Available online at www.scholarsresearchlibrary.com

Scholars Research Library

Annals of Biological Research, 2013, 4 (5):204-207
(http://scholarsresearchlibrary.com/archive.html)

Scholars Research Library
ISSN 0976-1233
CODEN (USA): ABRNBW

Effect of potassium and Zeolite on seed, oil and, biological yield in safflower

[*1]Smimeh Khodami Abasiyeh, [2]Amir Hossein Shirani Rad, [1]Babak Delkhoush, [1]Gorban Noor Mohammadi and [3]Hadis Nasrollahi

[1]Department of Agronomy, Islamic Azad University, Science & Research Branch, Tehran, Iran
[2]Seed and Plant Improvement Institute, Karaj, Iran
[3]Department of Agronomy, Islamic Azad University, Khorramabad, Iran

---

ABSTRACT

One of the most important issues, that it should be considered is proper nutrition during growth of the crop. In addition, provide all the nutrients needed by plants sufficiently to produce more and better quality.In order to study the effect of potassium and zeolite on the seed, biological and, oil yield in an experiment in a factorial randomized complete block design with three replications conducted in the 2011-12. Potassium in these experiments in four levels (0, 50, 100, 150 kg/ha) and zeolite in two levels (0, 10 tons/ha) were studied. The attributes studied in this experiment, including seed yield, biological yield, harvest index (HI), and oil yield. Results showed that between the levels of potassium and zeolite and their interaction are significant at the 1% level. Maximum seed yield obtained with consuming maximum amount of potassium and zeolite (793.2kg/ha).

Keywords*:* Safflower, potassium, zeolite, yield, yield components

---

INTRODUCTION

Potassium is an essential element for all living creatures and in physiology and metabolism in plants, not only in the eyes of amount in the plant tissue, but also in terms of physiological and chemical functions in the most cation (Mengel and Kirkby, 2001). Potassium is play special role in plant survival under environmental stress.

In potassium deficiency conditions, the sensitivity of plants to environmental stress increases (Cakmak, 2002).So that in the stress condition generated the reactive oxygen radicals in plants are highly motivated(Cakmak, 2005). Research in sunflower shows that potassium significantly increased seed number per head, harvest index, and oil yield(Soleimanzadeh et al, 2010). Experiments show that the application of potassium fertilizers has an essential role in increasing the yield of corn (Malakooti and Lotfollahi, 1999). Increased use of potassium (potassium sulfate source) in soybean is associated with increased yield (Azizi, 1998, and Beiknejad, 2007). Increased potassium application by increasing the number of filled seeds per head caused increase in seed yield of sunflower (Chaudhry and Mushtag, 2004). One of the ways to preserve soil moisture and prevent functional decline,is the use of zeolite mineral (Daneshmandi and Azizi, 2009). zeolites are group of hydrate aluminosilicate crystalline with porous microstructure that contains and exchangeable cations in alkaline group, i.e. Na^{+}, K^{+}, mg^{2+}, Ca^{2+} in the form of reversible attract water again to swap some of their construction(Glifton, 1985). Zeolite has fertility property of soil and water conservation temperature and storage water (Kazemi, 2004). Zeolite with their crystalline structures and porous materials that act as molecular sieves and with having a high cation exchange capacity causes reform soil and can better plant growth in sandy soil.

MATERIALS AND METHODS

In order to evaluate the reaction of safflower to different values of potassium and different humidity conditions, the use of zeolite and disuse of zeolite, a factorial experiment in a completely randomized block design with three replications in crop year 2011-12 at the research farm in Qazvin was done.

Factors examined included two irrigations level (routine irrigation (control) and irrigation from flowering stage to the next) and four levels of potassium (0,50, 100, 150 kg/ha) and Zeolite in two levels(0,10 Ton/ha). Goldasht variety was used in this experiment. Each plot has 6 line with 4 meters height, with 30 cm to 50 cm spacing between rows. Row plant spacing was 5 cm and a density was 67 plants per square meter. Plant nutrition and fertilization based on soil testing and fertilization recommendations. Generally for provide potassium use the source of potassium sulfate, and to provide phosphorus use the resource of triple superphosphate that were applied before planting. For provide nitrogen from urea in three stages (one-third before planting, one- third in the 2 to 4 leaf and one- third in stem elongation) were used.

