Available online at http://www.ijabbr.com

International journal of Advanced Biological and Biomedical Research

Volume 2, Issue 6, 2014: 2051-2060

The effect of magnetic water and calcic and potasic zeolite on the yield of Lepidium Sativum L.

Mohsen Ahmadee[*1], Abas Khashei Siuki[2], Seyed Reza Hashemi[2]

[1]*M.Sc. Student, Irrigation and Drainage, Birjand University, Iran*
[2]*Assistant Professor of Water Engineering, Birjand University, Iran*

ABSTRACT

The use of recent technologies for the increase of growth indexes and the plants yields is an important aspects and till now many research works for this has been done. One of these efforts is the usage of magnetic water and zeolite for the increase of yield plants. This research work is an study on the effects of magnetic water and zeolite that has been done on frame work of pore random design and by factorial method by 6 treatment and 6 iteration and totally in 36 plot for the Lapidium sativum L. plant in the research greenhouse of agriculture college of Birjand university in Iran. The treatment of water (in the form of common and magnetic water) was selected as the original treatment and zeolite treatment (on the form of calcic, potasic and without zeolite) selected as the secondary. The results showed that the effect of type of water on the dry weight roots, dry weight of stem, the ratio of stems to roots and roots to stems and leafs the 99 percent of confidence limits are meaningful. The variety of zeolite was a meaning full effects about 0.99 percentage of confidence on the growth percentage of plants, the length of leaf, the length leafs tail, the width of leaf, the wet weight of roots, the weight of leaves, the total dry weight of plant, the dry weight of leaves, the height of plant, the ratio of root to leaf and stem, the efficiency of water used in the confidence limits of 99 percents the length of root and the dry weight of stem within confidence limits of 99 percent and on ration of stem to root in confident limit of 95 percents are meaningful. ..the mutual effects of type of water and zeolite on the length of leaf tail, the dry weight of root and stem, the ratio of stem to root and ratio of root to stem and leaf showed the meaningful effects.

Key words: Magnetic water, Calcic zeolite, Potasic zeolite, Lepidium sativum L., Yield, Water use efficiency

INTRODUCTION

Increase of plant productions yield is the final aim in agriculture business. Till recent years many research works conducted to increase the plant's production yield. For example, some research works suggested chemical fertilizers to increase the plants yields. Then the chemical fertilizers can increase the plants yields but the negative effects of them on the products and water resource are obvious and frequent use of

Corresponding Author E-mail: m.ahmadee@yahoo.com

them cause the damage to environmental. Therefore, there are some needs to use of some soil fertilizer alternatives, that not to be harmful to environment. The use of zeolite for increase of water efficiency and increase of plants production is an important aspects towards sustainable agriculture. Zeolites belong to groups of alominosilicate minerals, that capable storage of water in the soil and increase soil fertility (Kazemian, 2004). Khashei et al., (2008) in a pure random frame work and in factorial basis by zeolite treatment in 4 doses (0, 2, 4 and 8 g/kg) of soil and 3 soil moisture depletion level (45, 65 and 85 percent accessible water), studied the yield production of corm and showed that the use of natural zeolite (clinoptilolite) are meaningful in corn production yields. Valnete et al., (1982) studied the effect of zeolite on two variety of tress as peach and grape showed that the use of zeolite increase the growth and products of these two trees. Burriesci et al.,., (1993-1994) showed that the use of zeolite cause the increase of emergence of spinach seeds and increase the tomato product yields in comparison of based control treatment. In another research work that in Italy, by addition of 35-100 g. zeolite per hectares in potato farm the increase of production research to 30-70 percent (Bedelean, 1997). Kavoosi and Rahimi (2013) reported that the effects of zeolite on rice product within confidence limit of 99 percent in Product of hay in 95 percent of confidence limit was meaningful. In another research works by the use of zeolite in colza farm shwes that the yield product increase considerably (Gholamhosseini, 2009). The use of magnetic water also increases the agriculture products. Pulsed electromagnetic fields showed that could replace hormones in vegetative propagation of oregano, stimulating rooting process in stem cuttings (Bilalis et al., 2012). The treat of magnetic water effect the absorption of calcium and phosphor in organic materials and the plants can easily absorb them and consequently increase their growth (Maheshwari and Grewal, 2009). The influence of magnetic treatment in two pea varieties proved favorable on the emergence, growth, development and the final seed yield (Podlesny et al., 2005). Magnetic fields promoted the germination ratios of bean and wheat seeds and moreover the treated plants grew faster than control (Cakmak et al., 2010). Line and Yotvat (1990) reported the increase of water efficiency in agricultural plants by magnetic water. The studies of Stiken and Turan (2004) and Danilov et al., (1994) showed that the use of magnetic water increase the numbers of fruits in plant such as cheery and tomato. The researcher works shows that the usage magnetic water and zeolite was increased the production yields of Lepidium Sativum L.

