*		1	0
48			*	1	∞
57			*	1	∞
66			*	1	∞
75		*		1	0
85				-	-
93		*		1	0
Sum		4	5	9	1.25
Percent		40	50	100	-

Challenging coefficient of student with picture is $5.4=1.25$

; based on this challenging coefficient with picture is obtained 1.25 that it has been also established between 0.4-1.5 domain according to William Roomy method. As a result, the book with challenging coefficient 1.25 is adjusted as an active case.

Table 3: Challenging coefficient of questions in natural sciences book of the second primary grade

Page	Category	A	B	C	D	Sum	Challenging coefficient
12						1	0
21			*	*		1	∞
30			*	*		1	∞
39			*			1	∞
48				*	*	1	∞
57						1	0
66				*	*	1	∞
75			*	*		1	∞
84						1	0
93			*	*		1	∞
Sum		0	5	6	2	10	2/33
Percent		0	50	60	20	100	-

The challenging coefficient of students with question is $2+5.0+3=7.3=2.33$

The obtained challenging coefficient is 2.33 and this is higher than 1.5 representing that the book questions are not adjusted as active case.

The sciences training purposes in manual and lesson book have been represented as a pyramid aiming at the implementation of the natural sciences learning and educational field in national lesson plan. One of the most important purposes of this field is subjected to optimize and boost the attitudes and scientific behavior of all learners. This behavior provides the most intelligent interaction in confronting with the various environmental phenomena [8]. This aim has been considered in all teaching manual purposes, too. The recovery of the teaching methods and the application of the scientific methods in educational programs can also optimize and increase the students' sensations awakening the spirit of the curiosity among all students potentially; also, these approaches can make the greatest background for forming creative thinking among all learners and finally this will also boost the scientific behavior of students making a sustainable self training and continuous education for these students. [5] says in this relation: the Iranian educational and lesson planning system in regardless with having longest history is mainly established based on traditional patterns and subject-based case emphasizing mainly on types of knowledge-based issues and transformation of scientific realities and facts towards the students. The irrelevance of the lesson plan context of the primary, guidance and high school grades with together, the lack of enough arrangement with the social conditions and features and the difficulty of understanding the concepts of these lessons for students are the main fundamental problems that have been entered into the lesson planning field.

DISCUSSION AND CONCLUSION

According to [Table 1], the results of the book text analysis showed that in the natural sciences book the challenging index of students with book text is 0.98. this number is established between 0.4-1.5 representing that the book text is represented as active. The challenging coefficient with book text is 0.98 as an active case according to William Roomy method. This is considered as little higher than moderate level and when this number is close to 1.5, the degree of the learners' challenging with text will be also increased. It is better to recover some suitable statements in order to increase the degree of students' challenging degree with book and related context because this will also increase the temperament of

curiosity among learners; it also is better to allocate some intriguing and creative motivational situations for students to raise the active methods in this regard.

The obtained results of the analysis regarding to the book pictures based on [Table 2] showed that the challenging coefficient of students with pictures is 1.25 that this degree is also established between 0.4 to 1.5 representing that the pictures of the book have been represented as active challenging the learner according to William Roomy theory; however, the obtained coefficient is going towards up and as a result the book pictures have been designed as active case in this regard.

The results of the present study regarding to the analysis of the book pictures based on William Roomy formula specified that due to the designing and allocation of some pictures into the book in processes b (5 cases of pictures invite students to achieve their tasks), these have suitable context regarding to the natural sciences book pictures. Since in the primary grade the picture language is better than written language, the learner can make a better connection with lesson book making him or her to read the text and concepts in this pavement; regarding to the representation of the book, it should be struggled to use the most attractive pictures because one of the best ways for attracting children towards the lesson issues is subjected to the usage of pictures.

The results of Sadaghat (1996) regarding to the analysis of the first, second and third natural sciences book according to William Roomy method do not have adaptation with the picture because of the inactiveness of these pictures. For making enough confidence of the results accuracy, it is necessary to carry out some other studies in future based on William Roomy technique. The obtained results of the analysis regarding to the questions in [Table 3], it is shown that the challenging coefficient of learner with questions is 2.33 that has been established based on William Roomy method higher than the determined degree (0.4-1.5). According to William Roomy, the questions of the book have been represented as inactive. These results are adaptive with the results of Sadaghat [12]. The results showed that the questions of the book have been represented as inactive due to the challenge of learner with the subjects and these subjects are beyond of the learners' understanding and this is one of the main reasons for students' reluctance for reading and studying their tasks. For the reason, all repetitive questions should be eliminated from the books in order to prevent the students' reluctance in this regard. Based on the carried out studies and the results of the study, it seems that the purposes being established for raising the students and learners' temperament and creative issues in national lesson plan have been little paid attention.

Hence, it can be concluded that the authors of the books regarding to the second primary school for the natural sciences book should pay attention to the inactiveness of the lesson books; this has been roughly proofed in [Table 3]; in this [Table 3], it also is little paid attention to the discovery and creative spirit of students. The analysis and results are different with other studies background; for instance, the results of [9] are not adaptive with the questions of the book. Based on the obtained results, it should be also mentioned that when designing the context of the lesson program, the learners should be also challenged with the context so that the former experiences have to make learners to get interested in these issues conducting them to make their analysis for the subjects. In this case, these learners will be also tended to nurture and grow their wisdom and thinking issues. In contrast, when all information and data are given to learners along with new knowledge, they will tend to memorize these new things efficiently and when an opportunity is not provided for them, the subjects will be established temporarily into the mind. In this mood, not only the learned issues of the learner are not assisted him but also the learner will not be able to distinguish the best situation because the new materials will not be allocated in future learning affairs as well and this comes true when the learner is getting evolved into the active learning process because he or she will be able to combine all learned issues together reaching to the semantic construction meaningfully. The existence of suggestions in studies regarding to design subjects for growing the skills, the existence of the questions and activities making students to tend to get allocated into intriguing situations and motivational creation, the existence of the questions with pictures or activities for finding a solution and applying the discovery phases, research and problem-solving, criticism thinking, divergent thinking and processing information represent that there is an emergent need for these kinds of subjects in the primary school.

Training sciences with active combinative learning-teaching approach

Designing and representing a model for navigating the active combinative teaching-learning approach coming from the obtained results of the present study can be implemented as an approach for training sciences going towards the increase of the national lesson plan issues. The main aim of the active combinative approach is subjected to the approach that the learner can participate and intervene into the process of learning-teaching. Hence, when the teaching process is designed and organized in a suitable way according to all learners' conditions, it can be stated that the active combinative teaching method has been applied in this pavement. Thus, it can be claimed that this approach is to apply the pros and cons of the different approaches together because this will recover the application of other methods. The active combinative teaching-learning approach has got its arrangement with the necessity of paying attention to training the learning path and the consciousness acquisition method. The active combinative approach is coming along with giving the necessary freedom to all students in order to achieve the related tasks (out of class activities). This approach has paid highly attention to the participative, cooperative, co-thinking and learning through cooperation. The thinking infrastructure of the active combinative approach is subjected

to the structuralism. Hence, it can be stated that the active combinative approach is roughly emphasized on the participation of students in the process of teaching-learning. In the structuralism theory, the scientific investigation of the mental events such as acquisition, processing, saving and recovery of information is carried out potentially. Hence, the main emphasize of the related theory is subjected to the learning cognition in the learner's mental structure that not only takes the former knowledge of the learner but also it takes some approaches that these may be applied for the recent influence of the learner. By applying the active combinative approach, it can recover many various activities and educational purposes. For instance, the application of the group research methods, discovery-based training, representation and simulation of the active combinative approach in relation to the educational issues are very efficient for the educational affairs; but this does not mean that these methods do not have any questions and responses. Therefore, achieving activities through students and the construction of some opportunities for learners can assist students to get fertilized for educational issues. Indeed, the active combinative learning appears when the experiences and knowledge of students will be emerged as new cases because they will be able to reach to the new learning opportunities efficiently. The lesson plan of the natural sciences should be designed so that all individuals have to reach to their responsibility and decision-making programs effectively. The biological understanding with participation actively in objective and tangible processes cannot be taken place possibly. These processes in natural sciences include making discussion, working with materials and equipments, deduction and analysis and production of the knowledge. Providing the necessary facilitations and basic conditions is very essential for reaching to the most enriched educational and constructive environment in this field. One of the most essential necessities of this environment is subjected to the representation of new teaching methods in order to raise the discovery and creative spirit among all learners.

RESEARCH SUGGESTIONS

The representation of the national document of the sciences education plan including the purposes, content, teaching methods and testing methods of the sciences education should be evolved into the national lesson plan regarding to the educational and learning purposes of the natural sciences. The comparative investigation of the lesson plan elements (purposes, content, teaching and testing methods) should be advanced in the sciences training affairs of progressive countries in order to optimize the technology section of the education in these related countries efficiently. According to the obtained results of [Table 3] and inactiveness of the questions in sixth primary school natural sciences book and the weakness of the cognitive elements and the experimentation design of learners in moderate level for reaching to the responses in relation to the book content, the authors of the book and lesson planners should be very careful in designing the questions and training the cognitive skills because the accurate design and planning will lead to grow the creation process in all contents and purposes of the educational affairs. By representing the history of the science and the scientific activity approach the practical pattern for the discovery of the students will be increased because these scientists are the main pattern of the students in educational activities efficiently. In the end, it is suggested all researchers to evaluate and investigate the content of other books in primary grade in order to reach and access to the national lesson plan purposes.

CONFLICT OF INTEREST

There is no conflict of interest.

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FINANCIAL DISCLOSURE

None

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ARTICLE

FIELD STUDY OF FLOW AND HEAT TRANSFER IN TUBE MICROPHONE

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ABSTRACT

In this study, the flow field and temperature inside the tube has been equipped with micro fin. To this end a tube with an internal diameter of 2.2 cm and a length of one meter aluminum is considered. Micro fin a micrometer diameter is 1,000 mm. It is assumed that the wall of the tube at a constant temperature of 100 ° C should be applied. Micro fin for different torsion angles and different input speeds of the working fluid (water) temperature changes quickly and Central line tube and Nusselt number is calculated. Comparing friction coefficient and Nusselt number shows that the use of micro fin in the pipe hub to drastically increase the average Nusselt number of the tube is simple. Also shown that adjustments in the range of twist angle of 30 degrees to 60 degrees in about 9% on average Nusselt number is impressive. As well as the results of numerical simulations with data provided by third parties compare been. This comparison indicates very good results in this study is consistent with previous research results.

INTRODUCTION

Heat exchangers are widely used in various industries, transportation, power generation, air conditioners, electronic equipment and spacecraft are used, so a lot can be said with regard to the use of heat exchangers to improve the coefficient of performance heat exchanger can be a significant savings in costs, materials and the space occupied. For this reason, the increase in heat transfer has been the subject of interest for researchers. In all these researchers to review and select the appropriate operating fluid, the right makeup, the choice of materials with good thermal transfer properties and design of various geometries for heat exchanger to increase its productivity were illuminated. To do this, there are two general methods- active and passive methods. The methods often require an external energy source is active. These methods are often faced with turbulent flow using the fan, turn the heat transfer surface, vibration and heat transfer surface with electrostatic fields are produced. Mechanical methods such as turning the heat transfer surface in applications such as cooking or drying etc. are used, but in general it can be said that active methods of increasing the heat transfer due to high initial costs, the need for an external power supply, high maintenance costs and less complexity in industry is not normally used. The use of passive methods has been considered as a very effective method. For this reason, experimental and numerical studies in this field have been done a lot in recent decades. Perhaps most importantly, the interest of researchers in this area can be applied simply being passive methods for heat transfer, he said. In other words, we can say that in this way requires no external power supply is to increase the heat transfer rate and this is important. In fact, increasing the amount of heat transfer in a converter converter to improve efficiency, reduce costs, reduce weight and volume becomes; therefore, it is possible to design heat exchangers enable small. High energy costs and environmental problems, researchers have tried to find ways to increase the rate of heat transfer and increase performance heat exchanger is thrown. It should be noted that is always on the side of the blades, the more heat resistance. For we know that the heat transfer coefficient air - and generally gases - much less than the coefficient of heat transfer fluids. Using blades is not only to increase the heat transfer surface but also turbulent flow as well. We know that the heat transfer coefficient in the turbulent flow over the heat transfer coefficient in laminar flow. Several plug-ins are used for this purpose. These plug-ins can be as turbulator larger or micro fin.

Literature

In 2003, Miyara and et al [1] laboratory studies conducted on micro fin Herringbone different geometries. They showed that by increasing the angle of micro fin increase heat transfer and pressure drop increases.

In 2007, Islam and Miyara [2] examined the flow behavior inside of the tubes micro fin and outlines mechanisms involved in this phenomenon occurred. They also stated that during the two-phase flow rate drops to increase the rate of heat transfer plays an important role. In other words Numerical methods for studying the inside micro fins achieved better results.

In 2004, Koyama and et al [3] studies on a pipe with a length of 6.02 mm and angle of 24 degrees 52 micro fin and did. They flux mass flow of 362 kg m sec and 39.9 times the input pressure and steam quality 0.1 to 0.95 were considered. They reported that the heat transfer coefficient of thermal flux, but the quality is not affiliated steam.

In 1988, Yoshida and et al [4] to review the working fluid flow in the pipe R22 with a length of 15.8 mm and 60 fin micro fin the angle of 308 and 5.9 times their working pressure. They are your experiments

KEY WORDS

Microfin, numerical simulation, flow field, temperature field

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aimed at providing a clear pattern to the inside of the tubes micro fin did. flow pipe into the groove in the longitudinal direction of flow, but by increasing the fluid mass flux at the top of the pipe to flow down. After mass flux of 200 kg per square meter seconds of angular mode varies the flow pattern of a wave mode.

In 1995, Fujii and et al [5] the pattern of fluid flow in the pipe micro fin of R-22 of 9.52 mm and the angle of 188 degrees with 60 micro fin began. They experiment inlet pressure of 4 times to 6.5 times have changed, as well as 110 to 220 Kg.m²/s were considered. They are Sinuous – angular patterns, angular, angular-mist species and behavior for the species reported in May. They ultimately your results with patterns that Scott [6] reported compared. Although the reported differences between the two models showed significant flow into the pipe micro fin.

In 2001, Yashar and et al [7] experimental studies on phase flow boiling and condensation inside the tube also being examined with simple and micro fin treaty. Several years later, in 2003, Newell et al. [9,8] also conducted a similar experiment. They succeeded in that position liquid film thickness on the flow pattern within the tube slots micro fin of the measure. in this case, more uniform distribution of fluid in the pipe micro fin is a simple tube.

In 2002, Pettersen [10] to investigate the flow of carbon dioxide in its saturation temperature of 20 ° C and for the mass flux of 100 to 580 kilograms per square meter flat micro-channel payment within seconds. They reported that in the conditions prevailing pattern of fluid flow and creep model for fluid flow pattern position but high mass and high vapor resolutions of May is observed as well. They reported that in their experiments, the wave pattern not seen in any case.

Governing equations

To analyze the flow behavior for all of flow, conservation of mass and momentum equations solved. For compressible flows or flows of heat transfer, energy conservation equations are solved. When turbulent flow should be used for modeling turbulence. The purpose of turbulent flow modeling to determine terms such as Reynolds stresses, turbulent mass flux or using turbulent heat flux linking these values to current values and average gradients especially in the middle.

continuity of conservation of mass equation is written as follows:

$$\frac{\partial \bar{\rho}}{\partial t} + \frac{\partial}{\partial x_i} (\bar{\rho} u_i) + \frac{\partial}{\partial x_i} (\rho' u_i') = 0 \tag{1}$$

Where ρ is the fluid density and u_i is velocity components. Momentum equation is written as follows:

$$\rho \frac{D\bar{V}}{Dt} + \rho \frac{\partial}{\partial x_i} (\bar{\rho} u_i' u_j') = \rho g - \nabla \bar{P} + \mu \nabla^2 \bar{V} \tag{2}$$

Inertia tensor perturbation momentum equation includes an additional term $\bar{\rho} u_i' u_j'$ that of any current turmoil is not negligible and the main reason is the complexity of turbulent flow analysis. In the above equation P is static presure and ρg is physical force of gravity. Formula (3-2) may be also wrote the following:

$$\rho \frac{D\bar{V}}{Dt} = \rho g - \nabla \bar{P} + \nabla \tau_{ij} \tag{3}$$

Relationship stress tensor defined as follows:

$$\tau_{ij} = \tau_{ij,Laminar} + \tau_{ij,Turbulent} = \left[\mu \left(\frac{\partial u_i}{\partial x_j} + \frac{\partial u_j}{\partial x_i} \right) \right] - \bar{\rho} u_i' u_j' \tag{4}$$

Mathematical terms, sentences inertia behave in such a way that the system disturbances, viscous tensions of Newtonian plus an additional stress tensor $\rho(u_i u_j)$ vortex which signified the effect of the turmoil on the average flow field.

Because chaos is a flow instability due to shear stresses (velocity gradients) is created, the stronger the shear stress, turbulent flow also will be more intense. Critical shear stress for turbulent flow, yet from a computational perspective is a bit complicated.

The energy equation is written as follows:

$$\rho C_P \frac{D\bar{T}}{Dt} = - \frac{\partial}{\partial x_i} \left[-k \frac{\partial \bar{T}}{\partial x_i} + \rho C_P \bar{u}_i' T' \right] + \frac{\mu}{2} \left[\frac{\partial u_i}{\partial x_i} + \frac{\partial u_i'}{\partial x_j} + \frac{\partial u_j}{\partial x_i} + \frac{\partial u_j'}{\partial x_i} \right]^2 \tag{5}$$

Term $\rho C_p \overline{u_i' T'}$ correlation between velocity and temperature fluctuations and entropy in order to represent transmission and turbulent heat flux is called Turbulent Heat Flux.
Equation (1), (3) and (5), commonly called RANS equations.
Dittus and Boelter [11] empirical equation below to calculate the number of heat transfer tubes microfin proposed:

$$Nu = 0.0034 Re^{1.1} Pr^{0.4} \quad 2300 < Re < 19500 \quad (6)$$

Also in 1976 Ganielinski empirical equation below to calculate the number of heat transfer inside pipes nusselt proposed [11]:

$$Nu = \frac{\left(\frac{f}{8}\right)(Re-1000)Pr}{1+12.7\left(\frac{f}{8}\right)^{\frac{1}{2}}(Pr^{\frac{2}{3}}-1)} \quad 3000 < Re < 5 \times 10^6, \quad 0.5 < Pr < 2000 \quad (7)$$

F the friction coefficient is high in relation to the Blasius equation for micro fin of the tube is calculated as follows [11]:

$$f = 0.316 Re^{-1/4} \quad (8)$$

The coefficient of friction on the inside of the tube micro fin can be modified relationship Blasius also be calculated as follows [11]:

$$f = 0907 Re^{-0.286} \quad (9)$$

Numerical Simulation

First micro fin pipe geometry in ANSYS software version 14.5 will be drawn Design Modeler environment. In this simulation study for three different groove angle of 30 °, 45 ° and 60 ° will be examined. The tube length equal to one meter internal diameter of 2.2 cm will consider it. It is assumed that the pipe is made of aluminum. You can view the geometry depicted in [Fig. 1] can be seen.

