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## The examination of different NaCl concentrations on germination, radicle length and plumule length on three cultivars of clover

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### ABSTRACT

To evaluate the effect of different levels of NaCl concentrations on cultivars of Egyptian, Red and Persian clovers, an experiment was carried out under pilot project intended to completely randomized with 3 replications at Islamic Azad University, Roudhen branch, in 1391 (2012). NaCl concentrations were of 0, 150 and 300 mM/Liter. The traits included radicle length, plumule length, and wet weight of radicle and plumule as well Ratio of plumule length to radicle length. The results of variance analysis showed that there are significant differences among various clover cultivars and NaCl concentration. The relevant traits decrease with the increase of salt concentration. Consequently, various clover cultivars have shown different responses. Therefore, according to Duncan's mean comparisons method, the Persian clover has shown more resistance to NaCl than other clover cultivars and could have the significant growth in radicle length and plumule length of 150 mM NaCl concentration.

**Keywords:** NaCl, Red clover, Persian clover and Egyptian clover,

### INTRODUCTION

According to studies FAO 7% of the world's land is salt affected. Excessive irrigation and poorly drained soils will increase soil salinity, reducing plant cultivation and production level. Therefore, the development of salt tolerant crops and the use of plants seem necessary.

[7] showed that, among the figures, there are significant differences in salt tolerance for lettuce. The plant germination rate decreases and stops by NaCl concentration increase.

[1][2] showed the effect of different levels of salinity on germination and early growth of local lentil has a significant impact.

[3] studied the effect of salinity on germination of different mass sainfoin. Their results showed that with increasing of salt concentration, germination rate and percentage of shoot and root length decreases.

Given the above, examining the varieties and cultivars resistant to salinity is obligatory. Also, the knowledge of how cultivars respond to salt concentrations in the germination, the physiological and ecological aspects is very important [4].

## MATERIALS AND METHODS

To evaluate the effect of different levels of NaCl concentrations on cultivars of Egyptian, Red and Persian clovers, testing was carried out under pilot project intended to completely randomized with 3 replications at Islamic Azad University, Roudhen branch, in 1391 (2012).

Mean Comparisons were carried out based on Duncan's test. NaCl concentrations of include testifier (using distilled water) of 0, 150 and 300 mM/Liter of NaCl salt.

First, by using a seed meter, a 100 seeds was considered for each test unit. After sterilizing the seeds concentration of NaCl was applied and the data processing was taken after one week. (The traits including lengths of radicle and plumule as well as, wet weight of radicle and plumule, germination percentage, and ratio of plumule to radicle) and analysis was carried out by Word and SAS software.

## RESULTS AND DISCUSSION

### **Germination percentage:**

The results based on (Table 1) shows that the cultivars of clover are significant at 1% of various NaCl concentrations level. According to (Table 2), the highest germination percentage was related to Persian clover (84%) and the lowest germination percentage to red clover (55% percent). Also, the highest germination percentage of NaCl concentration (71%) was related to 150 mM concentration and the lowest germination percentage of NaCl concentration (85%), to 300 mM concentration. Also, the rate of testifier (67%) has no significant difference with 150 mM. Based on [5] research results, crops that can tolerate salinity up to a certain threshold, after which the plant growth is reduced with increasing salinity. In this study, the highest germination percentage is obtained at 150 mM which correspond with this evaluation.

### **Radicle length:**

The results based on (Table 1) shows that the cultivars of clover are significant at 1% of various NaCl concentrations level and the interaction is significant at the 5% level. According to (Table 2), the maximum radicle length (16 mm) is related to the Persian clover and the minimum radicle length (9 mm) to the Egyptian clover. Also the maximum length of radicle in different concentrations of NaCl is related to testifier and the minimum radicle length (17 mm) and the minimum one to concentration of 300 mM, is (7 mm). The Interaction effect in (Table 3) showed that in testifier the maximum radicle length of Persian clover 25.8 mm and the red clover in 300 mM NaCl concentration has the minimum radicle length (4.73 mm). Consequently, the clover cultivars have different responses to the different concentrations of NaCl. [7] showed that there are significant differences between root development and increased root tolerance in lettuce figures.