MATERIALS AND METHODS

The present research work conducted in the year (2013) in research greenhouse of agricultural college of Birjand university. This experiment conducted in the form of pure random blocks and by factorial method, 36 pot by the height of 20 cm and 15 cm diameter was used as the experimental treat. The 18 pot was irrigated by magnetic water (Wm) and 18 another pot was irrigated by tap water (W0), In any irrigation treatment, 3 treat of soil without zeolite (Z0) and potasic zeolite (Zk) by diameter of 0.5-1 mm and calcic zeolite (Zca) by diameter of 0.5-7 mm in 6 iteration was applied. For magnification of irrigation water a constant magnetic by 44 mT magnet field was used. The required water of all treat was calculated and prepared by submerging the magnet into the vessel for 24 hrs before irrigation (Kiani, 2007). For the treats, containing zeolite at the ratio of 4% weight of soil the amount zeolite has been added. For the irrigation of plots, the freeboard of 2 cm has been kept away in the vessel. In any plots 30 seed by the equal distance and in the depth of 1 cm were planted. The seed by the germination rate of 95%. The first irrigation held immediately after cultivation of seeds and soil was saturated. The characteristic of used soil has come in the table 1. The characteristics of irrigation water presented in table 2 and the characteristics of used calcic and potasic zeolite presented in table 3, 4 and 5 respectively. After the end of emergence period, weeding for the purpose of homogeneity in the number of plants carried out

in the pots. This experiment conducted within 6 weeks and then the treats for the purpose of experiments took away. To take out the roots firstly the soils around the plant by digging a profile and then by the use of a plate the distillated water used to wash the roots zone of plants in the soil lab. The wet and dry weight of branches, roots and stems calculated by a digital weightier with the accuracy of 0.0001 gr. Moreover the length of leaves, roots and stems and the width of leaves by a ruler by the accuracy of 0.1 cm measurement. For the estimation of leaf area index, the LAI parameters apparatus by the accuracy of 0.01 cm^2 used. The wet particles of plants after weighting kept for the period of 48 hrs in Owen in the temperature of 70 ^oC and then weighted. The comparison of mean weights carried out by the Tukey test of probability method and for data analysis, the software of SAS 9.1.3 was used.

Table-1. Soil properties used in the design

Organic Matter	Organic carbon	Total Ca (mg/l)	pH	EC (ds/m)	Sand (%)	Silt (%)	Clay(%)	Texture
0.29	0.17	15	7.98	0.46	48	42	10	Loam

Table-2. Water properties used in irrigation

K (mg/l)	Na (mg/l)	Cl (meq/L)	HCO3- (mg/l)	CO3-2 (mg/l)	Mg (mg/l)	Ca (mg/l)	pH	EC (ds/m)
3.3	56.916	1.8	0.5	0.1	0.11	0.45	7	۰/۰۸۷

Table-3. Components of casic zeolite

SiO_2 (%)	Al_2O_3 (%)	Fe_2O_3 (%)	CaO (%)	Na_2O (%)	K_2O (%)	MgO (%)	TiO_2 (%)	MnO (%)	P_2O_5 (%)	Type of zeolite
70.95	7.88	1.31	2.21	3.00	3.67	0.62	0.162	0.022	0.013	Calcic zeolite
L.O.I (%)	SO3 (%)	Cl (ppm)	Ba (ppm)	Sr (ppm)	Cu (ppm)	Zn (ppm)	Pb (ppm)	Ni (ppm)	Cr (ppm)	Type of zeolite
8.13	1.345	3504	1154	399	54	5	39	12	7	Calcic zeolite

