Cumhuriyet Üniversitesi Fen Fakültesi
Fen Bilimleri Dergisi (CFD), Cilt:36, No: 3 Özel Sayı (2015)
ISSN: 1300-1949

Cumhuriyet University Faculty of Science
Science Journal (CSJ), Vol. 36, No: 3 Special Issue (2015)
ISSN: 1300-1949

Effect of Zeolite and salinity on growth indices of marigold (Calendula officinalis L.)

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Received: 01.02.2015; Accepted: 05.05.2015

Abstract. The aim of this study was the effect of zeolite, The corrosive effects of salt stress and negative interactions on the yield and quality of Calendula officinalis extract in saline soils, such soils are considered Saveh city. experiment was done factorial based on randomized complete block in a greenhouse at the Experimental Station, College of Agriculture, Azad University of Saveh in the 90-89. With three levels of salinity factor 1 (as a control), 3 and 6 dS m-zeolite second factor with four levels of 0 (control group), 22, 11 and 44 g to 5 kg. After a four-leaf stage of the crop to be irrigated every other day for the pot plant. Then Irrigation was under salinity treatments. During the breeding period of growth parameters including the number of lateral branches, number of flowers per plant (after 4 months) flower and leaf chlorophyll pigments carotenoids were measured and the results were announced as follows. In this experiment the salt applied to the damaged plant. Test results showed that the zeolite had a positive result in the increase in performance. The amount of zeolite in two levels 22 and 44 grams per 5 kg. Also zeolites and salinity interaction was significan.

Keywords: number of flowers per plant, chlorophyll, carotenoids, salinity, callendula officinalis L.

1. INTRODUCTION

Herb rich reservoir of secondary metabolites of many drugs are the basic ingredients. Although these materials are made primarily guided by genetic processes but However, their construction is significantly influenced by environmental factors. So that environmental factors cause changes in the amount and quality of medicinal plants and their active constituents Such, alkaloid, glycosides, steroids, volatile oils (essential oils), and so is (1,2). When a medicinal plant crops economically viable the content of secondary metabolites that have reached the optimal level. Choosing the right variety of environmental factors (1,2,3) can be achieved to the maximum amount of product.

Salinity is in many parts of the planet of the factors limiting agricultural production. More than 13 percent of the world's cultivated land and about 50-30% of the world's land is affected by salinity (7,10). Tension or Stress is a term first used were by scientists in biological organisms. Later the term was taken from physics It is as anything that has the potential of injury to living beings were defined. Stress is the result of the abnormal physiological processes of one or a combination of biological and environmental impact can be achieved. As stated in the definition of stress can be damaging That might have been the result of an abnormal metabolism and may be a drop in growth, plant death or the death of the plant develops (4). In recent years have been considered the development of sustainable farming systems. In this regard, the application of natural mineral materials to improve the fertility of soil physical and chemical modification that would increase the water holding capacity of the soil. That zeolite one of the mineral Zeolites (crystalline aluminosilicate with tiny pores) with alkali cations are exchangeable with unlimited three-dimensional structure. Each type of zeolite has a unique

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Special Issue: The Second National Conference on Applied Research in Science and Technology

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crystal structure. Therefore, the physical and chemical properties have been reversibly absorb water. There are special porous crystalline structure that remains in the presence of hard water Zeolites are made to adapt to different applications (5,12). One of the reasons for the use of zeolites in agriculture production and productivity of soil, moisture absorption and maintain it for a long time And savings in fertilizer use and the prevention of environmental pollution is (8). Including new approaches to increase effectiveness and prevent the loss of moisture and chemical fertilizers and Using natural ingredients such as mineral zeolite in agricultural fields (14).