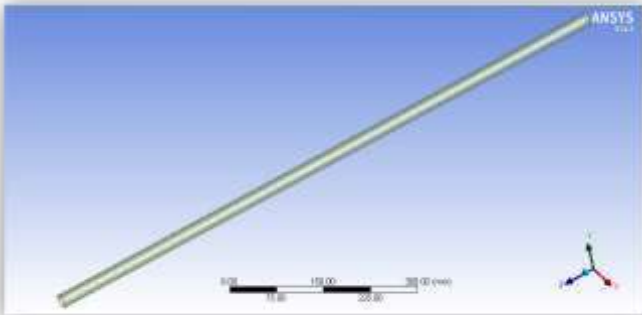


Fig. 1: Plotted geometry view in the Design modeler.

It is assumed that the working fluid is water and the walls are made of aluminum tubing and the well bore. It also assumes an incompressible fluid flow, and the flow of an incompressible fluid assumed to Pressure based method is used to solve the problem. The issue will be examined in steady state. The effect of gravity, is neglected. Thermo-physical properties of materials also are assumed to be constant with temperature change, not much has changed.

For the first simulation speed of 0.01 meters per second for our input. The entry into the fluid temperature ambient temperature of 300 degrees Kelvin considers. The pressure boundary condition for the output of output. It should be noted that the outlet pipe is discharged to the environment as a result of pressure gauges consider zero output. The last boundary condition that must be set boundary condition wall of the tube. Generally, two different modes can be considered for this boundary condition. The first condition of constant wall temperature condition and the second condition is a constant heat flux. The study examined the issue is fixed to the wall temperature. For constant wall temperature boundary condition, the wall temperature of 373 K to consider. Simple algorithm will be used for problem solving.

RESULTS

Micro fin inside the tube with a twisting angle of 60 degrees, changing the speed in the center of the pipe line can be seen in [Fig. 2] can be observed.

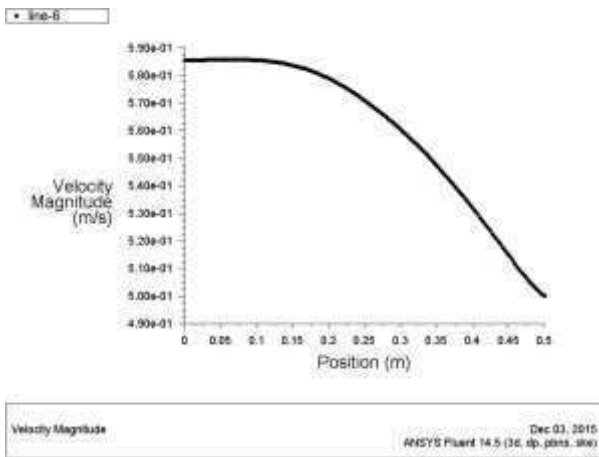


Fig. 3: Change the temperature in the center of the pipe line for micro fin tube with a twisting angle of 60 degrees and a speed of 0.5 meters per second input.

The numerical and experimental heat transfer rate and friction coefficient for different input speeds, in [Table 1] below.

Table 1: Comparison of experimental and numerical coefficient of friction and heat transfer obtained for different Reynolds numbers for microfin twisting angle 60

V(m/s)	Re	f(Calc)	f(CFD)	%diff	Nu(calc)	Nu(CFD)	%diff
0.1	2734	0.0943	0.117369	-24.463	28.57	33.62689	-17.7
0.2	5468	0.077373	0.089032	-15.069	64.97767	74.13303	-14.09
0.3	8202	0.068901	0.077891	-13.048	97.22466	112.907	-16.13
0.4	10936	0.063459	0.070958	-11.817	127.1792	147.6935	-16.1302
0.5	13670	0.059536	0.065248	-9.59459	155.5762	181.1325	-16.42687
0.6	16404	0.056511	0.060874	-7.72069	182.8069	212.7008	-16.35276
0.7	19138	0.054074	0.057933	-7.13758	209.1122	243.0705	-16.23925
0.8	21872	0.052047	0.055248	-6.14867	234.6548	273.207	-16.42931
0.9	24606	0.050323	0.053139	-5.59496	259.5513	303.1888	-16.8127
1	27340	0.04883	0.0512	-4.85437	283.8888	332.689	-17.1899
1.1	30074	0.047517	0.049612	-4.41	307.7353	349.4027	-13.54
1.2	32808	0.046349	0.048249	-4.1	331.1446	382.5383	-15.52
1.3	35542	0.0453	0.047044	-3.85	354.1607	402.1849	-13.56
1.4	38276	0.04435	0.045929	-3.56	376.82	438.0533	-16.25
1.5	41010	0.043483	0.044809	-3.05	399.1531	460.1437	-15.28

Table 2: Comparison of average Nusselt number and friction factor for Mykrvfynt with a twist angle of 30 ° and 60 °

V(m/s)	Re	f(CFD-30)	f(CFD-60)	Nu(CFD-30)	Nu(CFD-60)
0.1	2734	0.12709	0.117369	36.73421	33.62689
0.2	5468	0.096606	0.089032	81.24382	74.13303
0.3	8202	0.084143	0.077891	123.476	112.907
0.4	10936	0.076535	0.070958	161.5805	147.6935
0.5	13670	0.072652	0.065248	198.5089	181.1325

0.6	16404	0.064916	0.060874	232.9682	212.7008
0.7	19138	0.063732	0.057933	266.6545	243.0705
0.8	21872	0.057824	0.055248	299.4654	273.207
0.9	24606	0.05754	0.053139	332.3069	303.1888
1	27340	0.055841	0.0512	364.4208	332.689
1.1	30074	0.053521	0.049612	382.3286	349.4027
1.2	32808	0.052145	0.048249	419.2247	382.5383
1.3	35542	0.05194	0.047044	440.7452	402.1849
1.4	38276	0.049533	0.045929	479.2347	438.0533
1.5	41010	0.048621	0.044809	504.3321	460.1437

CONCLUSION

Micro fin tube of the Nusselt number and friction coefficient is more than a simple tube, as well as in all cases with increasing speed, and thus increasing the Reynolds number, heat transfer coefficient and the average Nusselt number increases if the coefficient of friction is reduced. Micro fin pipes of general change in the angle of torsion micro fin very noticeable effect on the average heat transfer coefficient of friction and is also generally much lower torsion angle (step greatly reduced micro fin) to slightly heat transfer and the coefficient of friction increases. The answer is especially for micro fin torsional angle of 30 degrees as well. In empirical relations for pipes microfin angle of torsion and micro fin step in relations can not be seen. Perhaps the reason for this is because of the influence negligible.

Below in [Fig. 4] heat transfer values obtained from numerical simulations with experimental data obtained in previous research and empirical correlations were compared.

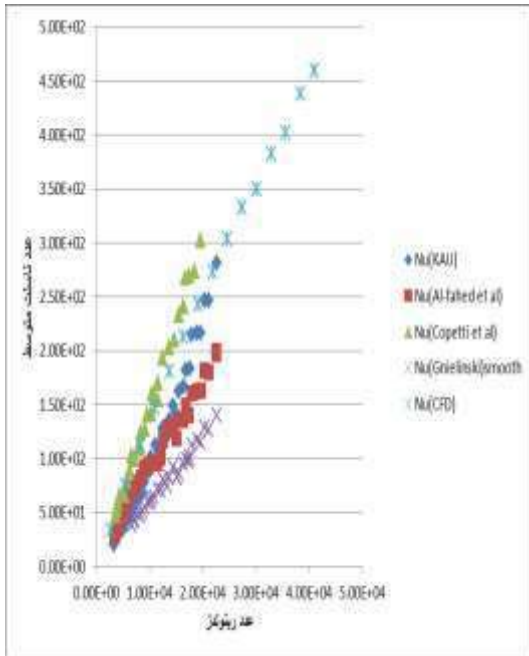


Fig. 4: A comparison of the Nusselt number of numerical simulations with experimental values.

As the [Fig. 4] shows the Nusselt number obtained from numerical simulations with experimental data in this study, earlier research has a very good match. Nusselt numbers in this study is calculated for Reynolds numbers about 45,000.

Also keep in [Fig. 5] friction coefficient values obtained from numerical simulations with experimental data obtained in previous research and empirical equations were compared.

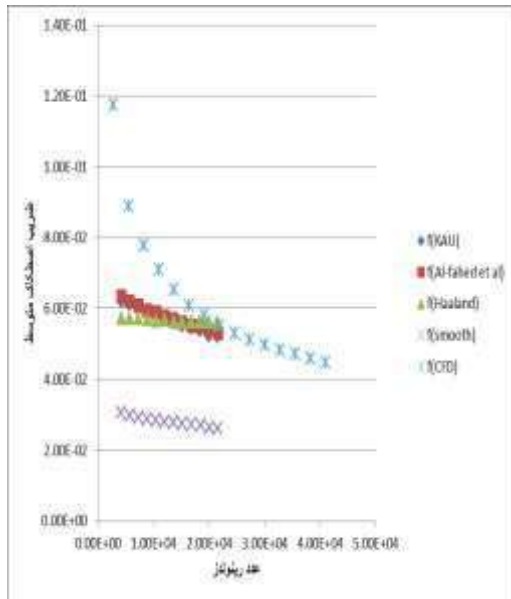


Fig. 5: Compare the coefficient of friction of numerical simulations with experimental values.

As shown in [Fig. 5] also has been shown, the friction coefficient of the numerical simulation is an excellent fit with the experimental data.

CONFLICT OF INTEREST
There is no conflict of interest.

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ARTICLE

INVESTIGATING THE EFFECT OF NANO-LIME COLD RECYCLED ASPHALT MIXTURE PROPERTIES IN PLACE WITH BITUMEN EMULSION

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ABSTRACT

Urgent need to produce asphalt from recycled materials is felt due to the limited resources needed of materials for the production of asphalt. On the other hand, the use of cold asphalt of bitumen emulsion in recent decades had been more considered due to high fuel price and reduces a number of environmental pollutants and limitation of energy resources. We should use inevitably additives in order to improve the quality; durability and strength of prepared mixture due to the use of recycled materials and bitumen emulsion in the preparation the cold asphalt mixtures. In Iran, so far in the preparation of emulsified asphalt, the additives are used that are used in micro dimensions and the usage of nanoparticles in asphalt mixture is less. According to a research laboratory and modified Marshall Design method, the usage possibility of nanoparticles and lime and its effect on the properties of asphalt emulsion have been studied in this study. Comparison of recycled asphalt samples that have nanoparticles lime properties has been shown that strength properties of recycled asphalt bitumen emulsion are without nanoparticles improves the samples lime in about 5%.

INTRODUCTION

One method of recycling, which today has more acceptance because of its advantages is cold recycling with the use of asphalt emulsion. In this way, due to the variety of materials, and procedures, as well as organizations and institutions according to previous experiences, Marshall Method is modified. In Iran, the most common design approach is Marshall Method that is used in recycled asphalt mixtures with bitumen emulsion. In this study, with the use of modified Marshall method has been tried to investigate the role of Nano material, lime and bitumen emulsion to improve the strength of recycled asphalt mixture Marshall and thus improve its performance against failure by Marshall Resistance meter(1).

MATERIALS AND METHODS

Modified Marshall Method

Modified Marshall Method is used for bitumen cold recycling project with bitumen emulsion in accordance with ASTM-D1559 or AASHTO T245 that is different with hot asphalt design method. The limited scope of this directive is limited to mixtures that bitumen emulsion or young making emulsions are consumed to prepare them with comply with the specifications of ASTM-D5505, materials of RAP (Reclaimed Asphalt Pavement) and, if necessary, new stone materials are consumed (2).

Building RAP (Reclaimed Asphalt Pavement) and, if necessary, new stone materials are used. In this way mixed design are done in a way that the total amount of moisture does not exceed to 3% (% Water emulsion, water content in the crushed asphalt and the percentage of water is added to the mixture) (3). The specimens are dense with 50 hammers Marshall. Compacted samples for 6 hours at 60 ° C and then are cured for 12 hours in the lab and then Marshall Resistance and psychological test's action is applied for determining the specific gravity. Optimization is calculated for maximum weight percent bitumen emulsion set and empty space percentages are calculated for different amounts of bitumen emulsion.

Design method proposed in this study

In this study, a modified Marshall Method is used that in asphalt pavement milling machine of gradation, moisture percent, bitumen percent and asphalt carved stone material properties were determined after sampling. Then, in accordance with the existing guidelines, asphalt samples weighing 1150 g was developed with bitumen emulsion of 2, 2.5, 3, 3.5 and 4 percent and Nano-lime of 1, 2 and 3% and then water, bitumen emulsion and additive (Nano-lime) added and mix together for about 3 minutes so that to be obtained a completely homogeneous mixture (4).

The four samples compacted by Marshall (Three samples to measure their mental strength and Marshall and a measure of weight in water samples) and a sample was created to measure the specific gravity of the sample. Samples prepared by application of 50 hammer Marshall and after curing for 6 hours at 60 ° C, for 24 hours are put it in ambient temperature, respectively (5). Then were removed from the Marshall molds and were tested at the same resistance and softness temperature. The crushed sample was weighted at first and then the sample was put in water about 5 minutes the sample weight was measured in water and also immediately achieved after drying the surface of the sample weight saturation. The actual weight of the sample is calculated by having this data. as well as the weight of the container filled

KEY WORDS

Cold recycling, asphalt emulsions, Nano-lime,

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with water without aggregates asphalt mixture of asphalt maximum theoretical density was calculated by weighing samples of uncrushed asphalt mixture and by getting uncrushed sample weight in the water (6).

RESULTS AND DISCUSSION

Technical specifications of cold recycled asphalt mixtures test results without additives
Five series of Marshall Samples with values of 2, 2.5, 3, 3.5 and 4% bitumen emulsion without any additive made from crushed asphalt that technical specifications have been shown as below [Table 1].

Table 1: Technical specifications for asphalt mixtures with bitumen emulsion 2%

Sample weight in the air (g)	1160	Uncrushed sample weight in the air (g)	1175
Sample weight in the water (g)	672	Weight of full of water dish (g)	2637
Saturated sample weight (g)	1202.5	Weight of the container filled with water and containing the sample (g)	3300
Real gravity (gr/cm ³)	2.12	The maximum sample density (gr / cm ³)	2.21
Marshall Resistance (kg)	730	Softness (mm)	2.6

Table 2: Technical specifications for asphalt mixtures with bitumen emulsion 2.5%

Sample weight in the air (g)	1168	Uncrushed sample weight in the air (g)	1185
Sample weight in the water (g)	675	Weight of full of water dish (g)	2637
Saturated sample weight (g)	1208	Weight of the container filled with water and containing the sample (g)	3320
Real gravity (gr/cm ³)	2.15	The maximum sample density (gr / cm ³)	2.23
Marshall Resistance (kg)	755	Softness (mm)	2.85

Table 3: Technical specifications for asphalt mixtures with bitumen emulsion 3%

Sample weight in the air (g)	1164	Uncrushed sample weight in the air (g)	1180
Sample weight in the water (g)	664	Weight of full of water dish (g)	2637
Saturated sample weight (g)	1198	Weight of the container filled with water and containing the sample (g)	3315
Real gravity (gr/cm ³)	2.19	The maximum sample density (gr / cm ³)	2.31
Marshall Resistance	785	Softness (mm)	3.3

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THE IIOAB JOURNAL

(kg)			
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Table 4: Technical specifications for asphalt mixtures with bitumen emulsion 3.5%

Sample weight in the air (g)	1177	Uncrushed sample weight in the air (g)	1175
Sample weight in the water (g)	672	Weight of full of water dish (g)	2637
Saturated sample weight (g)	1210	Weight of the container filled with water and containing the sample (g)	3300
Real gravity (gr/cm ³)	2.18	The maximum sample density (gr / cm ³)	2.28
Marshall Resistance (kg)	755	Softness (mm)	3

Table 5: Technical specifications for asphalt mixtures with bitumen emulsion 4%

Sample weight in the air (g)	1183	Uncrushed sample weight in the air (g)	1192
Sample weight in the water (g)	661	Weight of full of water dish (g)	2637
Saturated sample weight (g)	1205	Weight of the container filled with water and containing the sample (g)	3320
Real gravity (gr/cm ³)	2.17	The maximum sample density (gr / cm ³)	2.27
Marshall resistance (kg)	705	Softness (mm)	2.5

As well as Marshall Resistance changes, real specific gravity, the maximum theoretical specific gravity, softness and percentage of void space than the percentage of bitumen emulsion used have been shown in [Fig [1 to 5]. According to [Fig. 1] can be seen that, Marshall Resistance increases with the percentage of bitumen for asphalt mixtures, this increase was pitch of 3.2 and then Marshall Resistance reduces with decreasing the bitumen emulsion sample. Thus, according to this figure and [Fig. 2 to 5] percent of optimum bitumen emulsion, is 3.2% by weight of stone materials (7).

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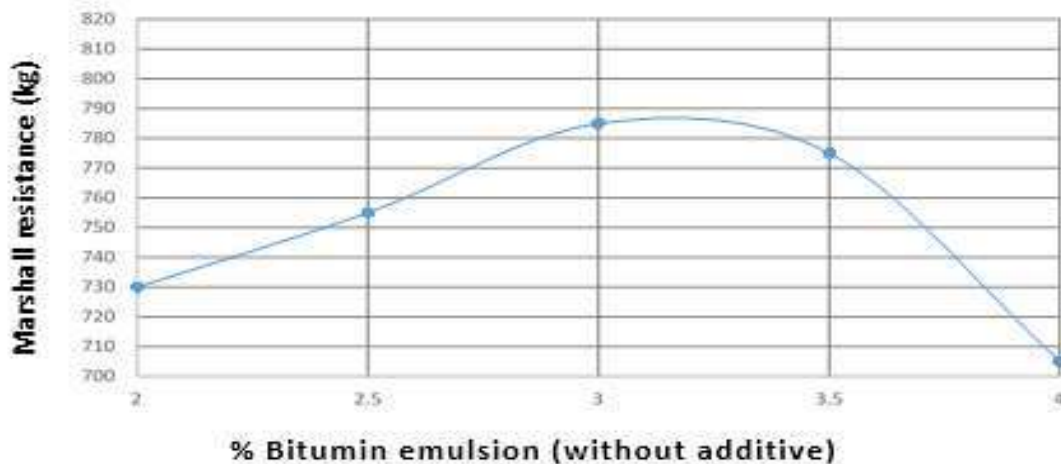


Fig. 1: Marshall Resistance changes - the percentage of bitumen emulsion (without additives).