Table-4. Components of casic zeolite

SiO_2 (%)	Al_2O_3 (%)	Fe_2O_3 (%)	CaO (%)	Na_2O (%)	K_2O (%)	MgO (%)	TiO_2 (%)	MnO (%)	P_2O_5 (%)	Type of zeolite
70.25	7.68	0.91	1.12	3.10	3.43	0.39	0.153	0.017	0.006	Calcic zeolite
L.O.I (%)	SO3 (%)	Cl (ppm)	Ba (ppm)	Sr (ppm)	Cu (ppm)	Zn (ppm)	Pb (ppm)	Ni (ppm)	Cr (ppm)	Type of zeolite
11.84	0.600	2049	1158	666	56	2	27	5	6	Calcic zeolite

RESULTS AND DISCUSSION

The result of variance differentiation showed in table 5. The treat of water on the root dry weight index, the dry weight of stem, the stem to root ratio, the ratio of root to stem and leaf within the confidence of 99 percent was meaningful. The zeolite treat on emergence percentage index, the length of leaf, width of leaf, leaf area index, the total wet weight, the wet weight of root, the wet weight of leaf, the total dry weight, the dry weight of leaf, height of plant, the ratio of stem to root and the water use efficiency in the confidence limit of 99 percent showed the meaningful effects. This treat within the confidence limit 99 percent on the root length index, the length of leaf tail, the dry weight of stem by 95 percent confidence limit over root to stem and leaf ratio index showed a meaningful effects. These result coincides by the study of Khashei et al., (2008) in the meaningful effect of zeolite in water use efficiency in corn, also studied by Ahmadee et al., (2013) in effect of zeolite in cumic emergence percentage and the study of Gholizadeh et al., (2006) on the meaningful effect of zeolite on total wet weight of plant the medical plants of Dracocephalum moldavica. The interaction of water and zeolite shows the meaningful effects on the dry weight stems and the ratio stem to root at the confidence limits of 99.9 percent. Result show that the interaction of water and zeolite had a confidence effect on dry weight of root and ratio of root to stem and leaf (Percentage error<0.01) and had a meaningful effect on leaf tail length (Percentage error<0.05).The comparison of mean values based on the type of used water showed on table nr. 6. The use of domestic water against magnetic water showed increase on values as 1.41 time for dry weight of root, 1.61 time for dry weight of stem and increases the ratio of root to stems and leaves equal to 1.50 times. However, the domestic water increased the dry weight of dry roots and stem, but the rate of increase of dry weight of stem was more. The results of this treat showed the ratio of stem to root. Compare to magnetic water showed the reduction of 1.49 times. The type of water did not showed meaningful effects on the other components. These results considers to Rangbar et al., (2012), they show the wheat production did not affected dry types of water (magnetic water or domestic water). The comparison of mean values based on type of used zeolite show in the table nr 7. Result showed that potasic zeolite low paire to calcic zeolite and the base soil shpwed the more effect on Lepidium sativum L. production. The use of potasic zeolite cause the increase of root yields, the length of leaves, the the length of leaf tail, the width of leaf, leaf Area index, the total wet weight, the wet weight of root, the wet weight of leaf, the total dry weight, the dry weight of root, the dry weight of stems, the dry weight of leaf, the height of plant, the ratio of stem to leaf and the water use efficiency. The use of potasic zeolite and and calcic zeolite makes the increase of emergence percentage but the use of zeolite did not have any effect on the stem length. The use of zelite reduced the ratio of roots to stems and leaves in the control treat.

Table-5. The results of differentiation of variance (F test) of mean error least square method of elements.

Water use efficiency	Root to stem and leaf ratio	Stem to root ratio	Plant height	Dry weight of stem	Dry weight of leaf	Dry weight of root	Total dry weight	Wet weight of leaf	Wet weight of root	Total wet weight	Leaf area index	Width of leaf	Length of leaf tail	Length of leaf	Length of root	Length of stem	Percentage of germination	Variation
12.14^{ns}	17.99^{***}	37.57^{***}	2.16^{ns}	21.36^{ns}	0.04^{ns}	18.76^{***}	0.4477^{ns}	0.22^{ns}	3.19^{ns}	1.09^{ns}	0.43^{ns}	0.30^{ns}	0.03^{ns}	0.03^{ns}	1.75^{ns}	1.93^{ns}	0.05^{ns}	Water
4.23^{***}	4.22^{*}	12.18^{***}	9.20^{***}	8.38^{**}	13.25^{***}	1.03^{ns}	20.84^{***}	37.13^{***}	9.67^{***}	43.01^{***}	20.66^{***}	10.17^{***}	7.48^{**}	18.68^{***}	8.36^{**}	1.82^{ns}	10.65^{***}	Zeolite
3.25^{ns}	7.24^{**}	15.35^{***}	1.74^{ns}	13.61^{***}	1.77^{ns}	8.48^{**}	1.59^{ns}	2.62^{ns}	0.21^{ns}	1.78^{ns}	2.03^{ns}	1.71^{ns}	3.84^{*}	1.55^{ns}	2.23^{ns}	3.07^{ns}	1.82^{ns}	Water*Zeolite
0.0011	0.0044	1.35	2.16	0.00005	0.00028	0.0003	0.00037	0.0021	0.0003	0.0026	39125.1	0.04	0.26	0.07	2.56	2.14	143.76	error