Finally, traits such as seed yield, oil yield, biological yield, and harvest index measured. Then use the combine, the grain separated and the seeds weight for each plot calculated and seed yield per plot obtained. By dividing the seed yield on biological yield, harvest index was determined. After determining the oil content of seeds per plot, with multiply it in seed yield, oil yield obtained.

RESULTS AND DISCUSSION

Seed yield

Seed yield is the most important factor in crop production. Based on the results of analysis of variance, this trait at 1% level probability was under effect of all simple effects (Table 1). So that maximum seed yield with 150 kg/ha potassium (2818 kg/ha) and minimum yield with disuse potassium (1877kg/ha) obtained (Table 2). Maximum and minimum seed yield respectively with use 10 tons per hectare Zeolite (2729.75 kg/ha) and without zeolite (2143.75 kg/ha) resulted (Table 2). Duncan test results also showed that the interaction of K × zeolite with the highest potassium and zeolite tasted, maximum seed yield (2973kg/ha) obtained (Table 3). Increasing use potassium was associated with increased yield (Fanaie et al, 2009). During the examin on the effect of potassium on yield and nutrient use efficiency of rapeseed reported seed yield significantly affected ,so that compared with the control treatment (lack of potassium) treatments that received 150 and 300 kg/ha potassium had the 17.5 and 31.7 percent higher performance (Jianwei et al., 2007).

Oil yield

This trait is statistically affect of the simple effect of K, zeolite and interaction K× zeolite and showed significant differences at 1% level probability (Table 1). So that maximum and minimum oil yield obtained from 150 kg/ha(972.1 kg/ha), and lack of potassium (615.0 kg/ha) respectively (Table 2). Duncan test results also showed that the interaction of K × zeolites and zeolite tested with the highest amount of potassium, the maximum oil yield (1036 kg/ha), obtained (Table 3). The research was conducted on the safflower plant showed that potassium deficiency reduces oil yield (Gerendas and Sattelmacher, 2008). Research shows that potassium significantly increased seed number per head, harvest index, and oil yield in sunflower (Soleimanzadeh et al, 2010).

Biological function

According to Table 1, this trait statistically was under the simple effect of potassium, zeolites and interaction zeolite × K at the 1% level probability. Thus, the maximum biological yield by use 10 tons/ha zeolites (15450.12 kg/ha) and lowest biological yield with the disuse of zeolite (13984.12 kg/ha) was obtained (Table 2). Maximum biological yield by use 150 kg/ ha potassium (15680 kg/ha) and disuse potassium minimum biological yield (13360 kg/ha) obtained respectively (Table 2). Duncan test results also showed that the interaction of K × zeolites and zeolite tested with the highest uses potassium, maximum biological yield (16150 kg/ha) obtained (Table 3). Omidi et al. (2007), express biological yield loss due to reduced dry matter accumulation.

Harvest index

According to Table (1) this trait statistically was under the simple effect of potassium, zeolites and interaction zeolite × K at the 1% level probability. Thus, the maximum harvest index by use 150 kg/ha (17.49%) and the lowest harvest index with disuse potassium (12.95%) obtained (Table 2). The highest harvest index with the highest amount of potassium and zeolite used in this experiment (18%) and the lowest harvest index without using potassium and zeolite (11.05%), obtained (Table 3). In an experiment on sunflower showed that maximum obtained in Yoroflor variety by use 75 kg/ha potassium sulfate and water consumption after 210 mm evaporation from class A pan. The highest number of seeds per head obtained in irrigation after 210 mm evaporation treatment and the consumption of 175 kg/ha of potassium (1120 numbers) and minimum obtained from irrigation after 70 mm evaporation treatment and the use of 75kg/ha potassium (681 numbers) (Afkari bajehbj et al.2009).

table1: Analyzes of variance of traits

HI	Biological yield	Oil yield	Seed yield	df	S.O.V
14.758/758**	3079027.938**	125907.063**	795366.188**	2	replication
50.079**	12715563.250**	302482.472**	2111543.500**	3	k
90.77**	25789872.00**	604803.00**	412.752.00**	1	zeolite
7.510**	888228.50**	27000.50**	206142.50**	3	zeolite×k
0.856	92783.271	4923.440	31316.321	30	error
15.89	12.07	18.49	17.26		CV(%)