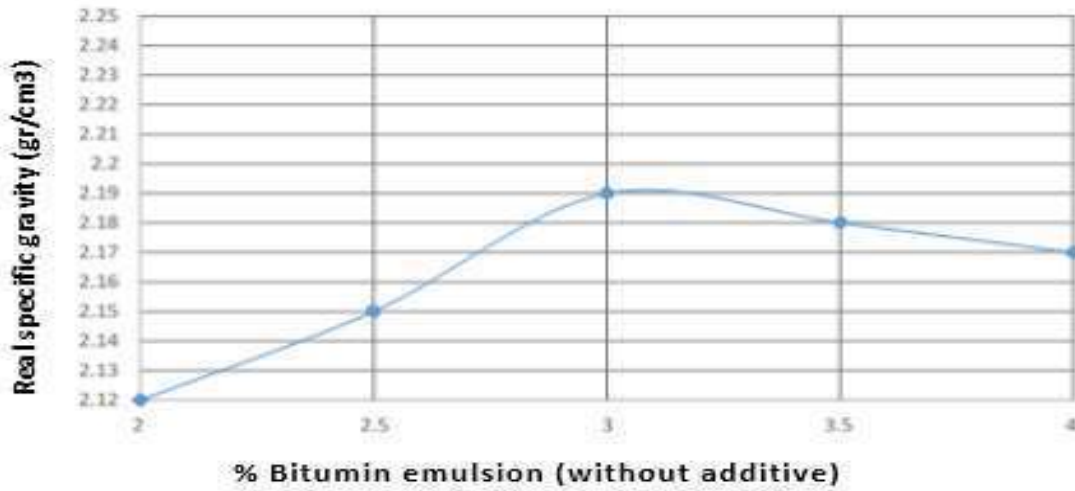


Fig.2: Real specific gravity changes - the percentage of bitumen emulsion (without additives).

According to [Fig. 2], that show the real specific gravity changes with the addition of different samples of the bitumen emulsion, production samples can be seen on real gravity that with the percentage of bitumen in the asphalt mix up the real gravity of samples and a denser and denser object is reached mixed performance improves (8). However, the results also showed that after adding 3% bitumen emulsion increase the real specific gravity was stopped cold asphalt mix and then decreased with increasing bitumen virtually real specific gravity.

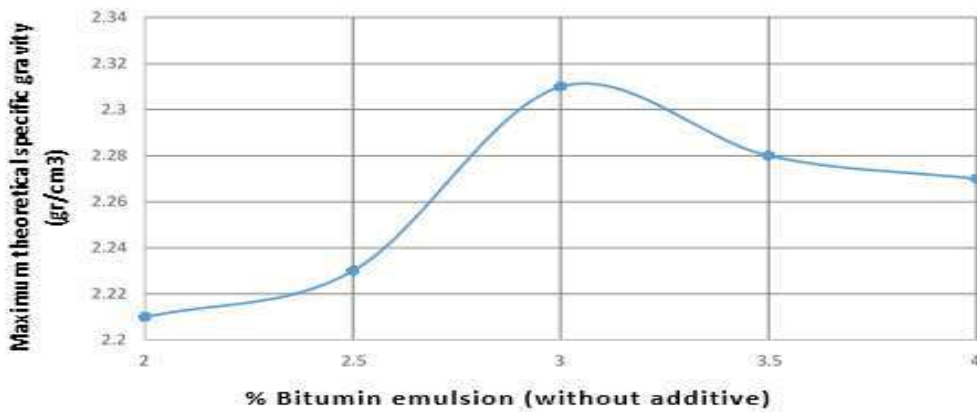


Fig.3: Maximum theoretical specific gravity changes - the percentage of bitumen emulsion (without additives).

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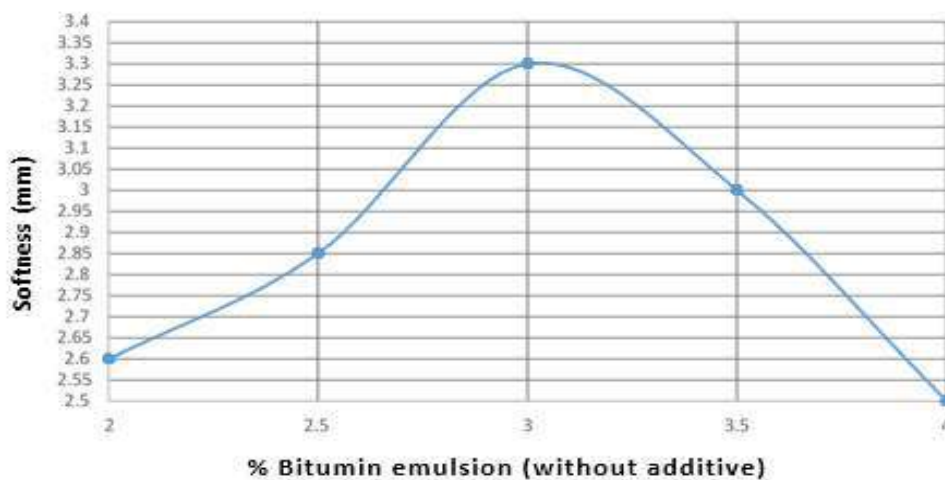


Fig. 4: The softness changes - the percentage of bitumen emulsion (without additives).

About the maximum theoretical specific gravity of the samples can be said with respect to [Fig. 3] by increasing the percentage of bitumen in the asphalt mixture, Asphalt maximum theoretical specific gravity increases. The reason for increasing specific gravity can search in fine-grained clumps with the coarse aggregate and more continuous granulation was blended (9). This is an increase of about 3.1% of bitumen emulsion stopped and then increase the amount of bitumen emulsion mixture has backfired and reduces the theoretical maximum specific gravity of the samples.

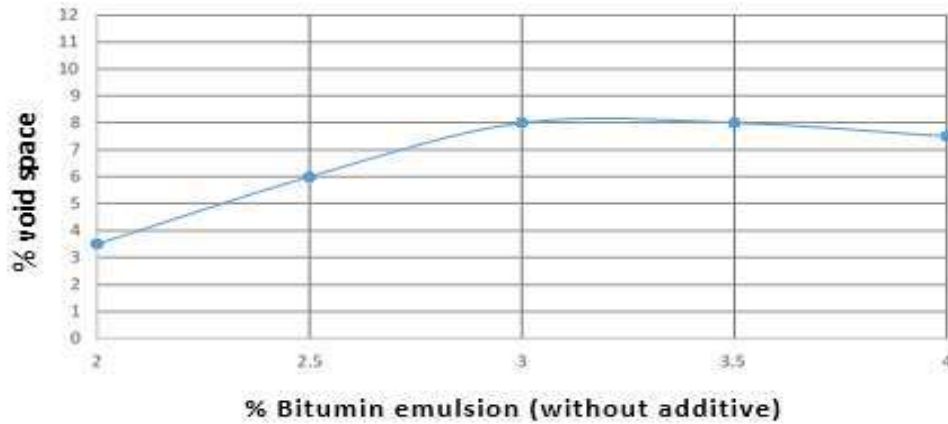


Fig. 5: void space changes - the percentage of bitumen emulsion (without additives)

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Test results of Technical Specification mix asphalt with Nano asphalt

After determining the optimal amount of emulsion and with regard to kind of additive (Nano asphalt) that has a positive surface charge the anionic emulsion breaker used and to determine the optimal amount of Nano-lime accordance with previous practice, three sets of samples with values 1, 2 and 3 percent by weight of materials, Nano added lime made and tested the results of which are as the following [Table 6]:

Table 6: Technical specifications for asphalt mixtures with bitumen emulsion and Nano-lime of 1%

Sample weight in the air (g)	1210	Uncrushed sample weight in the air (g)	1250
Sample weight in the water (g)	667	Weight of full of water dish (g)	2620
Saturated sample weight (g)	1215	Weight of the container filled with water and containing the sample (g)	3265
Real gravity (gr/cm ³)	2.17	The maximum sample density (gr / cm ³)	2.25
Marshall resistance (kg)	745	Softness (mm)	2.3

Table 7: Technical specifications for asphalt mixtures with bitumen emulsion and Nano-lime of 2%

Sample weight in the air (g)	1229	Uncrushed sample weight in the air (g)	1278
Sample weight in the water (g)	776	Weight of full of water dish (g)	2620
Saturated sample weight (g)	1265	Weight of the container filled with water and containing the sample (g)	3344
Real gravity (gr/cm ³)	2.26	The maximum sample density (gr / cm ³)	2.38
Marshall resistance (kg)	826	Softness (mm)	3.4

Table 8: Technical specifications for asphalt mixtures with bitumen emulsion and Nano-lime of 3%

Sample weight in the air (g)	1208	Uncrushed sample weight in the air (g)	1255
Sample weight in the water (g)	684	Weight of full of water dish (g)	2620
Saturated sample weight (g)	1258	Weight of the container filled with water and containing the sample (g)	3226
Real gravity (gr/cm ³)	2.5	The maximum sample density (gr / cm ³)	2.36
Marshall resistance (kg)	810	Softness (mm)	2.1

According to [Fig. 6] can be seen that adding Nano lime increases resistance to cold asphalt mixture Marshall samples compared to if the samples were used without additives (Nano-lime) . Nano additives also increase the percentage of lime in asphalt mixture to about 2.2 percent by weight of asphalt mixtures, Marshall also increases the resistance of samples then the amount of Nano-lime Marshall resistance is reduced (10). Thus, according to this figure and [Fig. 7 to 10] percentage of improved Nano lime to add to the mix is 2.2% by weight of the asphalt mixture.

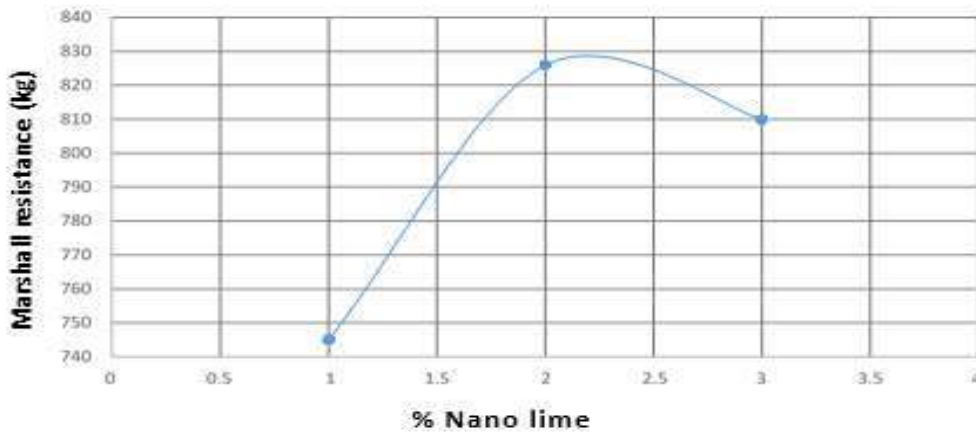


Fig.6: Marshall Resistance changes - the percentage of Nano Lime

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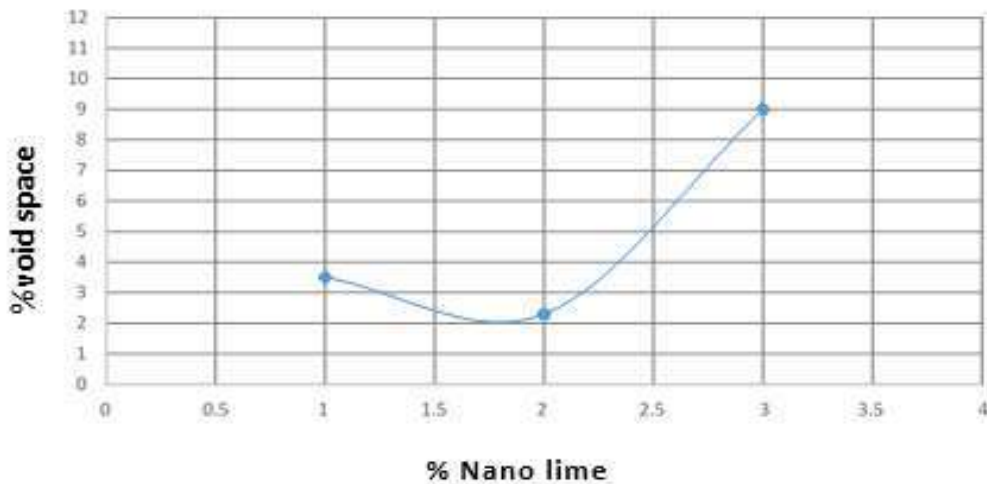


Fig.7: Void space changes - the percentage of Nano Lime.

According to [Fig. 7], percentage of void space of the samples decrease compared to no additives with adding Nano lime to cold asphalt mix, and offers denser and more compact body that can be greater due to the use of filler content (additives) that fill porous limestone aggregates used by the Nano-filled Bath and gives more and more impenetrable seal body (11). This reduction of the amount of void space up to about 1.8 percent of Nano-lime and then the decreasing trend has been reversed the void space and void space asphalt mixture increases by increase the amount of Nano-lime to 3%.

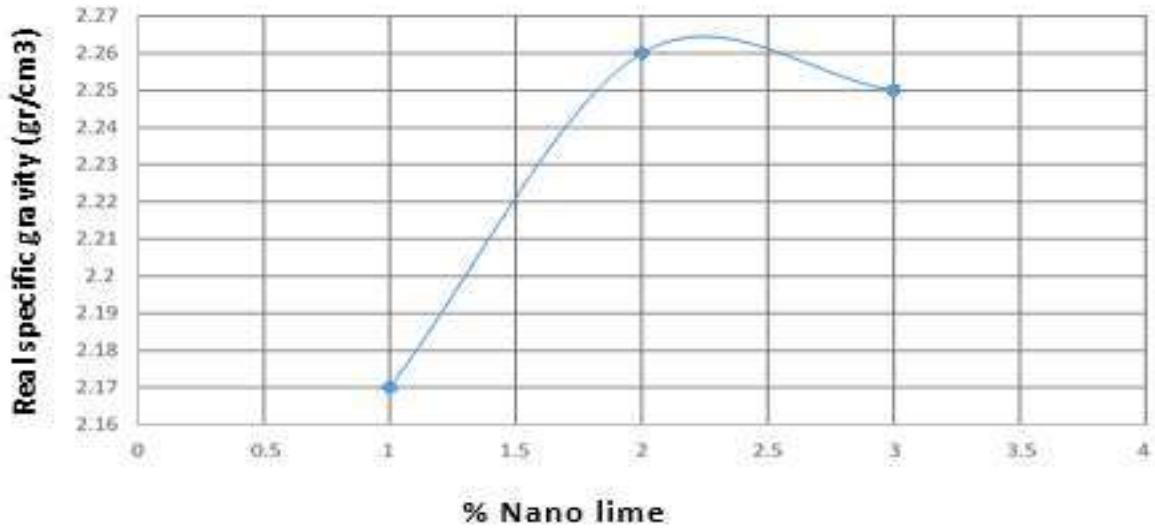


Fig. 8. Real specific gravity - Nano-lime percent.

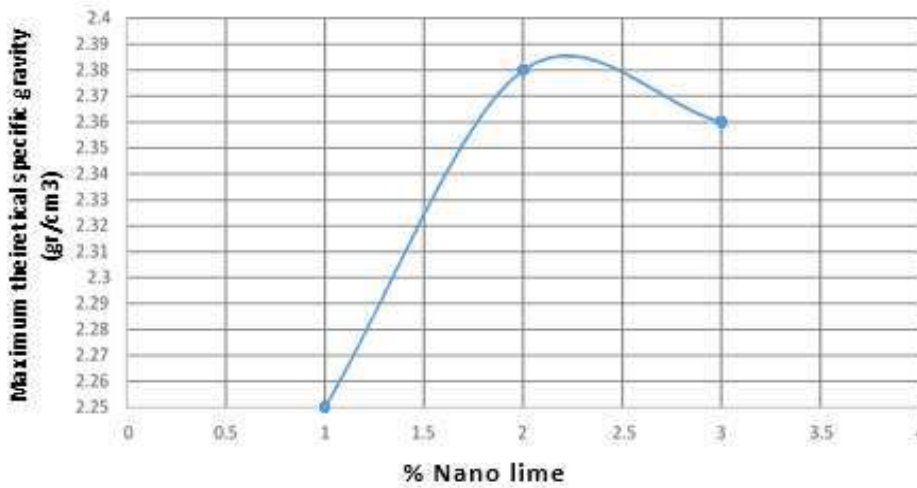


Fig. 9: Maximum theoretical specific gravity changes - Nano Lime.

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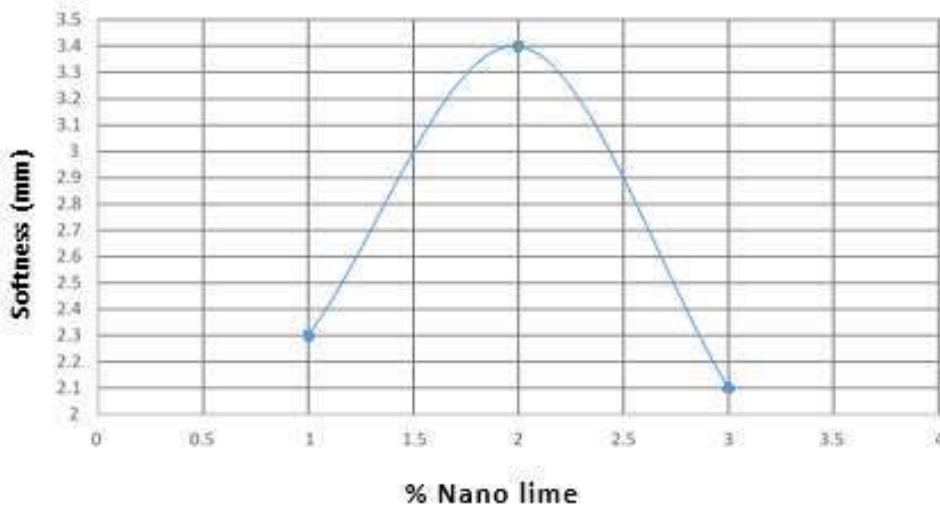


Fig.10: Softness changes - Nano Lime.

COMPARISON OF SAMPLE RESULTS

A comparison of the various parameters asphalt additives and without Nano asphalt is as below.