Ns, *, ** and *** are non significant, significant at 5, 1 and 0.1% probability levels, respectively.

Table-6. The comparison of mean values based on type of water.

Water use efficiency (kg/m^3)	Root to stem and leaf ratio	Stem to root ratio	Plant height (cm)	Dry weight of stem (gr)	Dry weight of leaf (gr)	Dry weight of root (gr)	Total dry weight (gr)	Wet weight of leaf (gr)	Wet weight of root (gr)	Total wet weight (gr)	Leaf area index (cm^2)	Width of leaf (cm)	Length of leaf tail (cm)	Length of leaf (cm)	Length of root (cm)	Length of stem (cm)	Percentage of germination	Type of water
0.2203^{a*}	0.283^{a}	4.832^{a}	5.74^{a}	0.0314^{a}	0.0806^{a}	0.0274^{a}	0.1275^{a}	0.1458^{a}	0.0224^{a}	0.1740^{a}	806.702^{a}	0.92^{a}	2.82^{a}	1.66^{a}	5.74^{a}	1.25^{a}	69.81^{a}	Domestic water (W_0)
0.2286^{a}	0.188^{b}	7.209^{a}	6.46^{a}	0.0195^{b}	0.0817^{a}	0.0194^{b}	0.1325^{a}	0.1530^{a}	0.0339^{a}	0.1920^{a}	847.996^{a}	0.96^{a}	2.85^{a}	1.68^{a}	6.45^{a}	1.92^{a}	68.88^{a}	Magnetic water (W_m)

* Means with the same letter(s) in each row have not significantly difference based on Tukey's test ($p \leq 0.05$).

Table-7. The comparison of mean values based on type of zeolite.

Water use efficiency (kg/m^3)	Root to stem and leaf ratio	Stem to root ratio	Plant height (cm)	Dry weight of leaf (gr)	Dry weight of root(gr)	Dry weight of stem (gr)	Total dry weight (gr)	Wet weight of leaf (gr)	Wet weight of root (gr)	Total wet weight (gr)	Leaf area index (cm^2)	Width of leaf (cm)	Length of leaf tail (cm)	Length of leaf (cm)	Length of root (cm)	Length of stem (cm)	Percentage of germination	Type of zeolite
0.190^{b}	0.273^{b}	4.90^{b}	5.27^{b}	0.067^{b}	0.0228^{a}	0.0197^{b}	0.110^{b}	0.088^{b}	0.012^{b}	0.105^{b}	631.71^{b}	0.78^{b}	2.47^{b}	1.45^{b}	4.68^{b}	1.34^{a}	56.66^{b}	Control (Z_0)
0.208^{b}	0.239^{b}	5.92^{b}	5.45^{b}	0.074^{b}	0.0221^{a}	0.0241^{b}	0.120^{b}	0.118^{b}	0.026^{b}	0.150^{b}	716.55^{b}	0.89^{b}	2.77^{ab}	1.49^{b}	6.26^{ab}	1.18^{a}	73.05^{a}	Calcic zeolite (Z_{ca})
0.274^{a}	0.194^{a}	7.23^{a}	7.59^{a}	0.101^{a}	0.0252^{a}	0.0324^{a}	0.159^{a}	0.241^{a}	0.046^{a}	0.293^{a}	1133.78^{a}	1.66^{a}	3.27^{a}	2.07^{a}	7.34^{a}	2.24^{a}	78.33^{a}	Potasic zeolite (Z_K)

* Means with the same letter(s) in each row have not significantly difference based on Tukey's test ($p \leq 0.05$).

Table-8. The comparison of mean values based on type of water and zeolite.