,significant at 5 and 1%,NS:not significant*

Table2: Means comparison of simple effects of traits

HI (%)	Biological yield (Kg/h)	Oil yield (Kg/h)	Seed yield (Kg/h)	treatments
				k
12.95c	13360d	615.0c	1877c	0
15.42b	14510c	797.8b	2364 b	50
16.99a	15320b	29.7a	2689a	100
17.49a	15680a	972.1a	2818a	150
				zeolite
14.33b	13984.12b	714.12b	2143.75b	0
17.08a	15450.12a	938.62a	2729.75a	10

Means of each trait in each group with at least one letter in common have no significant difference at 5% probability level.

REFERENCES

[1]Afkari bajehbaj, A., Gasimov, N. and Yarnia, M. **2009**. *J.Food, Agriculture and Environment*, 7(3&4):448-451.
[2]Azizi,M. **1998**.The effect of different irrigation regimes, agronomic characteristics, physiological, and biochemical soybean. Ph.D. dissertation, Department of Agriculture, Ferdowsi University of Mashhad, 143 p.
[3] Beiknejad, p. **2007**. Different amounts of potassium and magnesium on agronomic traits of soybean genotypes. Master's thesis ,Azad university Bojnourd Branch, 78 pp.
]4]Chaudhry, A. U. and Mushtag, M.**2004**. *Pakistan J. of Biological Sciences*.2(3):887-888.
[5]Cakmak, I. **2002**. *Plant Soil*. PP.3-24.
[6]Cakmak, I. **2005**. *J. plant Nutr.* 168:521-530.
[7]Fanaie, c. R, M. Galoie, m. Kafi, Ghanbari. A.H. Shirani Rad, **2009**. *Journal of Agricultural Sciences*. (3) :291-273.
[8]Gerendas،J.,Sattelmacher,B.**2008**. *Journal of Plant Nutrition and Soil Science*.page:431-439.
[9]Glifton, R.A, **1985**. Natural and synthetic Zeolites, International Circular 9140. Washigton,D.C.1
[10]Jianwei , L., J. Zou and F. Chen. **2007**. Effect of phosphorus and potassium application on rapeseed yield and nutrients use efficiency. Proceedings of the 12th International Rapeseed Congress. Wuhan, China. pp: 202-205
[11]Kazemian, H.**2000**. Recent research on the Iranian natural zeolite resource(Areview). Access in Nanoporous Materials-II. Banff, Albert, Canada.
[12]Kazemi, H., **2004**. Introduction to zeolite minerals, magic. Paradise Publishing, 126 pages.
[13]Malakooti, M.J. C. Lotfollahi, M. **1999**. Qualitative and quantitative performance increase forage maize using Klrv extra potassium in cold regions (the second culture). Technical Bulletin No. 107, Agricultural Education publication, Karaj, Iran.
[14]Mengel, K. and E. A. Kirkby. **2001**. Principles of Plant Nutrition. 4th. Edition. International Potash Institute,Bern,Switzerland.

[15]Omidi, C. **2007**. *Seed and Plant Journal* Volume 2-25, Issue 2009.
[16]Perrenoud, S. **1993**. Fertilizing for high yield potato. IPI Bulletin 8. 2nd Edition International Potash Institute, Basel, Switzerland
[17]Polat, E., M. Karaca, H. Demir and A. Naci Onus.**2004**. *J.Fruit Ornam.PlantRes*.12:183-189.
[18]Shahabifar,j., Ardalan, M. And Lotfollahi,M. **2003**. Optimal use of fertilizers containing micronutrients in the quantity and quality of wheat. Third National Conference of biological materials and efficient use of fertilizers and pesticides in agriculture. Ministry of Agriculture, Karaj, Iran.
[19]Soleimanzadeh, H., Habibi, D., Ardakani, M. R., Paknejad, F. and Rejali, F. **2010**. *World Applied Sciences Journal*. 8(4):443-448.