Table 9: Effect of Adding Nano lime on asphalt parameters

Type of parameter	Marshal stability	Real gravity	Voids	Softness	The maximum specific gravity theory
Without additives	785	2.19	8	3.3	2.31
With Nano-lime	826	2.26	3.5	3.4	2.38

CONCLUSION

1. Adding lime cause to increase the resistance of Nano Marshall Asphalt samples compare to lacking Nano lime sample. Based on experiments carried out in optimized weight of Nano-lime is 2.2% by weight of a mixture of asphalt. The optimum weight of the percent of increasing resistance with Nano Marshall Samples in compared with samples without lime is about 5 percent.
2. According to the results recycled cold asphalt mix design with extraction bitumen emulsion and in accordance with available instructions, asphalt samples were tested with different percentages of additives to obtain the optimal amounts and percentages for each additive, including water, bitumen emulsion and nono-lime. Since the type of produced asphalt is of cold kind and with bitumen emulsion, so this type of pavement has the initial resistance and low Marshall Resistance. So it is necessary to use additives to be able determine produced asphalt Marshall Resistance. Therefore, the use of additives that can be effective in improving the cold asphalt resistance is inevitably that Nano-lime has been used in this study.
3. As the test results show voids of the sample reduce by adding Nano lime to the cold asphalt mix and offers denser body. Thus it can be said that the use of Nano-lime offers more non-influential and a better seal body. Furnish led to the non-permeable seal of the top layer of pavement eventually that this causes the water to penetrate the pavement and the road is one of the causes of damage become less. So with limited infiltration of water from the body surface of the pavement and by considering the proper drainage arrangements in the lower layers of pavement can use the obtained feature by additives win maximum. On the other hand, due to the use of more filler content (Additives) used aggregate pores are filled with the finer material that this is resulted by increasing efficiency and strengthening of the mixture and skeleton of the mix. Finally, the effect of these cases appears with the increases the resistance Marshall and increases the fatigue swing in cold asphalt mix by considering the positive impact of all factors mentioned above.
4. Since the publication specialized in recycled asphalt doesn't mention any restrictions by mental recycled asphalt, therefore, this parameter is not very important for this type of pavement. But, it was observed for

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smooth asphalt layers Binder and Topeka according to instructions such as Asphalt Institute that the samples made with soft Nano-lime in the acceptable range. Binder and Topeka are for both classes. As mentioned regulations softness have been mentioned at the acceptable range for Binder cortex and cortex Topeka between 2 and 3.5, after more carefully at the results achieved by the softness of (mental) samples can be said that this type of pavement are run as potential in both the cortex Binder and Topeka.

5. It can be stated about the maximum specific theory weight of samples that asphalt maximum specific theory weight of asphalt increases with increasing the percentage of bitumen emulsion in cold asphalt mixture. The reason for this weight increasing can be more searched in locking and clamps of fine-grained with large stone materials and become joined the mixed granulation.
6. The real gravity is 3.3% with regard to testing asphalt content optimization of Marshall by weight of asphalt is mixed due to the cold recycling operation that maintenance limit of RAP is less in the diversity of materials used and with no repetition of tests, it is extended to the whole piece. In this case, laboratory maintenance costs and given the relatively low cost of testing methods modified Marshall are also reduced.

CONFLICT OF INTEREST

There is no conflict of interest.

ACKNOWLEDGEMENTS

None

FINANCIAL DISCLOSURE

None

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ARTICLE

DIVERSIFICATION POSSIBILITY OF MASHHAD TOURISM

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ABSTRACT

Considering increasing growth of urbanization in Iran and physical exponential expansion of cities and deterioration of environmental, social and psychological problems, making a plan for leisure time and developing recreational – tourism spaces of urban and suburban areas become one of the social requirements. Because of Imam Reza Holy shrine, Mashhad hosting different groups of internal and external tourists during the year but up to now, no comprehensive and applicable plan had been proposed for effective presence of tourists and increasing their shelf-life in Mashhad. By improving tourism spaces and diversifying travel packages, job creation become possible in this city and its result will be economical boom. In this regards, present paper investigates tourism diversification of Mashhad and its different aspects as a supplementary package of pilgrimage considering social and economical presence of tourists. For this purpose, questionnaires were filled by 401 samples of foreign and internal tourists during 2 years (2012-2014). current condition were analyzed in a separate Fig. and mean and percentage of centrality indices were achieved by SPSS. Result of shelf-life average in Mashhad is 6 days and travel motivations are pilgrimage, recreation, visiting tourism attractions and average spending per each pilgrim is 15 dollars.

INTRODUCTION

Social-cultural impacts of tourism mention this issue that tourism and traveling affect people and society system of values, social structures, style quality of host community and tourists life. Although main focus of studies in this field is on tourism destinations and less attention had been paid toward tourist dispatcher areas and tourists themselves [14]. Tourism activity in cities has broad extension. Urban areas often including broad span of historical and cultural attractions, shopping centers and restaurants (Varethi et al,2008, p91). Economical outcomes of tourism causes most tourism countries to consider it as a potential resource of foreign financial sources and knowing it as a way for compensating deficit of payment balance. But despite of international tourism importance, role of internal tourism should not be neglected. In this regard, investigating importance of internal tourism is important in various aspects. Although "tourism extreme poles" causes high density of tourism in some areas and neglecting others in extend field of tourism. However, distribution of internal tourism and its space pattern Finding in Iran show traveling and movement of many people in different areas of country (Maafi and Saghayi, 2010, p269). Providing suiFig. services for tourists and also diversification of these services is the main practice. Tourism arena in cities and metropolises including tourism product which entails set of tourism attractions, transportation availability, equipment and infrastructure facilities, hospitality services and organizational and institutional elements(Maafi & Saghayi,2008,p25). Tourism word was proposed firstly in 1811 in English journal of "sporting magazine". At that time, this word means traveling in order to visiting historical monuments and natural landscapes for pleasure (Salimisoodrajani et al,1390, p180). Today, tourism become one of the trade pillars and many countries in the world become one of the global poles by utilizing natural phenomena, historical monuments, ancient civilization, new technology, tourism towns and recreational equipment (Bakhtiari2015, p94). Although Boreman (1931) defines tourism as "travels which are done for recreation, relaxation, trade or other job activities or participation in special ceremony while tourist absenteeism in his/her permanent residual location during this travel being temporary(Poor-asghar & Veisi,2011, p191).

MATERIALS AND METHODS

By goal, this research is applicable and in terms of time, it is cross-sectional and by nature and method, it is descriptive-survey. Research variables were recognized by librarian research and literature study. Data were collected and analyzed by questionnaire of cultural heritage, artifacts and tourism organization and by SPSS software. As statistical society of research, tourists were selected in three levels of foreign, internal and provincial which was done during 2012-2014. Sample size were 400. Centrality indices were achieved by analyzing status quo, mean and percentage of centrality indices. Research variables indicated in questionnaire were: gender, age, marital status, education, job status (type and salary), experience of previous travel and so on.

RESULTS

Regardless of pilgrimage aspect, Mashhad has been developed in another aspects such as trade, scientific spaces, cultural and industrial affaires and now, it is mentioned as one of the cultural, commercial and industrial poles of country (Koosheshtabar, 1387, p21). In logistic plan of tourism of Khorasan-e-Razaviprovince (2011) distribution condition of infrastructures and equipment were investigated. According to that, 114 hotels exist in Khorasan-e-Razavi, 104 of them (91.4%) located in

KEY WORDS

tourist shelf-life,
economical boom,
diversification, Holy
Mashhad

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Mashhad. Distribution of existed beds in hotels show that more than of 95% are located in Mashhad. There are 235 apartment hotels in Khorasan-e-Razavi which are all located in Mashhad. Based on these statistics, there are 503 hospitality units from which, 479 units (95%) located in Mashhad. Also, there are 86 units in Mashhad which accept pilgrims and have 999 rooms and all of them owned by governmental organizations which are distributed in Mashhad (Forooghzade and Razavizade, 2014, p136). Due to the outputs of 400 questionnaires distributed among tourists during different seasons and events, following results are achieved. Researchers focus was making diversification in interview with expand range of tourists (strictly people who were not come from Mashhad and Khorasan-e-Razavi) for more accurate utilization of research results and completing research process in future.

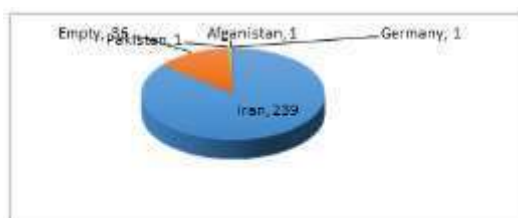
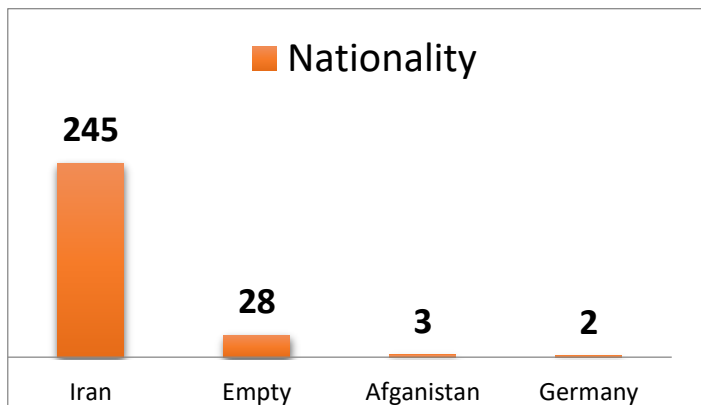


Fig. 1: Tourists nationality.

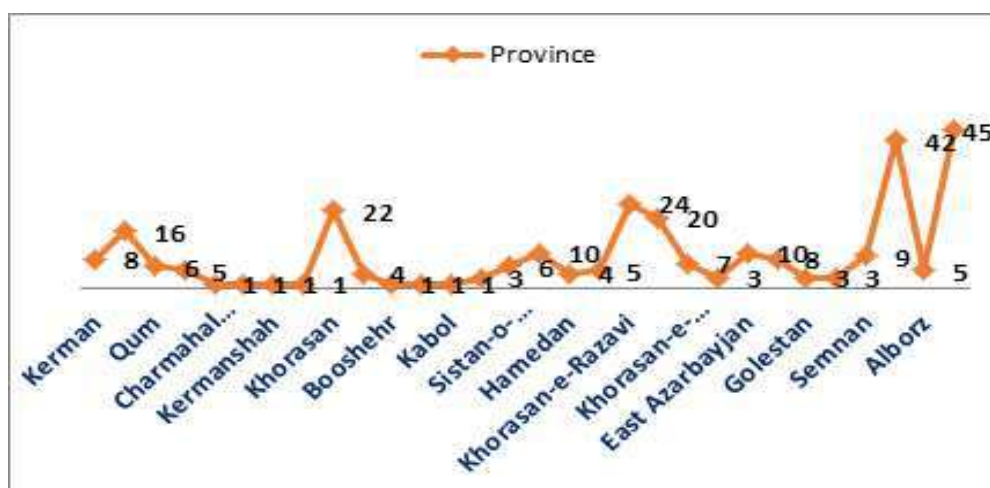


Fig. 2: Provincial distribution of Iran.

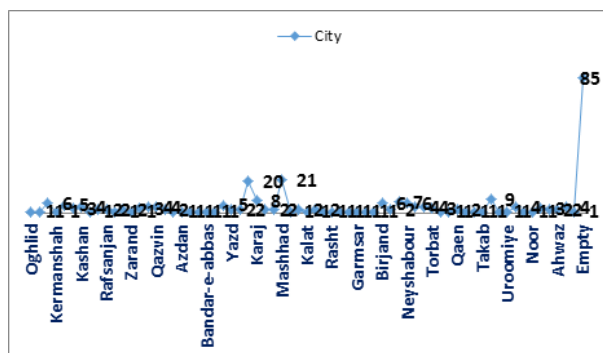


Fig. 3: County distribution of Iran.



Fig. 4: Tourists' religions.

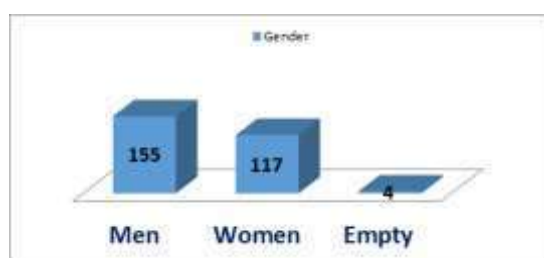


Fig. 5: Tourists' gender.



Fig. 6: Marital status of tourists.

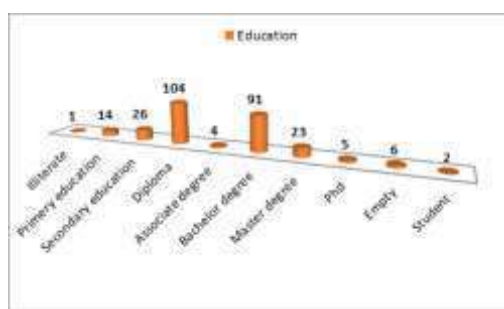


Fig. 7: Tourists' education.

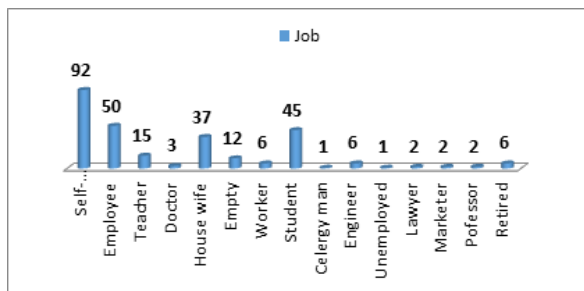


Fig. 8: Job status.

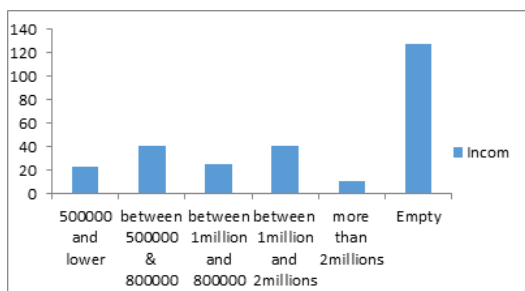


Fig. 9: Tourists' income.

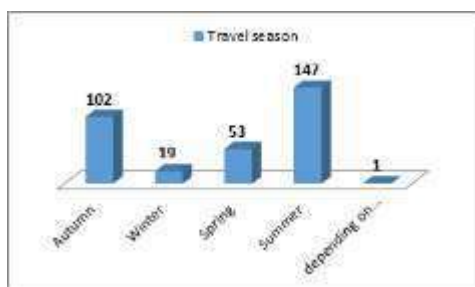


Fig. 10: Travel seasons of tourists.

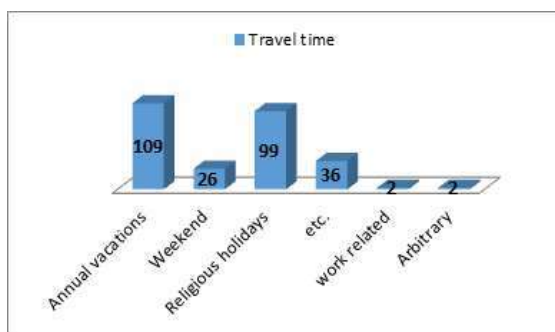


Fig. 11: Travel time of tourists.

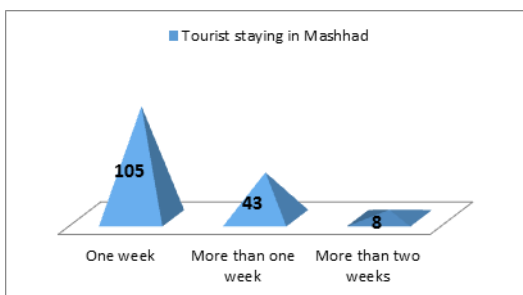


Fig. 12: Tourists staying time in Mashhad.

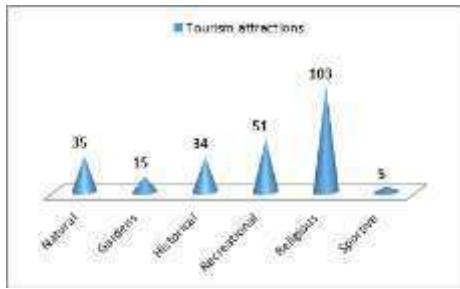


Fig. 13: Diversity of tourists' attractions.

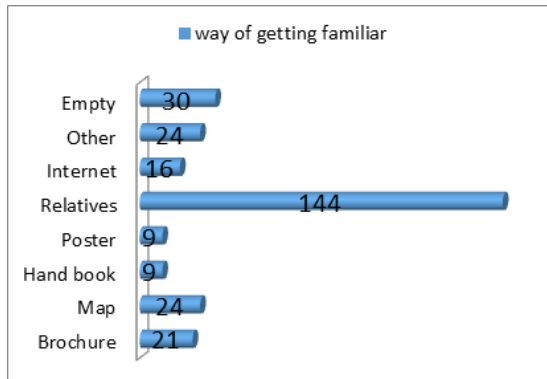


Fig. 14: Way of getting familiar with tourism attractions.



Fig. 15: Diversity of tourists purchases.

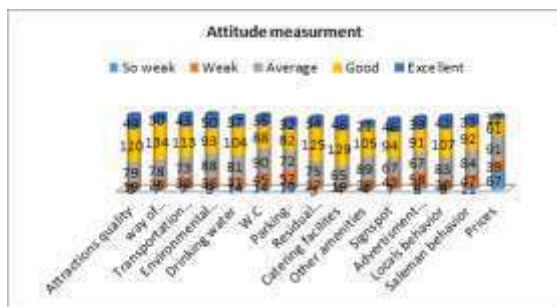


Fig. 16: Determining attitude of tourists.

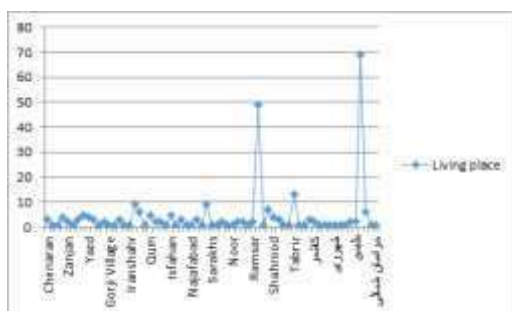


Fig. 17: Tourists' living places.

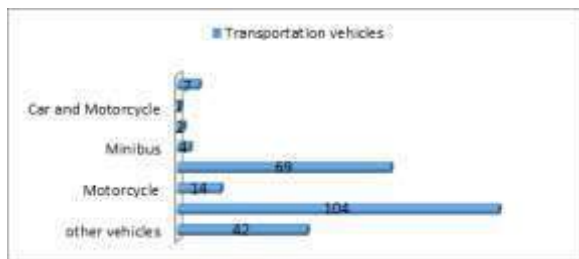


Fig. 18: Tourists' transportation vehicles.