Water use efficiency (kg/m^3)	Root to stem and leaf ratio	Stem to root ratio	Plant height (cm)	Dry weight of leaf (gr)	Dry weight of root (gr)	Dry weight of stem(gr)	Total dry weight (gr)	Wet weight of leaf (gr)	Wet weight of root (gr)	Total wet weight (gr)	Leaf area index (cm^2)	Width of leaf (cm)	Length of leaf tail (cm)	Length of leaf (cm)	Length of root (cm)	Length of stem (cm)	Percentage of germination	Type of water and zeolite
0.192^{b*}	0.261^{a}	5.17^{b}	5.50^{b}	0.0668^{b}	0.0220^{bc}	0.0229^{bc}	0.117^{b}	0.084^{b}	0.007^{b}	0.098^{b}	668.04^{c}	0.83^{ab}	2.57^{b}	1.45^{c}	4.98^{b}	1.48^{a}	62.22^{ab}	W0Z0
0.189^{b}	0.320^{a}	4.34^{b}	5.03^{b}	0.0676^{b}	0.0266^{ab}	0.0159^{c}	0.1101^{b}	0.094^{b}	0.022^{b}	0.120^{b}	648.20^{c}	0.78^{b}	2.43^{b}	1.38^{c}	5.98^{ab}	1.21^{a}	69.44^{ab}	W0ZCa
0.278^{a}	0.268^{a}	4.97^{b}	6.70^{ab}	0.1075^{a}	0.0336^{a}	0.0197^{bc}	0.1608^{a}	0.259^{a}	0.037^{ab}	0.303^{a}	1227.74^{a}	1.17^{a}	3.48^{a}	2.17^{a}	6.27^{b}	1.05^{a}	77.78^{a}	W0ZK
0.187^{b}	0.286^{a}	4.62^{b}	5.05^{b}	0.0686^{b}	0.0237^{bc}	0.0165^{c}	0.1089^{b}	0.092^{b}	0.016^{b}	0.180^{b}	595.38^{c}	0.73^{b}	2.38^{b}	1.47^{c}	4.38^{b}	1.20^{a}	51.11^{b}	WmZ0
0.226^{ab}	0.159^{b}	7.50^{a}	5.86^{b}	0.0814^{ab}	0.0176^{c}	0.0324^{ab}	0.1315^{ab}	0.143^{b}	0.030^{ab}	0.180^{b}	$784.90b^{c}$	1.00^{ab}	3.12^{ab}	1.60^{bc}	6.55^{ab}	1.15^{a}	76.67^{a}	WmZCa
0.271^{a}	0.120^{b}	9.50^{a}	8.48^{a}	0.0952^{ab}	0.0168^{c}	0.0451^{a}	0.1573^{a}	0.223^{a}	0.055^{a}	0.283^{a}	1039.82^{ab}	1.16^{a}	3.07^{ab}	1.98^{ab}	8.41^{a}	3.43^{a}	78.79^{a}	WmZK

* Means with the same letter(s) in each row have not significantly difference based on Tukey's test ($p \leq 0.05$). Z_0, Z_{ca} and Z_k indicant Control treatment, Ca zeolite and K zeolite, and W_0 and W_m indicant domestic and magnetic water, respectively.

In table 8 the comparison of means between type of water and zeolite has been showed. The percentage of emergence by the use of calcic zeolite in the magnetic water treatment and potasic zeolite in both treatments got the highest rank. In the magnetic water and potasic zeolite treatments the amount of used water was in the highest rank. In magnetic water treatments the use of potasic zeolite the percentage of emergence compare to control treat show and the increase of 1.54 time and in the domestic water treatment this increase was about 1.25 times. That these results considers by the research results of Ahmadee et al., (2013). They showed that the use of potasic by 2 weighting percent, the emergence percentage of cumic compare to control treat increase by 2.1 times. The length of root by usage of calcis zeolite in magnetic water treat showed the shorten length of root but this treat from the statistical points of view did not showed the vast different by the potasic zeolite and control treat in the domestic water treatment. These results considers with the report of huang and petrovic (1996) that considered the growth of roots of grape in improved sandy soils. The highest length of leaf tail, leaf area index and the dry weight of leaf n calcic zeolite observed by the domestic water treatment. The lowest amount for the mentioned index factors in the control treat treatment by the use of magnetic water. Therefore, the abusage of zeolite makes a meaningful effects on the mentioned indexes. Gholamhosseini et al., (2008) reported that the increase of leaf area index was under effect of zeolite. The results aboute the increase of leaf area index also coincides by the results of Gholizadeh et al., (2006). The width of leaf was the highest by the use of potasic zeolite in both treatment of different water. But in the treats of control treat soil in magnetic water and calcic zeolite showed the least amount. But these treats did not effects the length of stem. The highest height of plants (the total amounts of stem, leaf tail and leaf) yield in the potssic zeolite and magnetic water treat.