2. MATERIALS AND METHODS

Saveh city located along the longitude 50 degrees 20 minutes 43 seconds East and a width of 35 degrees North minute And the average height above sea level and covers an area of about 1,030 Mtrmy Break million and ten thousand acres of mature city Saveh city is located in arid and semi-arid weather and Rainfall and mean annual precipitation is about 200 mm. The maximum temperature in July and minimum temperatures in January And the average frost 40 days. The experiment was performed in three replicates in a factorial randomized complete block design with four levels of zeolite, 44, 22, 11, 0 grams per 5 kg and salinity levels in the 1, 3 and 6 dS m. The soil was prepared using a mixture of soil, sand and manure in the ratio 1: 4: 2. First of soil and compost sieve and then add sand and zeolite Finally, we add a certain amount to each pot And a set of dirt to get there as the soil medium. To prevent the spread of fungal diseases was first irrigation before planting seeds, using the fungicide carbendazim concentration of 50 g per 50 liters water. The pots were irrigated regularly and on alternate days. Fight against weeds was done mechanically. After the 4-leaf stage were thinned 2 of them. Only two plants were maintained in each pot And irrigation treatments were based on identifying every 2 weeks. Indices were measured during the growing period the number of flowers per plant (after 4 months), number of lateral branches of Kartnvyydgl Rngdan, the chlorophyll a, b and total chlorophyll content of leaves.

3. RESULTS

There are significant differences between different levels of zeolite and salt. Thus, different levels of zeolite has a significant effect on the number of flowers and number of lateral branches that 44 g of the zeolite with the highest number of flowers. There is a significant difference compared with the other levels but no significant interaction between salinity and zeolite. Salinity and zeolites and their interactions on chlorophyll a and total chlorophyll was significant, but the interaction between zeolite on salinity and chlorophyll b was not significant. Based on the results obtained from the use of chlorophyll a, chlorophyll b and total chlorophyll zeolite traits were significant. The study results showed that the use of zeolites increases the photosynthetic efficiency of mesophilic enzymes, water use efficiency and chlorophyll of content. Consumption increases the chlorophyll content of the zeolite. The results of the control surface salinity is the lowest chlorophyll. Reduction of salinity on plants is chlorophyll a negative result But this loss of inhibition is effective in preventing damage to optical interference And reduces the amount of light received by the leaves (11). Decrease in chlorophyll levels in plants under stress may be related to increased activity of chlorophyll degrading enzyme (6). There was no significant difference between the different levels of salinity on chlorophyll b. The plant is drought resistant wheat varieties compared to susceptible varieties of maintaining high levels of chlorophyll, the photosynthetic ability is better in dry conditions. Expression is an adaptation to these changes in the photosynthetic apparatus (9). Salinity reduces the amount of carotenoids. Although the general effect of salinity reduces pigment But also the effects on plant species (13).

In the experiment applying the salt to hurt the plant it was also observed in other plants and probably for this reason that the plant is tolerant crops and it can tolerate the salt. Zeolites have a high volume of pores and voids are useful, high resistance to temperature And specific chemical structure and high natural . It seems that adding zeolite to reduce the damage caused by soil salinity and increase performance.

Table 1 . Physical and chemical properties of studied soil.

C/N %	C%	Tptal N%	O.M%	%Water absorption	pH	EC(ds/m)
236	11.8	0.05	0.47	24	8.38	3/23
Zn Mg/Kg	Fe Mg/Kg	Total P %	P205 %	Mn Mg/Kg	K Mg/Kg	Total K %
0/8	1/54	2.65	1/00	¼	2050	1/2

Table 2 . Analysis of variance.

S.O.V	dg	Number of flower	Number of branches	Chlorophyll a	Chlorophyll b	Total Chlorophyll	Carotenoids
zeolite	3	17.009**	3.49*	0.04*	5.40*	4.43**	3.58*
Salinity	2	24.148**	9.43**	6.12*	0.32	0.30	3.93*
Zeolite×salinity	6	0.565	0.64	3.03*	0.33	2.61*	3.67**
Error	22	14.61	15.61	57.61	1.32	0.99	4.98
CV(%)		0.55	0.46	0.15	0.65	0.96	0.53

Table 3. Comparison of means.

Treatment	Number of flower	Number of branches	Chlorophyll a	Chlorophyll b	Total Chlorophyll	Carotenoids
Zeolite	33.88	7.44	0.04	0.97	0.60	2.43
Salinity	37.38	13.38	32.06	0.03	0.11	1.78
Zeolite×salinity	32.78	3.05	47.61	0.43	0.70	4.99

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