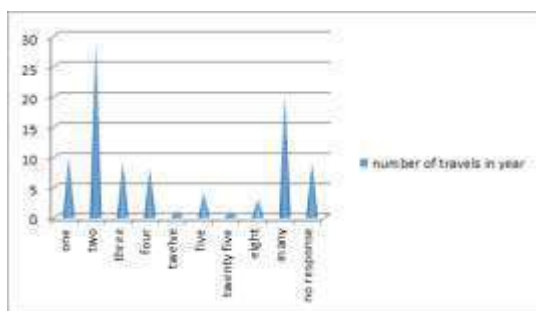


Fig. 19: Number of tourists travel.

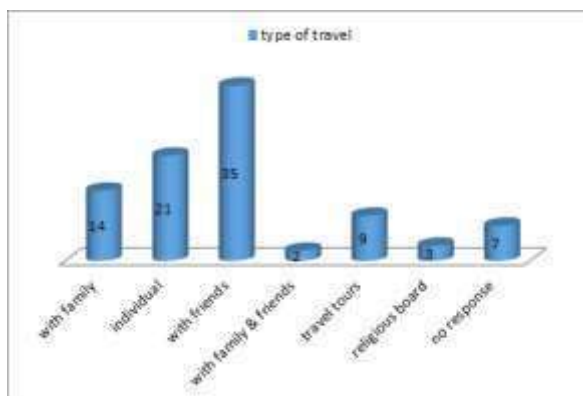


Fig. 20: Type of travel.



Fig. 21: Travel motivation.

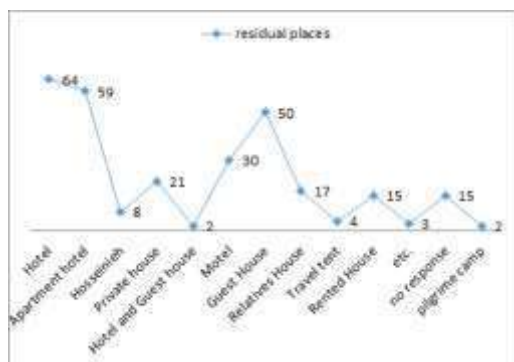


Fig. 22: Tourists' residual places.

DISCUSSION

Descriptive findings

1. About type of travel, most of respondents (76.8%) travel to Mashhad with their family and least of them (4%) travel with religious boards.
2. Much of impetus for traveling was pilgrimage with 79.8% and least of impetus was business goals with 3.8%.
3. Most of respondents (54%) choose summer for travel and least of them (12.2%) choose winter.
4. Among tourism attractions, most of tourists (67.8%) choose religious attractions and least of them (3.2%) sportive ones.
5. Due to the how getting familiar with tourism attractions, most of them (51.2%) got familiar through their relatives and least of them (3.5%) through handbooks.

CONCLUSION

Because 70% of pilgrims and tourists time dedicated to the pilgrimage of Imam Reza Holy shrine, unfortunately for the rest of time, these kind of people who travel with their family do not have special plan. It is clear if complete package being designed, planned and performed for them, they will have memorable and enjoyable travel. Also, by accurate planning, coordination and cooperation of related organizations, in addition to more synergy of resources and lower costs, tourism diversification of Mashhad become possible and will be performed. For purposiveness, concentration and diversity of tourists travel, paying attention to the ecotourism by utilizing current infrastructures in Mashhad and its urban supplementary complex in parks, waterfalls, water parks and other natural areas are proposed for useful filling of tourists leisure times gaps.

Recommendations

- Distribution and management of pilgrims during the year and peak times.
- Improving pilgrims safety for more satisfaction of them and providing their mental relaxation.
- Decreasing hotels and other residual centers costs (except hot seasons) for more attraction of pilgrims and tourists.
- Organizing non-official centers and places without license.
- Behavioural standardization of hosts (people who provide services for tourists).
- Improving information level of related organizations about foreign languages for increasing communications with foreign tourists.

CONFLICT OF INTEREST

There is no conflict of interest.

ACKNOWLEDGEMENTS

None

FINANCIAL DISCLOSURE

None

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STUDY THE EFFECTS OF ANTI-INFLAMMATORY CURCUMEX CAPSULES CONTAINING THREE PLANTS (GINGER, CURCUMIN AND BLACK PEPPER) IN PATIENTS WITH ACTIVE RHEUMATOID ARTHRITIS

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ABSTRACT

Background: RA is an autoimmune disease that presented with chronic inflammation due to synovial hyperplasia, this disease progress through joint destruction. DMARDs is the most usual drug for treating this disease that accompanies with various adverse effects and complications. Aim of this study is to evaluate anti-inflammatory effect of a compound herbaceous drug consist of (ginger, Curcumin and black pepper) in rheumatoid patients so that decreasing dosage of DMARDs. **Method:** 60 patients with Rheumatoid Arthritis upon ACR2010 criteria, enrolled study and divided to two groups consist of 30 patients. Both group received routine treatment of anti-rheumatoid agent consist of Methotrexate as DMARD, prednisolon and Hydroxychloroquine (HCQ), one group received compound herbal drug named Curcumex consist of (ginger, Curcumin and black pepper) and control group received placebo as a same dose. Before and after 8 weeks DAS 28 score, TJC, SJC, ESR and CRP was calculated and compared in two groups. **Results:** Curcumex reduces TJC AND SJC significantly rather than placebo in patients with rheumatoid arthritis. Also DAS Score 28 decreased in Curcumex group rather than placebo (p -value <0.001). Laboratory markers such as ESR decreased in patients group, but there were no differences between two groups in CRP scales. (Value=0.322)

INTRODUCTION

Rheumatoid arthritis (RA) is the most common systemic autoimmune disease and is a chronic illness related to joint inflammation, progressive disability and complications in patients which have adverse impacts on their quality of life [1]. Rheumatoid arthritis affecting approximately 1% of the population. Women are three times more likely to be affected than men, with 80% of patients developing the disease between the ages of 35 and 50 [2]. RA is a systemic disease; therefore, many patients exhibit extra-articular manifestations [3,4]. Despite exhaustive research, the precise cause of RA remains unknown. Although a variety of cells play a role in RA disease, macrophages may be of particular significance in the disease process. Proinflammatory cytokines secreted by macrophages, such as tumor necrosis factor- α (TNF- α), interleukin 1 (IL-1), and interleukin 6 (IL-6), are believed to have a critically important role in the induction and propagation of chronic inflammation [4]. Rheumatoid arthritis (RA) causes premature death, disability, and lowers the quality of life in the industrialized and developing world [5]. The contemporary recommended approach to treating RA is very aggressive [6]. Non-biologic disease-modifying antirheumatic drugs (DMARDs), which reduce disease activity and prevent joint deformity, are prescribed within three months of diagnosis. Previously most people started with corticosteroids/non-steroidal anti-inflammatory drugs (NSAIDs), then fewer people slowly progressed to non-biologic DMARDs and even fewer people received biologic DMARDs if they did not respond to the previous drugs. Treatment guidelines have also changed with the increased biologic DMARDs available. In 2012, the American College of Rheumatology updated RA medical management guidelines [7]. These guidelines describe which biologic DMARDs to use for specific RA disease profiles (e.g., features such as disease activity, signs and symptoms, and prognosis) [7]. Recently, the beneficial anti-inflammatory properties of statins have been investigated among humans in diseases with high levels of inflammation such as RA, sepsis, organ transplantation and multiple sclerosis. The current clinical trial has been done to determine the anti-inflammatory impact of statin in rheumatoid arthritis because the clinical trials in this matter are not sufficient.

Nowadays, Due to the antioxidant properties And High anti-inflammatory, Extracts and derivative of plants is widely used [1]. DMARDs is the most usual drug for treating this disease that accompanies with various adverse effects and complications. Aim of this study is to evaluate anti-inflammatory effect of a compound herbaceous drug consist of (ginger, Curcumin and black pepper) in rheumatoid patients so that decreasing dosage of DMARDs.

KEY WORDS
ginger, Curcumin, black pepper, Rheumatoid Arthritis, DAS28, Curcume

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MATERIALS AND METHODS

This trial was randomized double blind that so that patients and researcher was not informed from type of intervention ,All participant were 18 years old or more, and met ACR2010 criteria for diagnosis of rheumatoid arthritis. All of them affected to moderate or severe stages of disease that their symptoms was not controlled with DMARD s and other routine treatments. They divided into two groups consist of 30 patients. Exclusion criteria were consisting of pregnancy, kidney or liver failure, and using other drugs that may be affected disease activity. Both group received methotroxate with a dose of 0.2 mg /kg administrated 2 last days of week, prednisolone with a dose of 5 mg twice daily in divided dose and HCQ with a dose of 200 mg daily. Otherwise this treatment a group received Curcumex daily and control group received placebo with a same dose. Before intervention and 8 weeks later DAS28 Score in two groups calculated and mean differences were compared.

Statistical analysis

For description of data we used from median and standard deviation in quantitative data and from percentage and abundance in qualitative data ,at first invariable analysis was used , after multivariate analysis done for correlation between independent and dependent variables.in this step all independent variable entered in regression model. We used chi - square and Fisher's exact test for correlation between two qualitative variable and from independent T test and Mann-Whitney U test for comparison of median in two groups for assessment of coincidental of qualitative and independent variables used Generalized Estimating Equation. And covariance for independent and quantitative variables. P values between 0.05 and 0.1 were supposed borderline. And a P value less than 0.05 was significant. All analysis was done with SPSS software version 20.

RESULTS

Curcumex administration in case group reduced tender joint count (TJC) significantly in patients rather than control group (P Value < 0.001).

Otherwise patients that received Curcumex have less swelling joint count at the end of study (P value < 0.009).

Patients had less DAS28 score at the end of study versus control group. (P value < 0.001)

Erythrocyte sedimentation rate (ESR) diminished in Curcumex group rather than placebo, but there was no differences in CRP scale in case and control group at the end of study (P value = 0.322).summaries of results shown in [Table 1, 2].

Table 1: Mean differences between placebo and Curcumex group

Variable	Curcumex (Mean±SD)	Placebo (Mean±SD)	P-value
TJC	2.27±1.96	10.33±3.66	<0.001
SJC	1.07±1.17	7.13±3.84	<0.001
DAS28 Score	3.29±0.89	5.51±0.72	<0.001
ESR	21.50±12.67	38.47±18.92	<0.001

Table 2 : CRP scale changes before and after intervention

Variables (CRP)	OR	95%CI	P-value
Placebo After to Before	2.361	(0.652,8.546)	0.191
Curcumex After to Before	57.606	(15.917,208.48)	<0.001
Before			
Curcumex to Placebo	0.08	(0.023,0.282)	<0.001
After			
Curcumex to Placebo	1.953	(0.520,7.338)	0.322
Age	0.924	(0.895,0.954)	<0.001

DISCUSSION

In this trial, we evaluated effect of compound drug named Curcumex consist of (ginger, Curcumin and black pepper) and found that this drug significantly reduces inflammation both clinically and paraclinically in RA patients.

Rheumatoid arthritis and chronic inflammation that accompanied with this disease obligated patients using long term chemical drugs with enormous complications. New investigations try new drugs and policies with less complication and more beneficial [8]. In this trial struggle to use herbaceous drugs for treatment of rheumatoid arthritis. Proved before this trial that, Additives such as curcumin inhibit inflammatory mediators such as leukoterians and prostaglandins. They role this effect through antioxidant property [9].

At first time Binu Chandran¹ and ET al in 2012 in a pilot study showed that using Curcumin in RA patients have better outcome for control of disease activity rather than NSAID such diclofenac. And cucrumin patients have less disease activity scores rather than diclofenac group. Results of this study was Favourable with our study, but this trial was a pilot with small sample size , otherwise we tested a compound drug that one of its components were curcumin and cannot tell this curative effect in our study was related directly to curcumin or other gradients [10].

Abdel-Motaal M. Found in 2008 showed that Zingier with a dose of 50 mg/kg/day in rheumatoid patients other than reduction in DAS28 Score, also reduces inflammatory markers such as IL-1, IL-6, however in our study other clinical items such as tender joint count and swellings joint count was assessed, otherwise laboratorial markers of our study consist of Erythrocyte sedimentation rate and C reactive protein that was differ from this study [11].

Ludwig Boltzmann and ET al in 2013 showed that curcumin in vitro environments induce apoptosis in human fibroblasts and increases cell damage that all of this lead to anti-inflammatory effects that is useful for RA treatment. Also this finding was compatible with our study in confirming of anti-inflammation, but this study mentioned was in vitro, while our study was done in vivo environment and this was our superiority feature of our study [12].

Our study has some limitation and *strength*. One of this limitations is that we evaluated a compound drug consists of 3 various herbal, that cannot exactly say that anti-inflammatory and anti-ache effect of this drug in RA patients is contributed to each component of drug. from its strength of this study should say that this trial was done on human model while other studies done up to now, was performed on animal model or in vitro environments [13-15] or animal model [16] .otherwise in our study both anti-pain and anti-inflammatory effect of drug was evaluated while other studies usually studied only anti pain or anti inflammation alone [17].

At last, regarding various complications of routine anti rheumatoid drugs, and intending that these patients usually use non steroid anti-inflammatory agents for pain relief that have so many complications, and regarding of minimum complication of herbaceous drugs, using of such drugs for relief of pain and inflammation reduces complications of DMARDS drugs with various complications.

CONCLUSION

Administration of Curcumex with a dose of daily during 8 weeks reduce disease activity score (DAS28 Score), TJC, SJC and ESR in rheumatoid patients. Using Curcumex herbal drug in patients affected rheumatoid disease reduces inflammation and pain with minimum of side effects and lead to reducing dose of other chemical and routine DMARD s with too complications[18].

CONFLICT OF INTEREST

There is no conflict of interest.

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We appreciate to all of the patients suffering rheumatoid arthritis participate in our study, also from caregivers and members of health staffs in the Rheumatology Clinic of Golestan Hospital, Ahvaz, Iran who helped in data collection.

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FINANCIAL DISCLOSURE

None

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ARTICLE

SYNTHESIS OF THE CoO.CaO/ZnO CORE-SHELL NANOPIGMENT AND INVESTIGATION OF ITS EFFECTS ON THE PROPERTIES OF RUBBER COMPOUNDS BASED ON THE ACRYLONITRILE BUTADIENE ELASTOMER (NBR)

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ABSTRACT

synthesis of the core-shell nanopigment with two different proportions of shell (1CoO.3CaO/ZnO and 3CoO.1CaO/ZnO) and its effects as an activator on the properties of the acrylonitrile butadiene elastomer (NBR) were studied. To characterize the nanopigments, XRD, SEM, and TEM analyses were used. Also, 15 phr of the nanopigments with two different proportions, as mentioned before, were added to the elastomer base (NBR). The results obtained from the X-ray diffraction (XRD) confirmed the formation of desired phases, and the average particle sizes of particles for two proportions of 1:3 and 3:1 were reported to be 19 and 31.27 nm, respectively, using the Scherrer equation. Also, the images received from the SEM analysis proved the spherical shape of the particles. The approximate sizes of the particles for two proportions were within the ranges of 47.1–100 and 41.3–98.9 nm, respectively. The images obtained from the TEM analysis showed the formation of nanometer shells on the core surface (ZnO). Owing to the loading of the newly synthesized nanopigments with different proportions on the nitrile elastomer (NBR), there is a marked improvement of the rheological and physicochemical properties compared to the reference sample. The results confirmed the booster role of the new nanopigments.

INTRODUCTION

Polymer compounds are widely used in packaging, transportation, and automotive industries. Therefore, it is vitally important to improve their properties and qualities. One of the most effective factors of the physical and mechanical properties of rubber compounds is the use of fillers [1]. Fillers are classified into two types: soot and color [2]. Use of inorganic fillers with outstanding properties, such as high chemical resistance, environment-friendly, and reduced price in the polymer industry, is significant [3]. In fact, fillers improve the tensile strength and modulus; they reduce the cost of rubber compounds. This specific effect can be attributed to the chemical state of the filler surface, the shapes and sizes of particles, and their specific surface [1]. Zinc oxide (ZnO) has many applications in most industries; these include the production of ceramic pigments and electrical and optical materials [4]. A most common use of ZnO is in the polymer industry. The white color, the small size of particles, acid acceptor, and adaptability with organic and inorganic compounds are the reasons for the wide-ranging use of ZnO. It is generally used in the polymer industry as an activator, booster, and pigment [1]. The new approach applied by different industries to produce their products is the use of hybrid particles or the core shell. These particles have wide applications in the pharmaceutical industry (drug delivery), chemical engineering, biology, and optics [5]. In general, core-shell particles contain more than one chemical sedimentary component [6]. The core is usually chosen as a low-cost factor that contains 80%–85% 'per cent' of compounds. This factor can be covered by a shell that includes only 15%–20% 'percent' of pigments. Generally, hybrid compounds have unique properties compared to the time when they are used separately [7]. As a result, different studies have been carried out by researchers. One of these studies was conducted by Ahmed and El-Nashar in 2013, where the effects of ZnO/phosphate core-shell pigments on the properties of SBR/EPDM synthetic compounds with a proportion of 50:50 were investigated [1]. The results confirmed the effective role of the new pigments on the physical–mechanical properties and rubber compounds based on the SBR/EPDM in comparison with the commercial samples of pigments. Also, the high concentration of magnesium compared to the calcium concentration in the shell containing phosphate shows better properties in synthetic compounds. Also, the effects of CoO.MgO/Kaolin core-shell pigments with two different sizes, micro and nano, on the properties of SBR rubber were studied by Ahmed et al. in 2011[6]. Kaolin was considered as a core, while cobalt and magnesium oxides were chosen as a shell. The results showed that loading 6 phr of the nanopigments improve the physical–mechanical and dielectric properties in the styrene butadiene elastomer. The optimum loading for the micro-pigments was 30 phr. In 2013, El-Nashar et al. studied the effects of new ferric-kaolin pigments on the rheological, physicochemical, and magnetic properties of rubber compounds based on nitrile butadiene [7]. The results illustrated that by increasing the loading to 50 phr, the mechanical properties of rubber compounds based on NBR rises and then decreases. Hardness and magnetic properties considerably increase by loading the new core-shell pigments based on the nitrile elastomer compared to the reference sample. In 2015, another study was conducted by El-Sabbagh and Ahmed to investigate the productivity of styrene-butadiene rubber composites using kaolin covered by metal oxide pigments as a shell [8]. The results depicted that inorganic core-shell pigments improve cooking and the physical–mechanical properties as well as the tensile strength of rubber compounds based on the SBR elastomer. The merits of this method were the compatibility of inorganic pigments with the environment and the low-cost procedure. In 2015, Ahmed et al. synthesized the new kaolin–ferric core-shell pigments with the anticorrosion and environmental-friendly properties [9]. According to their results, the new kaolin–ferric core-shell pigments have an appropriate function in terms of corrosion in comparison with the common ferric pigments. Owing to their

KEY WORDS

Nanoparticles; Core-shell; Elastomer; Pigment; Co-precipitation

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environmental-friendly properties and low-cost procedure, the new pigments can be a good choice for color formulation, booster fillers in rubbers, ceramic composites, and electric nonconductors. The most important point in their results is the possibility that hybrid pigments could be replaced with other dangerous pigments such as chromates with the same performance. In 2015, Mao et al. synthesized $\text{Ce}_2\text{S}_3@\text{ZnO}$ with the core-shell structure and investigated its application as an inorganic and nontoxic pigment [10]. In their research, owing to the diffusion of hydrogen sulfide (H_2S) by cerium selenide (Ce_2S_3) and the resultant environmental problems, cerium selenide was covered with a uniform layer of ZnO. The results indicated that a uniform layer of ZnO with a thickness of 40 nm was covered on the core surface via a simple and low-cost method. The presence of a protective layer of ZnO prevented the diffusion of H_2S and hence the use of the new core-shell method resulted in the production of nontoxic, environment-friendly, and odorless pigments that have thermal stability. In 2013, Mark et al. studied the application of the core-shell theory in reducing the use of ZnO on the nitrile elastomer [11]. According to their research, which is now under review and based on the Europe Union Theory regarding the pollution of ZnO, all industries try to reduce the use of ZnO. However, ZnO plays an important role in the vulcanization process of rubber compounds. In this research, the effects of green core-shell nanopigments with different proportions of shells ($1\text{CoO}.3\text{CaO}/\text{ZnO}$ and $3\text{CoO}.1\text{CaO}/\text{ZnO}$) on the physical-mechanical properties and cooking rubber compounds based on the nitrile elastomer were investigated. Also, the boosting level of new nanopigments was studied. It should be mentioned that ZnO was considered as a core that contains just 80% 'percent' of the compound in the new nanopigments and covered with a shell of cobalt and calcium oxide with proportions of 1:3 and 3:1. The shell only includes 20% 'percent' of nanopigments.