As a result the use of potasic zeolite was the meaningful in the length of plants members that in coinseides By the result of ahmadi dahaj et al., (2009) conducted for the length of tomato root and the the higthest of this plant. Madani et al., (2009) and khashei siuki et al., (2008) were reported the effects of zeolite on the increase of length of potato and corn plants. The total wet weight, wet Wight of leaf and the total dry weight in the potasssic zeolite treats without consideration of type of water showed the highest amount compare to other treats that considers by the result of gholamhosseini et al., (2008). These researchers work on the effect of zeolite on the increase of dry weight of spring canola that this index meaningfully under effect of different used zeolite amounts. Also it has been observed that the water use efficient in these treats was the most. The dry weight of stem in use of calcic zeolite by domestic water and control soil in magnetic water was the least. In potasic zeolite treat by the magnetic water showed the highest amount. The increase of weight of stem in this treats were 2.83 and 2.73 times more than the treats calcic zeolite of control soil. The dry weight index of root under effect of calcic zeolite in domestic water treat showed the highest amount of the treat by the magnetic water showed the least amount the dry weight index of leaf by the use of potasic zeolite in domestic water treat showed the weight amounts and the least amount was belong to the calcic zeolite in the treat of domestic water and control soil in both treatments. Therefore the ratio of stem to root the treat contained zeolite in magnetic water highest amount was observed. Because the dry weight of stem in them was more than the other treats and the dry weight of root were the least. In ratio of root to hoot the results showed that the inverse situation and the treats contained zeolite in magnetic water show the least amounts. As the results, the dry weight shoot of these treats got increased while the dry weight of root got decreased. The amount of wet weight in the magnetic water and domestic water treats contain calcic zeolite compare to control treat in the (same water treat) increased by 2.50 and 3.09 the respectively. This increased in the dry weight index shows 1.44 and 1.43 time respectively. The wet weight of leaf and dry weight of leaf the amount of increase in potasic zeolite compare to control were 3.08 and 1.60 in domestic water use and 2.42 and 1.38 in

magnetic water therefore the use of domestic water and potasic zeolite shows the more increase in production yield in this plant.

CONCLUSION

In this research by the use of calcic and potasic zeolite along with domestic and magnetic water treatments, the increase on the product of lepidim sativum L. were investigate the results shows that the use of domestic water showed the meaningful positive effect on the dry weight of roots. Dry weight of stems but in overall the type of the water did not show any effects on the production yield of the plant, which probably it is because of low salinity of water. But the type of zeolite showed the meaningful effects on any production yield components. Between the used the zeolite, potasic zeolite in the type of soil had the better effect on the production. The use of potasic zeolite without consideration of type of water, increase the emergence index, weight of leaf, the total wet weight, the wet weight of leaf and total dry weight of plant and more water use efficiency. By the use of this type of zeolite with magnetic water treat, the root and shoot, the wet weight of root and dry weight of stem increased. The uses of this zeolite along with domestic water were effective in increase of leaf length, leaf tail length, and dry weight of root and dry weight of leafs. All research works were based on use or not to use zeolite since till no any research work conducted on the effect of type of zeolite and the agriculture production yield. In this research work by the use of two type of zeolite we reached in different result. Although the result of different study recommended the use of zeolite by in same works the efficiency of zeolite were reported, although zeolite increased the mentioned of water use soil. In the present research recommended the use of zeolite to increase the agriculture production efficiency and used water. In addition, for future recent work recommends that to increase the experiments and zeolite verity.

ACKNOWLEDGEMENT

We here-by acknowledge the Afrazand company for the help to preparation of zeolite materials and special thanks to the Mr Mehran Rajabi in this company.

REFERENCES

Ahmadee, M., Khashei Siuki, A., Bagheri Moghadam, M. 2013. Evaluation of effect of potasic zeolite on the time and percentage of cumin emergence. 12th national conference of irrigation and evaporation reduction. University of shahid bahonar, Kerman, Iran. [in Persian].