MATERIALS AND METHODS

The chemicals employed in the synthesis of core-shell nanopigments are as follows:

Zinc oxide (ZnO) with 99% purity made by Daejung Company in South Korea, calcium nitrates and cobalt nitrates with 99% purity made by Merck Company in Germany, ammonia with 25% purity made by Merck Company in Germany, ethanol with 99% purity made by Merck Company in Germany.

The materials employed in the synthesis of rubber compounds based on the NBR are as follows:

Acrylonitrile butadiene (33%) made by LG Company in South Korea, stearic acid made by Chem Acid Company in Malaysia, CBS made by Lanxess Company in Belgium, sulfur with 99% purity made by Tesdak Company in Iran, ZnO made by Shokouhieh Company in Iran, dioctyl phthalate (DOP) made by LG Company in South Korea.

The devices employed in the characterization of core-shell nanopigments are as follows:

Electric furnaces (the BATEC-PC-21 model) made in Taiwan, the X-ray diffraction (XRD) device (the STOE-STIDY-MP model) made in Germany, the scanning electron microscope (SEM) device (the KYKY-EM3200 model) made in China, the transmission electron microscope (TEM) device (the EM10C-100KV model) made by ZEISS Company in Germany.

The devices employed in testing rubber compounds based on the NBR elastomer are as follows:

Two-roller mill made by WSMCO.LTD Company in Taiwan, the rheometer device (the MDR-HIWA900 model) made by HIWA Company in Iran, the laboratory hydraulic press (the PTP60 model) made in Iran, the puller (the UNIVERSAL-M350-5KN model) made by TESTOMETRIC Company in Iran.

Synthesis of core-shell nanopigments with two different proportions of the shell:

To synthesize $1\text{CoO}.3\text{CaO}/\text{ZnO}$ and $3\text{CoO}.1\text{CaO}/\text{ZnO}$ core-shell nanopigments, the co-precipitation method was used. It should be mentioned that the percentage of core and shell considered for nanopigments were 80% and 20%, respectively. First, certain amounts of cobalt nitrate and calcium nitrate along with ZnO were dissolved in water. To create an alkaline media, ammonia was added. Then, the solution was stirred using a magnet for 6–12 h. The obtained precipitate was filtered, heated in an oven, and finally, calcined in an electric furnace with an average slope of $20\text{ }^\circ\text{C}\cdot\text{min}^{-1}$ within a temperature range of 600–1000 $^\circ\text{C}$ for 1–12 h. To characterize the nanopigments, X-ray diffraction, SEM, and TEM analyses were performed. The achieved results have been discussed in the Results and Discussion section.

Synthesis of rubber compounds based on the NBR:

The synthesis of rubber compounds was accomplished based on the new formulation presented in [Table 1]. In this research, a sample was considered as a reference sample without nanopigments, and two other samples were loaded by the new nanopigments. First, the components were processed on the two-roller mill device within a temperature range of 75–80 °C in two steps. During the synthesis of the mixture, the temperature, time, and shape of sections were exactly controlled. To start the synthesis of rubber compounds, the elastomer, activators, fillers, emollients, and antioxidants were processed by the two-roller mill device. In the second step, the accelerator and sulfur were added to the mixture because early use of the two compounds disrupts the cooking process. In this study, owing to the absence of soot, the new core-shell nanopigments were added to the mixture after adding the activator. The most significant thing in the synthesis of rubber compounds is a uniform distribution of nanopigments via the core-shell method, which is an important advantage in using new nanopigments. After preparing the mixture, the samples were kept at room temperature for 24 h, pressed under by the hydraulic press device, and baked under the appropriate temperature. Next, the tensile and cooking tests were carried out. The obtained results have been discussed in the Results and Discussion section.

Table 1: The selected formulation for the synthesis of rubber compounds

Chemicals	Z _b	Z _{1:3}	Z _{3:1}
NBR	100	100	100
S.A (Stearic acid)	1.5	1.5	1.5
N-Cyclohexyl-2-benzothiazole Sulfonamide (CBS)	1.7	1.7	1.7
S	1.5	1.5	1.5
ZnO	5	5	5
Diocetyl phthalate (DOP)	3	3	3
1CoO.3CaO/ZnO	-	-	15
3CoO.1CaO/ZnO	-	15	-
Values based on phr (Part per Hundred parts of Rubber)			
Z _b : The reference sample without the nanopigments. Z _{1:3} : The sample containing 15 phr of 1CoO.3CaO/ZnO nanopigment. Z _{3:1} : The sample containing 15 phr of 3CoO.1CaO/ZnO nanopigment.			

RESULTS and DISCUSSION

The XRD analysis was employed to investigate the crystal structure of the synthesized core-shell nanopigments. The analysis was carried out at 25 °C in the presence of a copper lamp. The XRD patterns of 1CoO.3CaO/ZnO and 3CoO.1CaO/ZnO core-shell nanopigments have been illustrated in [Fig. 1] and [Fig. 2].

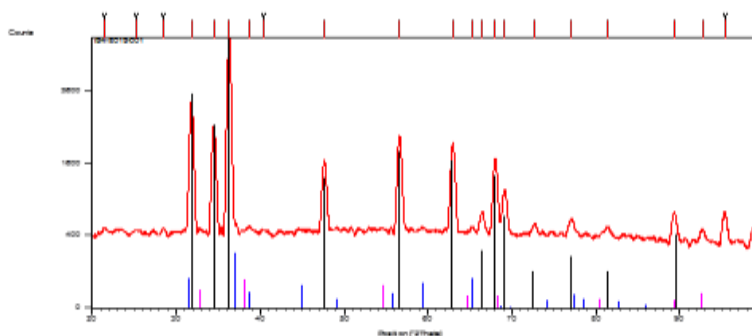


Fig. 1: The XRD pattern of the 1CoO.3CaO/ZnO nanopigment.

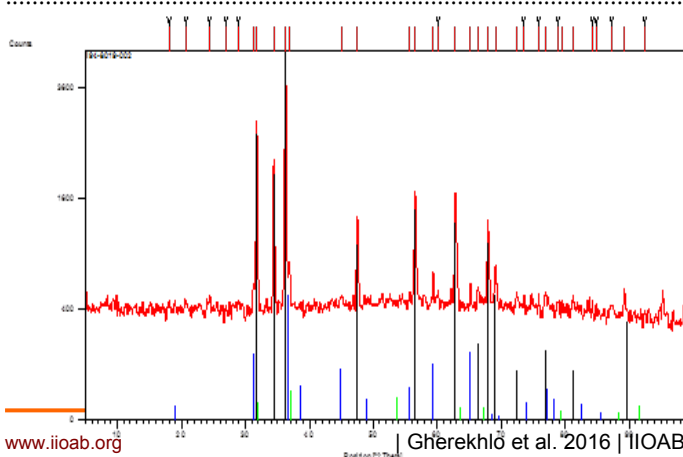


Fig. 2: The XRD pattern of the 3CoO.1CaO/ZnO nanopigment.

- 1) The peaks at $2\theta = 31.7^\circ$ and 36.2° are related to the ZnO that has the hexagonal crystal lattice in two synthesized nanopigments.
- 2) The peak illustrated at $2\theta = 65.2^\circ$ shows the cobalt oxide with cubic crystal lattice in two samples.
- 3) The peak at $2\theta = 89.23^\circ$ confirms the presence of calcium oxide with cubic crystal lattice in two samples of nanopigments.

The results depict the successful formation of the desired phases. The average sizes of the synthesized nanopigments were reported to be about 31.7 and 19 nm using the Scherrer equation for two proportions of 3:1 and 1:3, respectively. The calculations for determining the average size of particles was carried out using [Formula 1].

Formula 1:

$$D = \frac{0.9\lambda}{\beta \cos\theta}$$

where D is the size of crystal beads, λ is the wavelength of X-ray, β is the peak width in the half of maximum intensity (radian), and θ is the diffraction angle. [Fig. 3] and [Fig. 4] show the SEM and TEM images of the synthesized nanopigments with the proportion of 1:3. The results obtained from SEM, illustrated in [Fig. 3], confirms the presence of non-uniform spherical particles. Also, the size of particles has been reported within the range of 47–100 nm. [Fig. 4] depicts the transmission electron microscopy images that confirm the presence of a core with a thickness of 70 nm which is covered with a thin and uniform shell with a thickness of 3 nm. According to these images, the particle size has been reported to be lower than 100 nm.

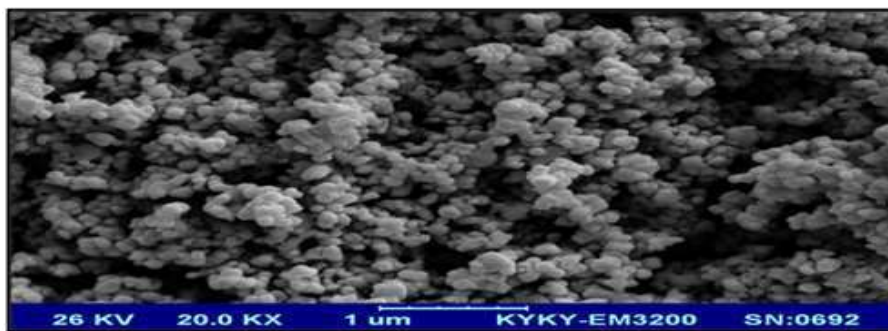


Fig. 3: The SEM image of the 1CoO.3CaO/ZnO nanopigment with 20,000 times magnification.

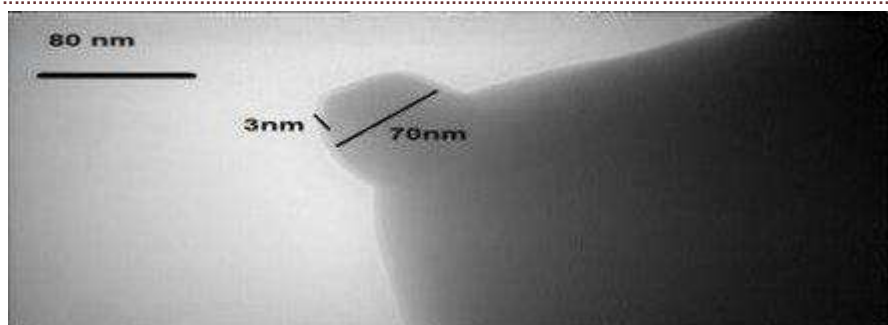


Fig. 4: The TEM image of the 1CoO.3CaO/ZnO nanopigment.

The results obtained from TEM and SEM analyses for the nanopigment with the proportion of 3:1 have been illustrated in [Fig. 5] and [Fig. 6]. The results of the TEM analysis, shown in [Fig. 5], depict the non-uniform spherical shape of particles. The size of particles has been reported to be within a range of 41.3–98.9 nm. As shown in [Fig. 6], the results of TEM confirm the presence of a core with a thickness of 33.5 nm which was covered by a thin and uniform shell with a thickness of 3.6 nm. It should be mentioned that the proportions of the core and shell in the synthesis of the nanopigments are about 80% and 20%, respectively. The major part of the core is ZnO and the remaining 20% is related to the different oxides of cobalt and calcium as the shell.

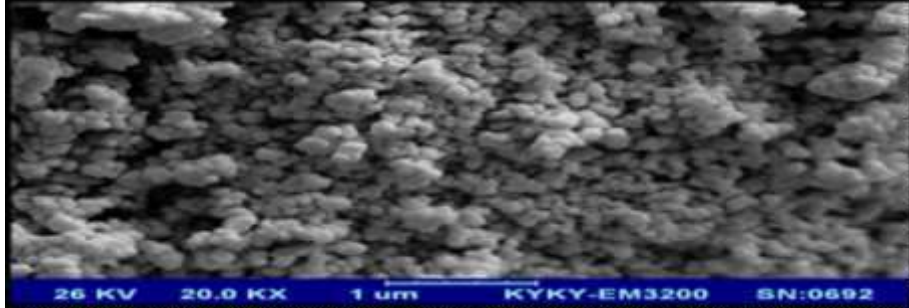


Fig.5: The SEM image of the 3CoO.1CaO/ZnO synthesized nanopigment with 20,000 times magnification.

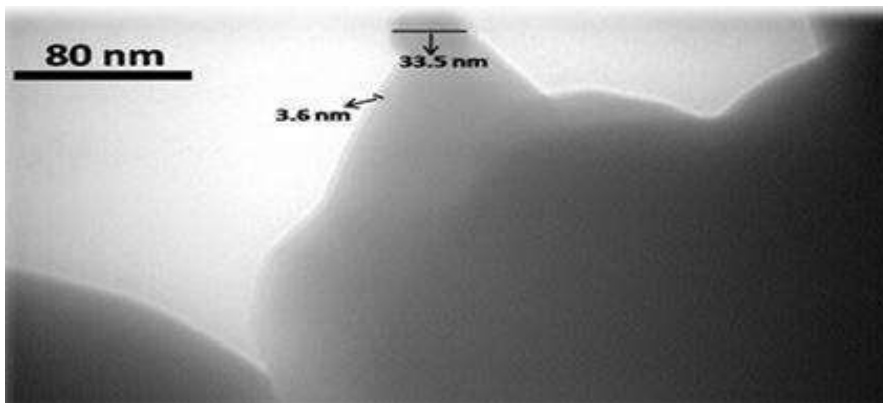


Fig.6: TEM image of the 3CoO.1CaO/ZnO nanopigment with 125,000 times magnification.

The results obtained from the rheological or cooking properties of rubber compounds containing new nanopigments, compared to the reference sample, have been presented in [Table 2]. As can be seen, the amount of the maximum moment (MH) increases by adding nanopigments based on elastomer compounds compared to the reference sample. The reason for this increase can be attributed to the presence of nanopigments and strong interactions with the polymer matrix. Owing to an increase in the effective contact surface of nanopigments and strong bonds (Van der Waals forces or chemical bonds) connecting the polymer chains to the surfaces of nanopigments, the cross-links increase, resulting in a decrease of polymer chains in the rubber compounds and an increase in the maximum moment [4, 6]. The minimum moment (ML), which is defined as a level of hardness in the vulcanized compound, shows a constant trend at the beginning of the cooking process. The ΔM parameter is the density of cross-links; it is obtained from the difference between the maximum and minimum moments. The results illustrate the increase in the ΔM parameter. The changes of the cooking moment by loading nanopigments can be used to determine the interactions or the level of boosting between the nanopigment-polymer matrix [3]. This factor is named as the reinforcement factor or α_f , which is calculated using [Formula 2].

Formula.2:

$$\frac{D_{max} - D_{min}}{D_{max}^o - D_{min}^o} - 1 = \alpha_f \frac{m_f}{m_p}$$

where $D_{max} - D_{min}$ is the maximum changes of moment during the cooking process for the rubber loaded by nanopigments, $D_{max}^o - D_{min}^o$ is the maximum changes of moment during the cooking process for the raw rubber, α_f is the reinforcement coefficient, m_f is the mass of nanopigment, m_p is the mass of elastomer base used [1]. As presented in [Table 2], the amount of reinforcement increases by loading nanopigments compared to the reference sample. This increase in the sample with a proportion of 3:1 is more than the increase in the sample with a proportion of 1:3. This increase can be due to the strong interfacial

interaction of the nanopigment-polymer matrix. These positive changes show the boosting effects of the new core-shell nanopigments [1]. Three other significant parameters are scorch time (T_{s2}), the optimal time for cooking or T_{c90} (the time needed to reach the 90% of final moment), and the cooking rate index (CRI). Loading the new core-shell nanopigments reduces the optimal time for cooking because of the effects of nanopigments on the decreasing time required for the sulfuring process in the cooking. Also, a uniform distribution of nanopigments into the nitrile elastomer matrix not only reduces this parameter, but also improves the process of producing and saving energy [6]. On the other hand, the effects of chemical active sites and surface properties of the new core-shell nanopigments cause an effective interaction between the nanopigments and polymer chains as well as increase the formation of cross-links in the polymer. As a result, the vulcanization process takes place quickly to decrease the optimal time for cooking [3, 6]. Also, the cooking rate index of the rubber compound loaded by the 1CoO.3CaO/ZnO nanopigment increases, and the 3CoO.1CaO/ZnO nanopigment shows the similar behavior with the reference sample. The scorch time is decreased by loading the core-shell nanopigments.

Table2: The results obtained from the rheological properties (cooking)

Core-Shell pigments 15 phr	Sample number		M_L	M_H	T_{c90}	T_{s2}	CRI	f_a	ΔM
			dN.m	dN.m	min:sec	min:sec	min ⁻¹		(M_H-M_L)
	Z _b	Without Pigments	0.552	6.208	14:55	6:04	11.303	-----	5.656
	Z _{1:3}	1CoO.3CaO/ZnO	0.552	6.484	13:16	5:48	13.387	0.32	5.932
	Z _{3:1}	3CoO.1CaO/ZnO	0.552	7.173	13:22	5:34	11.303	1.13	6.621

Z_b: The reference sample without the nanopigments.
 Z_{1:3}: The sample containing 15 phr of 1CoO.3CaO/ZnO nanopigment.
 Z_{3:1}: The sample containing 15 phr of 3CoO.1CaO/ZnO.

Another test was the tensile test carried out on the rubber compounds loaded by the new core-shell nanopigments. The results obtained from the tensile test have been depicted in [Table 3].

Table 3: The trend of changes in the physicomechanical properties of the rubber compounds containing nanopigments and the reference sample

Sample number		Stress N/mm ²	Elongation mm	Modulus 100% N/mm ²	Modulus300% N/mm ²
Z _b	Without Pigments	2.16	236.44	1.04	1.84
Z _{1:3}	1CoO.3CaO/ZnO	2.10	210.04	1.22	2.01
Z _{3:1}	3CoO.1CaO/ZnO	2.20	227.03	1.20	2.00

As can be seen, the improvement in physicomechanical properties is related to loading the nanopigments in such a way that this increase shows a good interaction between nanopigments and polymer. A slight increase of the tensile strength in the rubber compound containing 3CoO.1CaO/ZnO is due to the improvement of interfacial bonds between the nanopigments-polymer matrix because a strong interaction can lead to the increase and transfer of resulting tensions from the polymer matrix to the core-shell nanopigment distributed into the rubber compound [3, 6]. More improvement in the tensile modulus about 300%(Tensile stress at 300% elongation. also known as "300% Moduluse") and 100%(Tensile stress at 100% elongation. also known as "100% Moduluse") compared to the reference sample confirms a uniform distribution of nanopigments into the polymer matrix along with the interaction of the nanopigment-polymer matrix. This raises the effects of tensions transformed from the polymer matrix into the nanopigments distributed in the rubber compound [3, 6]. Another significant parameter is the reduction of the increased length in the breaking point-this decreases in two rubber compounds containing the new nanopigments compared to the reference sample. This can be attributed to the increase of the boosting power by the core-shell nanopigments and the polymer chains being harder. Hence, the flexibility of vulcanized rubber gets decreased [3].

CONCLUSION

In this research, the synthesis of 1CoO.3CaO/ZnO and 3CoO.1CaO/ZnO core-shell nanopigments with two different proportions of the shell and their effects on the cooking and physicomechanical properties of rubber compounds based on the acrylonitrile butadiene elastomer were investigated. Also, the XRD analysis showed the formation of the desired phases. The images obtained from SEM and TEM analyses confirmed the spherical shape of particles, the size of nanoparticles within the range of lower than 100 nm, and the formation of a thin shell layer on ZnO, respectively. Also, the results related to the rubber compounds containing nanopigments with the NBR base illustrated that the presence of new core-shell nanopigments can improve the cooking properties, especially the optimal time for cooking. The improvement of this parameter depends on different factors such as the size of particles, the increase of effective surfaces in new nanopigments, and the presence of chemical active sites. These factors can make strong and effective interactions between the nanopigments and the polymer matrix. Also, formation of strong bonds (Van der Waals forces or chemical bonds) increases the cross-links that improve the

cooking properties. It should be mentioned that decreasing the cooking time is vitally important to save energy in the polymer industry. Another factor was the boosting power of rubber compounds containing the nanopigments compared to the reference sample. The increase in the boosting power in rubber compounds based on the nitrile elastomer confirms the effective role of core-shell particles. The results achieved from the tensile test show the improvement of the desired properties in the rubber compounds based on the NBR elastomer. This can be attributed to the improvement of interfacial bonds between the nanopigments and the polymer matrix. Also, because of the uniform distribution of new nanopigments and increases in the contact surface of nanoscale, strong interactions take place between the polymer matrix and the nanopigments, resulting in the increase and transfer of tensile forces from the polymer matrix to the core-shell nanopigments. The new inorganic core-shell nanopigments can be a suitable alternative for reducing the usage of organic pigments that pollute the environment. According to the optical and thermal stability as well as the environment-friendly properties, the inorganic core-shell pigments can be a good alternative to organic pigments. The new synthesized green nanopigments have unique properties that can compete with organic pigments.

CONFLICT OF INTEREST

There is no conflict of interest.

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None

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ARTICLE

SYNTHESIS OF CELLULOSE/ZIRCONIUM OXIDE NANOCOMPOSITE AND THE STUDY OF ITS ACTIVITY IN THE REMOVAL OF POLLUTANTS

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ABSTRACT

In this research, the cellulose/zirconium oxide nano composite was successfully synthesized. In the preparation of this nano composite, zirconium (IV) tert-butoxide and stearic acid were used as the sources of zirconium and complexing agent of cellulose, respectively. The structure of this nano composite was studied using Fourier transform infrared spectroscopy (FT-IR) analysis, and X-ray diffraction (XRD) and scanning electron microscopy (SEM) methods were applied to investigate the size and morphology of particles, respectively. Zirconium dioxide nanoparticles with the average size of 50 nm were obtained as the pure nano composite with cellulose and the sizes ranged from 31.9 to 46.3 nm. To study the catalytic activity of prepared nano composite, malachite green was used as one of the environmental pollutants. The effect of pollutant and adsorbent concentration, time, and pH was investigated, and the optimal conditions were determined for the removal of pollutants.

INTRODUCTION

Water, as the most vital fluid, covers more than three-quarters of earth surface. Nowadays, the limited resources of available fresh water are at the risk of microbial and chemical contamination, and many pollutants seriously threaten the vital resources for humans through industrial wastewater and fertilizers. Clean water (water without toxic chemicals and pathogens) is essential to human health. Also, clean water is considered as the vital pure substance in different main industries such as electronic, drug, and food. The world faces many challenges in increasing demand for clean water as fresh water resources [1-4]. Numerous issues related to the water quality can be improved using nanoparticles, nano filtration, or other product of nanotechnology. Innovation in the development of new technologies for making fresh water is considered as one of the most significant technologies. Using special nanoparticles placed in membranes or in the structure of filters purifies unusable drinking water obtained from institutes and factories in an effective, low-cost and quick way [5-7]. Nano materials have a great surface area compared to the materials with large scale. In addition, these materials can interact with different chemical groups in order to increase their affinity with especial compounds. Also, nano materials can be considered as the recoverable ligands with great capacity and selectivity for the toxic metal ions of radionuclides, organic and mineral solvents. Adsorbents are widely used as separators in the water purification and removal of organic pollutants such as malachite green from the polluted water. Malachite green is a triaryl methane dye which widely used in the textile industry for dyeing silk, leather, cotton, wool, and hemp. This substance is also applied as bactericide, fungicide, and parasiticide in the aquaculture industry. Due to the properties of malachite green, its removal from the aqueous solutions is difficult, and it is also toxic to many microorganisms [8-11]. Different methods have been reported for the removal of this substance from aqueous solution that using adsorbents with the adsorption ability of this substance can be considered as one of the effective methods [12, 13]. In 2014, Vinod et al. used pectin zirconium(IV)selenotungsto phosphate (PC/ZSWP) nano composite adsorbent, prepared via the sol-gel procedure, for removal of the methylene blue (MB) and malachite green (MG) in different conditions. The adsorption percentages of this photo catalytic nano composite for methylene blue and malachite green in the presence of light in 3 hours were 89.21 and 79.27%, respectively, which were higher than the adsorption of this photo catalyst in darkness. In 2014, Jing and co-workers synthesized a suitable adsorbent for removal of fluoride ions from the aqueous systems using sodium carboxy methyl cellulose saturated with Zr(IV) or CMC-Zr. They achieved the maximum adsorption capacity of this adsorbent by varying pH, temperature, the fluoride concentration, the amount of adsorbent, and the contact time. This spontaneous and endothermic process is in agreement with the Langmuir and Freundlich isotherm models. In this process which occurs through exchanging the sodium ions of adsorbent with fluoride ions, CMC-Zr can be a suitable adsorbent for removal of fluoride from the aqueous solutions [14]. In 2013, Rifaqat et al. applied graphene to increase the adsorption capacity of zirconium oxide (ZrO₂) nano composite adsorbent, and successfully removed 4-chlorophenol from the aqueous systems in high yields. Investigating the effect of temperature, concentration, contact time and pH showed the spontaneous and endothermic process, and the maximum adsorption took place at pH 1. Also, using the mixture of methanol and sodium perchlorate (0.1 M) (40:60) led to increasing the removal percentage of 4-chlorophenol to more than 90% [15]. The new aspect and innovation of this research is that the cellulose/zirconium oxide nano composite has been used for the first time as an adsorbent in the removal of pollutants. To prepare these nanoparticles, sol-gel method was applied due to its simple procedure and controllability of the shape of obtained nanoparticles.

KEY WORDS

Nanocomposite,
Cellulose, Zirconium
oxide, Malachite green,
Catalytic activity

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MATERIALS AND METHODS

Materials

Zirconium (IV) tert-butoxide, cellulose, stearic acid, malachite green, sodium hydroxide, hydrochloric acid, and acetone were purchased from the Merck company in Germany. Deionized water was used in the experiments.

Instruments

The Fourier Transform Infrared spectrometry (FT-IR) device with the model of PerkinElmer Spectrometer RX1FT-IR was used to confirm the synthesized nanoparticles. The size of nanoparticles was determined by X-Ray Diffraction (XRD) instrument with (XRD)PTS 3003 model. Scanning electron microscopy (SEM) device with EM 3200 model, made by KYKY Company, was performed for investigating the structure and morphology of samples. The adsorption of samples and their pH were measured using Perkin Elmer UV/Vis 25 spectrophotometer and METTLER TOLEDO pH meter, respectively.

Methods

Preparation of zirconium dioxide nanoparticles

Stearic acid (569 g, 2 mol) was melted in a beaker at 73 °C, then, zirconium (IV)tert-butoxide (383.7 g, 1 mol) was added to the mixture and stirred using a magnet. Afterwards, the mixture was heated in an oven at 300 and 400 °C for 60-70 min, and all impurities related to the stearic acid were taken out as H₂O, CO₂, and CO. Then, the temperature increased to 850-900 °C for calcination, and remained fixed for 5 hours. After the completion of this step, the mixture was cooled, and zirconium dioxide nanoparticles were obtained.

Preparation of cellulose-zirconium dioxide

Cellulose (4.5 g) and zirconium dioxide (0.5 g) (cellulose: zirconium, 90:10) were poured in a beaker, and some acetone amount of was added as the solvent. Then, the mixture was heated and stirred using a magnet. After drying the mixture by heating, the cellulose/zirconium nano composite was achieved.

RESULTS AND DISCUSSION

Fourier transform infrared spectroscopy (FT-IR)

FT-IR spectra of zirconium dioxide

[Fig. 1] illustrates the FT-IR spectra of pure synthesized zirconium dioxide nanoparticle. It shows the structural properties of nanoparticle. Two peaks at 517.88 and 618.06 cm⁻¹ demonstrate the vibrations of Zr-O in tetragonal zirconium oxide.

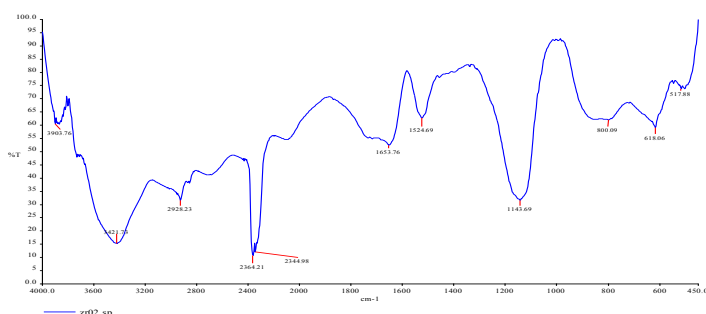


Fig. 1: FT-IR spectra of pure zirconium dioxide nanoparticle.

FT-IR spectra of pure cellulose

As depicted in [Fig. 2], absorption band at 3421.91 cm⁻¹ shows stretching vibration of OH groups present in the cellulose structure.

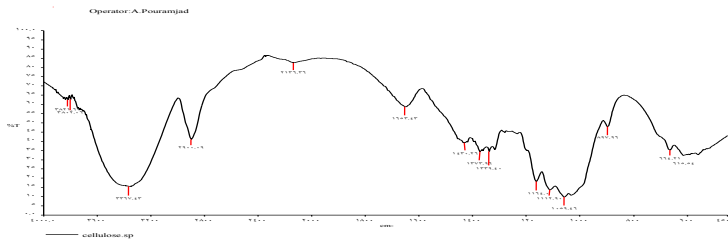


Fig. 2: FT-IR spectra of pure cellulose.

FT-IR spectra of cellulose/zirconium dioxide nano composite

[Fig. 3] presents the FT-IR spectra of cellulose-zirconium dioxide nano composite. In fact, it shows the structural properties of nano composite. Two peaks at 517.88 and 618.06 cm⁻¹ depict the vibrations of Zr-O in zirconium oxide, and the absorption band at 3421.91 cm⁻¹ illustrates the stretching vibration of OH groups present in the cellulose structure.

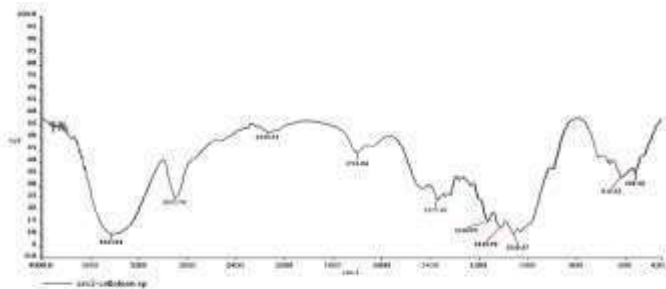


Fig. 3: FT-IR spectra of cellulose-zirconium dioxide nano composite.

XRD spectra of cellulose-zirconium dioxide nano composite

[Fig. 4] depicts the XRD image of zirconium dioxide nanoparticles. According to the obtained results, the prepared nanoparticle is cubic which is completely in agreement with the single crystal XRD. To calculate the average size of crystalline particles based upon the XRD spectra, Debye-Scherrer equation was used as follows [16]:

Equation 1:
$$\tau = \frac{k\lambda}{\beta \cos\theta}$$

Where k is a constant amount equal to 0.89; λ is X-ray wavelength equal to 0.154056; β is the width of peak at half the maximum, and θ is the half of diffraction angle.

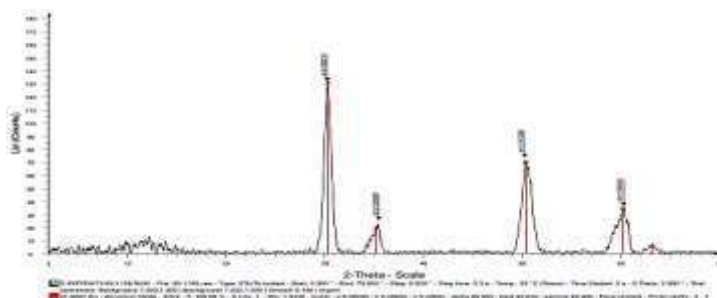


Fig. 4: XRD spectra of cellulose-zirconium dioxide nano composite.

Scanning electron microscopy (SEM)

SEM spectra of zirconium dioxide nanoparticle

As illustrated in [Fig. 5], SEM image shows the morphology of zirconium dioxide nanoparticles. These nanoparticles were distributed spherically throughout the sample. Zirconium dioxide nanoparticles are observable with the size of 50 nm.

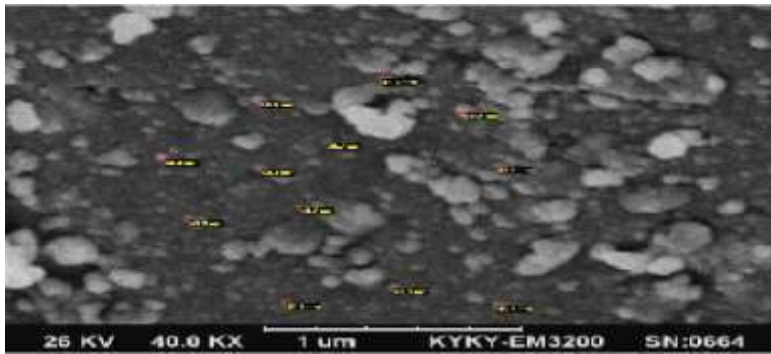


Fig. 5: SEM image of zirconium dioxide nanoparticle.

SEM spectra of cellulose-zirconium dioxide nano composite

The morphology of synthesized nano composite was studied using SEM analysis. As can be seen from [Fig. 6], zirconium dioxide nanoparticles were distributed on the cellulose surface as a substratum. The size of particles was in the range of 31.9 to 46.3 nm. The size of the smallest particle of zirconium dioxide is 31.9 nm. The appropriate homogeneity and distribution of particles are observable in SEM image.

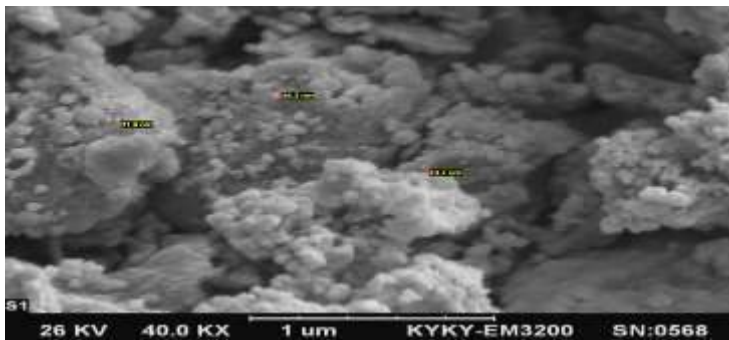


Fig. 6: SEM image of cellulose-zirconium dioxide nano composite.

Investigating the catalytic activity of cellulose-zirconium dioxide nano composite

To investigate the catalytic activity of cellulose-zirconium dioxide nano composite, malachite green was used as a pollutant. The effect of different parameters such as the amount of adsorbent, pH, the concentration of malachite green, and time was studied.

The calibration graph of malachite green adsorption versus its different concentrations

To measure the concentration of MG, the absorption properties of this substance in UV-Vis region were used. Also, to determine the maximum wavelength in the range of 350-800 nm using double-beam spectrophotometer instrument, the adsorption graph was drawn for different concentration of malachite green (1-10 ppm). As presented in Scheme 7, malachite green has the maximum adsorption at wavelength of 625 nm. As a result, this wavelength was chosen for the measurement of malachite green concentration.

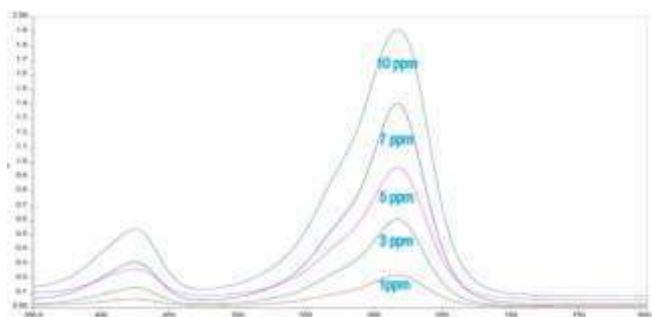


Fig. 7: UV-Vis spectra of MG solution (0-10 ppm).