Ahmadi Dahaj, M., Ghesemnezhad, M., Zavareh, M., Shiri, M. A., 2012. Effect of Tea Waste and Zeolite as a Growing Substance in Soilless Culture on Growth and Quality of Tomato Fruit, Agriculture science pub. And sustainable development. 22(2): 55-65. [in Persian with abstract English].

Bedelean, I. 1997. Properties and utilization of natural zeolites. program and abstract. ischia. proceeding 5th International conference on the Occurrence. Naples. Italy.

Bilalis, D., Katsenios, N., Efthimiadou, A., Karkanis, A., Efthimiadis, P. 2011. Investigation of pulsed electromagnetic field as a novel organic pre-sowing method on germination and initial growth stages of cotton. Electromag Biol Med. 31(2):143-150.

Burriesci, N., Valente, S., Ottana, R., Cimino, C., Zipelli, C. 1983. Utilization of zeolites in spinach growing. Zeolites. 4:5-8.

Burriesci, N., Valente, S., Zipelli, C., Bart, J. C. J. 1994. Studies on zeolite in agriculture, Effect on crop growth of prunus petsica and vinifera. Zeolites. 4:373-376.

Cakmak, T., Dumlupinar, R., Erdal, S. 2010. Acceleration of germination and early growth of wheat and bean seedlings grown under various magnetic field and osmotic conditions. Bioelectromagnetics. 31: 120-129.

Danilov, V., Bas, T., Eltez, M., Rizakulyeva, A., 1994. Artificial magnetic field effects on yield and quality of tomatoes. Horticulturae. 366:279-285.

Esitken, A., Turan, M., 2004. Altering magnetic field effects and plant nutrient element composition of strawberry. Soil & Plant Science. 54:135-139.

Gholamhosseini, M., Agha Alikhani, M., Malakoti, M. 2009. The effect of different level nitrogen and zeolite on quality and quantity production of spring canola. Agriculture and natural resource science and technology. 12(45): 537-548. [in Persian].

Gholizadeh, A., Esfahani, M., Azizi, M. 2006. The study on the effect of different levels of zeolit and water stress on charactristics and quality of moldavian balm. Journal of Pajouhesh & Sazandegi. 73: 96-102. [in Persian].

Huang, Z., Petrovic, A. M. 1996. Clinoptilolite zeolite effect on evapotranspiration rate and shoot growth rate of creeping bentgrass on sandbuse greens. Turfgrass Management. 1(4):1-9.

Kavoosi, M., Rahimi, M. 2001. The effect of zeolite in rice production. 8th congress of Iranian soil science. Guilan university. [in Persian].

Kazemian, H. 2004. Introduction on zeolite, A miracle mineral. Behesht publication. Tehran. Iran. 126 pp. [in Persian].

Khashei Siuki, A., Kochakzadeh, M., Shahabifar, M. 2008. Effect of application of natural zeolite clinoptilolite and soil moisture on corn yield component. Journal of Soil researchs (water and soil science). 22(2): 235-241. [in Persian].

Kiani, A. 2007. The magnetic water, A new innovation on increase of water efficiency. Zaiton monthly magazine. No. 183. [in Persian].

Line, I. J. Yotvat, J., 1990. Exposure of irrigation and drinking water to magnetic field with controlled power and direction. Magnetism and Magnetic Materials. 83:525-526.

Madani, H., Farhadi, A., Pazeki, A., Changizi, M. 2009. The effect of different level of nitrogen and zeolite on quality and quantity characteristics of potato, Agria variety (case study: Arak). New reconvene in agriculture. 3(4): 379-391.

Maheshwari, B. L., Grewal, H. S., 2009. Magnetic treatment of irrigation water: Its effects on vegetable crop yield and water productivity. Agricultural Water Management. 96:1229-1236.

Podlesny, J., Pietruszewski, S., Podlesna, A. 2005. Influence of magnetic stimulation of seeds on the formation of morphological features and yielding of the pea. Int Agrophysics. 19: 61-68.

Rangbar, Gh., Roosta, M., Cheraghi, S. A., 2012. An estimation of magnetic water on growth index of wheat in soil salinity, Journal of water resource in agriculture. 26(3):263-274. [in Persian].

Valente, S., Burriesci, N., Cavallaro, S., Galvagno, S., Zipelli, C., 1982. Utilization of zeolite as soil conditioner in tamato-growing. Zeolites. 2(4): 271-274.