The calibration graph is essential for determining the concentration of samples which their color were removed by the adsorbent. So, different concentrations of malachite green were prepared, and their adsorption was measured at the wavelength of 625 nm. The calibration graph, depicted in [Fig. 8], was drawn based upon the results of [Table 1].

Table 1: The changes of malachite green concentration and adsorption

Adsorption	MG concentration
0.1976	1
0.6014	3
0.9742	5
1.3745	7
1.9104	10

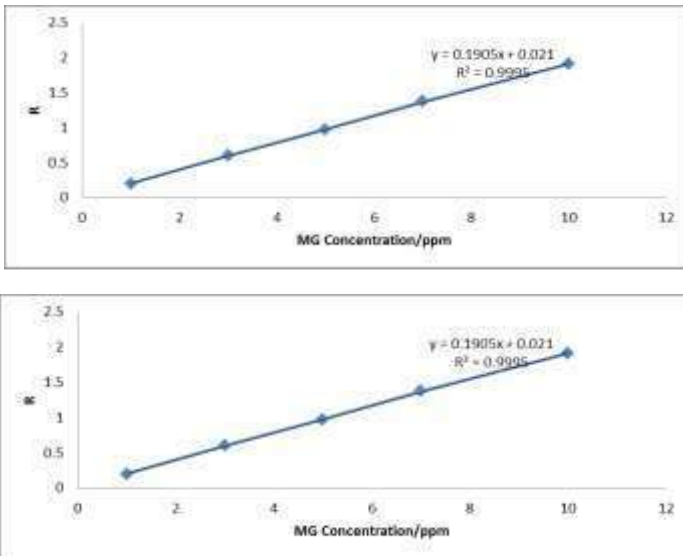


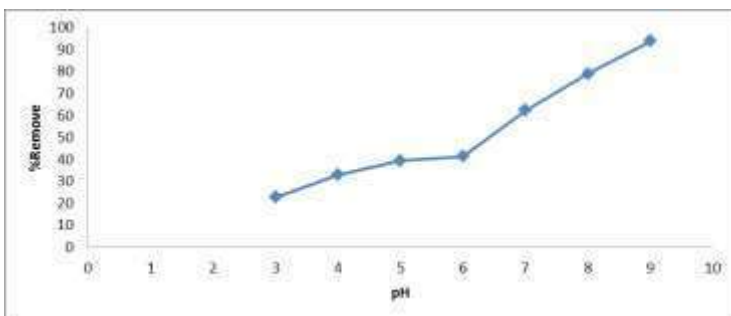
Fig. 8: The diagram of malachite green concentration versus different concentrations.

To calculate the removal percent, equation 2 was used in different experiments:
Equation 2:

$$\text{Removal Percent} = \frac{C_0 - C_t}{C_0} \times 100 \quad (2)$$

The study of optimal pH for the malachite green removal

One of the main parameters for the adsorption and removal of color pollutant is pH. To investigate and evaluate the effect of pH on the removal of malachite green from aqueous solutions, some experiments were conducted in different pH under the constant conditions of other parameters. As illustrated in [Fig. 9], the suitable pH for removal of color is 9.



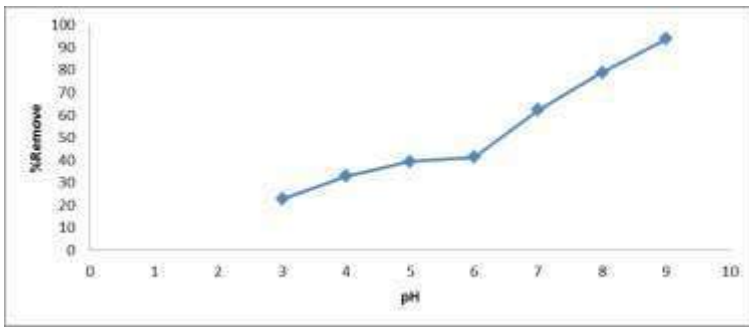


Fig. 9: The diagram of pH for removal of malachite green.

Studying the removal percentages of malachite green according to the amount of cellulose-zirconium dioxide nano composite adsorbent

The increase of adsorbent raises the adsorption percentage or color removal. In fact, by increasing the amount of adsorbent, the available sites for adsorption was increased, so the color removal increases. If the amount of adsorbent is more than the optimized amount, overlapping the sites of adsorbent molecules decreases the adsorption. The optimal amount of adsorbent for removal of pollutant from the system is 0.7 g.

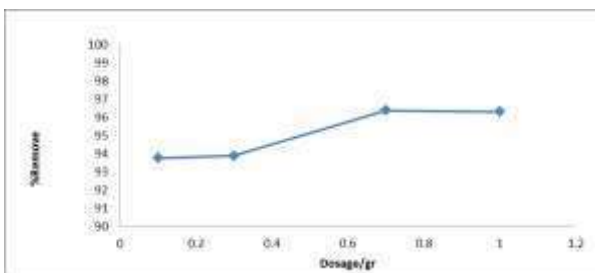


Fig. 10: The diagram of optimal amount of adsorbent for malachite green removal.

Investigating the removal percentages of malachite green based upon time

According to the diagram, rising time increases the removal percent. The highest removal percent occurs at t = 80 min. After t = 80 min, the removal percentage of malachite green decreases slightly.

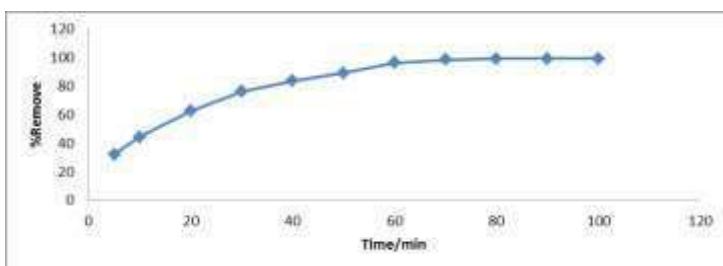
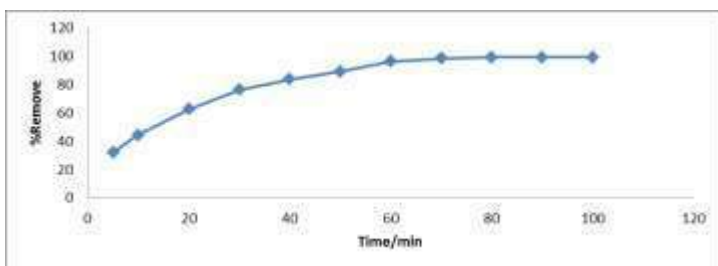


Fig. 11: The diagram of optimal time for removal.

Investigating the removal percentages of malachite green with different concentrations under the optimized conditions

[Fig. 12] shows the diagram of removal percent versus pollutant concentration under the optimized conditions (pH = 9, t = 80 min using 0.7 g of adsorbent). Increasing the initial concentration of color decreases the adsorption percent. The initial concentration is a driving force for overcoming the resistance of all dyes between aqueous and solid phases. As illustrated in Fig. 12, raising the concentration of dyes decreases the removal percent.

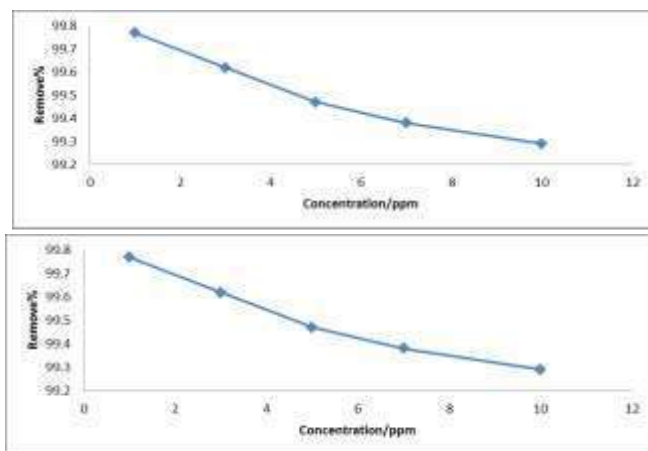


Fig. 12: The diagram of removal percent versus pollutant concentration.

CONCLUSION

The cellulose-zirconium dioxide nanoparticle was successfully synthesized. To investigate the catalytic activity of this nanoparticle, malachite green was used as a pollutant. The effect of various operating parameters on the malachite green removal was studied. The results showed that the highest percentage of removal occurs at pH = 9 and t = 80 min using 0.7 g of adsorbent and 10 ppm concentration of pollutant.

CONFLICT OF INTEREST

There is no conflict of interest.

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FINANCIAL DISCLOSURE

None

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DEPRESSION AND SEASON RELATIONSHIP

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ABSTRACT

Depression is a common psychiatric disorder characterized by a number of signs and symptoms which may include depressed mood, anhedonia, insomnia, weight loss, low energy, anorexia, difficulty in concentration, and suicidal thought. This study is a case-control clinical trial on 83 patients as the control group and 83 persons as the cases. The collected data were analyzed by SPSS and chi square. 8.5% of patients with depression had past history of viral disease in prenatal period, 32.5% of patients with depression were born on the summer and 16.9% were born on the winter but this difference was not significant. There was different prevalence in season of birth of patients (more on the summer than winter) but statistically not significant.

INTRODUCTION

Depression is a common psychiatric disorder characterized by a number of signs and symptoms which may include depressed mood, anhedonia, insomnia, weight loss, low energy, anorexia, difficulty in concentration, and suicidal thought. The lifetime prevalence of the condition in the general population is reported to be 10%–15%, but in women has been reported to be up to 25% [1–3]. Depression is much more common in women, occurring in a ratio of 2:1, and is the leading cause of disease-related disability in women [4, 5]. Mental health patterns in Iran are similar to those in other countries, but it seems that the prevalence of mental health disorders in Iran is lower than reported elsewhere. A review of the literatures showed a prevalence rate for depression of 4.29% in Iran [6, 7].

The etiology of depression is unknown but some factors are related for example: biologic factors, genetic factors, environmental factors and etc (one factor may be season of birth).

Fountoulakis et al reported the depressed patients as a whole did not show differences in birth season from controls. However, those patients born during the spring manifested higher HDRS (Hamilton depression rating scale) while those born during the summer manifested the lowest HAS (Hamilton anxiety scale) scores. DST (dexamethasone suppression test) non-suppressors were almost exclusively (90%) likely to be born during autumn and winter. No effect from the season of birth was found concerning the current severity of suicidal ideation or attempt [8].

National series of psychiatric inpatients studied in Scandinavian countries and in England and Wales have all shown that compared with live births in the general population, schizophrenic patients have a significant excess of births in the early months of the year. But there has been disagreement on whether a similar birth distribution holds for manic-depression. This research presents new data on the seasonal distribution of births of patients born in England and Wales between 1921 and 1955. Compared with all live births, manic-depression was associated with a significant excess of births in the first quarter, and a corresponding deficiency in the third quarter of the year. Neurotic depression showed no such association [9].

The season of birth influences the risk of schizophrenia, bipolar affective disorder and recurrent depressive disorder in England to a similar extent as other countries and suggests that at least a proportion of psychiatric disease could be prevented by ameliorating the risk factors responsible for these intriguing epidemiological observations [10].

Birth rates of people who later kill themselves show disproportionate excess for April, May and June compared with the other months. Overall, we found an increase of 17% in the risk of suicide for people born in the peak month ;spring-early summer; compared with those born in the trough month; autumn-early winter; this risk increase was larger for women (29.6%) than for men (13.7%) [11].

A significant decrease of births from March to July and an excess from August to November in OCD (obsessive compulsive) disorder patients as compared to the general population was noted, the relative risk of these months vs. the rest months of the year: 0.85 and 1.19. Effects of SOB (season of birth) in OCD were present in males but not in females. The findings support an effect of SOB in people with OCD, especially for men [12].

Humans born in winter months appear to have a higher risk for neurological disorders such as seasonal affective disorder, bipolar depression and schizophrenia [13].

KEY WORDS

Depression, season of birth, general population

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The slight seasonal variation in PPD (post-partum disorder) in our pilot study was not statistically significant [14].

Therefor some study showed there was a relation between some psychiatry disorder and season and our study was done about relation between season and depression.

METHODS AND MATERIALS

This study is a case-control clinical trial carried out in Shahid Mofeteh Clinic of Yasuj city in the South of Iran, 83 patients as the control group and 83 persons as the cases.

The patients with major depression were selected by psychiatrist and refer to researcher for this study. Demographic questionnaire (including seasonal birth), Beck depression rating scale and Hamilton rating scale were field for patients.

Inclusion criteria were being aged 15–60 years and a diagnosis of major depressive disorder on the basis of an interview, the Beck depression rating scale and Hamilton rating scale. Patients were excluded if they had received any antidepressant drug previously, had criteria for grief, adjustment disorder, and major depressive disorder with psychotic features, had concomitant axis II or III disorder and a history of bipolar disorder, or schizophrenia. Patients were excluded if they had alcohol abuse, substance abuse, cancer or any somatic disease, use of any antihyperlipidemic drugs and Women were excluded if they were pregnant or breast-feeding. This research was approved by the ethics committee and vice chancellor for research at Yasuj University of Medical Sciences. Patients were informed about the survey and written consent was obtained from all participants or their legal guardians.

The Beck depression inventory was used because it has been localized and validated for Iran. It also has appropriate reliability and validity (15 and 16).

For the Beck depression inventory, a score >10 was considered to be depression, within 10–19 scored as mild, 20–29 as moderate, 30–39 as partially severe, and >40 as severe depression (17 and 18).

Every participant had a score ≥20 (moderate to severe depression) of Beck depression rating scale completed Hamilton rating scale.

For Hamilton rating scale, a score of 0–7 is generally accepted to be within the normal range (or in clinical remission), while a score of 20 or higher (indicating at least moderate severity) is usually required for entry into a clinical trial (19 and 20).

The patients with Hamilton score ≥20 were selected.

The final results were supervised by psychiatrist.

The 83 persons were selected randomly in general population as control group, and Beck depression rating scale and Hamilton rating scale was field for patients and they were also visited by psychiatrist to determined not having psychological problem.

The cases were the same as control group by age, sex, weight, height and BMI (body mass index), marriage and educational level.

The collected data were analyzed by SPSS and chi square for comparing of mean of data.

RESULTS

There were approximately equal numbers of men and women in both treatment groups (22 men and 61 women in each group), and the age was between 20 and 40 years old, so the most was between 20 and 30. There was no significant difference between the two groups with regard to basic demographic data including age, gender, and educational level [Tables 1].

There was no significant difference between the two groups for mean Beck depression test scores before intervention [Table 1].

Depression was more between married than single(%71.1 to %26.5), low education more than high education(%36.1 to %8.5), female more than male(%73.4 to %26.6), unemployment more than high manager(%79.5 to %0.0) [Table 1].

8.5% of patients with depression had past history of viral disease in prenatal period, but there was no past history of viral disease in normal population at prenatal period [Table 1].

32.5% of patients with depression were born on the summer (the most) and 16.9% were born on the winter (the least) but this difference was not significant [Table 2].

Table 1: Variable index in patients and normal population

Index	normal No.(Percent)	Depression No.(Percent)	Total No.(Percent)
Male	22(%26.6)	22(%26.6)	44(%26.5)
Female	61(%73.4)	61(%73.4)	122(%73.4)
Single	22(%26.5)	22(%26.5)	44(%26.5)
Married	59(%71/1)	59(%71/1)	118(%71.1)
Widowed	2(%2.4)	2(%2.4)	4(%2.4)
Illiterate	10(%12)	10(%12)	20(%12)
Up to 5 class	30(%36.1)	30(%31.6)	60(%36.1)

From 6-8 class	18(%21.7)	18(%21.7)	36(%21.7)
From 9-12 class	18(%21.7)	18(%21.7)	36(%21.7)
Student of University	7(%8.5)	7(%8.5)	14(%8.5)
Unemployed	67(%80.7)	66(%79.5)	133(%80.1)
Farmer or non skill worker	3(%3.6)	4(%4.8)	7(%4.2)
Staff	8(%9.6)	10(%12)	18(%10.8)
Manager	0(%0)	0(%0)	0(%0)
Shopkeeper	5(%6.1)	3(%3.7)	8(%4.9)
History of Viral disease	0(%0)	7(%8.5)	7(%4.2)

Table 2: Depression and birth season

Index	Normal No.(Percent)	Depression No.(Percent)	Total No.(Percent)
Spring	21(%25)	19(%23)	40(%24)
Summer	23(%28)	25(%30)	48(%29)
Autumn	22(%27)	21(%25)	43(%26)
Winter	17(%20)	18(%22)	35(%21)
Total	83(%100)	83(%100)	166(%100)

X²=1.6 DF=3 P=0.64

DISCUSSION

Depression was more between female than male, married more than single, low education more than high education, unemployment more than manager. 8.5% of patients with depression had past history of viral disease in prenatal period, but there was no past history of viral disease in normal population at prenatal period. 32.5% of patients with depression were born on the summer (the most) and 16.9% were born on the winter (the least) but this difference was not significant.

Fountoulakis et al. reported; those patients born during the spring manifested higher HDRS while those born during the summer manifested the lowest HAS scores. Depressed patients as a whole did not show differences in birth season from controls. No effect from the season of birth was found concerning the current severity of suicidal ideation or attempts. In our research there was past history of viral disease and the depressed patients were born on the summer more than winter but statistically not significant.

Hare we reported the schizophrenic patients have a significant excess of births in the early months of the year and the manic-depression was associated with a significant excess of births in the first quarter and the neurotic depression showed no such association. Our research was about depression and the same as we report.

Disanto et al reported; at least a proportion of psychiatric disease could be prevented by ameliorating the risk factor/s, the same as our research that 8.5% of patients with depression had past history of viral disease in prenatal period.

Salib et al reported; an increase risk of suicide for people born in the peak month (spring-early summer) compared with those born in the trough month (autumn-early winter); this risk increase was larger for women than for men. In our research depressed patients were born on the summer more than winter but not significant.

Cheng et al reported; a significant decrease of births from March to July and an excess from August to November in OCD (an effect of SOB in people with OCD, especially for men). In our research depressed patients were born on the summer more than winter and some patients with depression had past history of viral disease in prenatal period.

Mark reported; humans born in winter months appear to have a higher risk for neurological disorders such as seasonal affective disorder, bipolar depression and schizophrenia. In our research depressed patients were born on the summer more than winter and some patients with depression had past history of viral disease in prenatal period.

Panthangi et al reported; the slight seasonal variation in PPD was not statistically significant, the same as our research that the depressed patients were born on the summer more than winter but not significant.

CONCLUSION

There was different prevalence in season of birth of patients (more on the summer than winter) but statistically not significant.

CONFLICT OF INTEREST

There is no conflict of interest.

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FINANCIAL DISCLOSURE

None

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