### **Plumule length:**

According to (Table 1) the clover cultivars are significant at 1% level of various NaCl concentrations and as well as their interaction effects are significant at the 1% level. According to (Table 2), the maximum plumule length, (17 mm) is related to the Persian clover and the minimum plumule length (10 mm) to the red clover. Also, the maximum rate of plumule length in NaCl concentrations regarding is testifier (18 mm) and the minimum length of plumule regarding concentration of 300 mM, is (6 mm). Interaction effect in (Table 3) revealed that the maximum plumule length at 150 mM in Persian clover is (21.93 mm) which has no significant differences with (20.20 mm) of testifier and is the minimum, (3.37 mm), in red clover at 300 mM. [8] has reported that salinity can affect plant or decrease its growth. Therefore, NaCl in this evaluation is the cause of plumule length decrease.

### **Wet weight of Radicle:**

Based on results shown in (Table 1), the effect of this cultivar been meaningful. According to (Table 2), the maximum wet weight rate of Persian clover radicle is (0.047g) and the minimum wet weight rate of red clover radicle is (0.042 g). Also, the maximum wet weight rate of testifier (control) in NaCl concentrations is (0.058 g) and the minimum wet weight rate of root in concentrations of 300 mM is (0.034g) is. [10] have announced that radicle length decreased as NaCl and KCl concentrations increased.

**Wet weight of Plumule:**

Based on results shown in (Table 1), clover cultivars been meaningful at 1% level of various NaCl concentration. According to (Table 2), the maximum wet weight rate of the Egyptian clover plumule is (0.11g) and the minimum wet weight rate of the Persian clover plumule is (0.94 g). Also, the maximum wet weight rate of plumule in NaCl concentration of 150 mM is (0.10 g) and the minimum one relating to concentrations of 300 mM is (0.0064g). Also, the testifier (control) rate of (0.10 g) has no meaningful difference with 150 mM. According to the survey, the highest shoot fresh weight was 150 mM. In other words, it is necessary to repair damage caused by stress to the plant's survival. Therefore, osmotic and physiological adjustment makes in growth of aerial and transpiration section [6]. Therefore, a thorough understanding of plant response to salinity stress and salt tolerant plants is useful for screening [5].

**Table 1 - Analysis of Traits Variance**

s.o.v	df	ms					
		Germination (percent)	Radicle length	Plumule length	Wet weight of Radicle	Wet weight of Plumule	Ratio of Plumule Length to Radicle Length
Cultivars	2	**	144.8 **	118.51 **	ns	0.000044**	0.22 *
Different concentration	2	**	**	342.25**	0.0013**	0.000052**	0.27 *
AB	2	94.55nc	46.25 *	25.02 **	0.00010ns	0.0000068nc	0.41 **
Error	18	60.64	13.84	3.39	0.000091	0.0000026	0.085
C.V		%11.84	%30.96	%13.71	%21.34	%17.56	%20.86

**Table 2 – Mean Comparisons for Traits**

Treatment	Germination (percent)	Radicle length	Plumule length	Wet weight of Radicle	Wet weight of Plumule	Ratio of plumule Length
Red Clover	55.77 b	9.87 b	10.33 c	0.042 a	0.0069 c	0.988 b
Persian Clover	84.66 a	16.64 a	17.42 a	0.047 a	0.0094 b	1.177 ab
Egyptian Clover	56.88 b	9.52 b	12.54 b	0.045 a	0.011 a	1.300 a
Testifier (*)	67.444 a	17.253 a	18.894 a	0.058 a	0.010 a	1.244 a
150	71.22 a	11.782 b	14.663 b	0.042 a	0.010 a	1.244 a
300	58.667 b	7.009 c	6.746 c	0.034 a	0.0064 b	0.955 b

**Table 3 – Comparisons of Mean Interaction Effects**

Clover cultivars	NaCl concentration	Radicle length	Plumule length	Ratio of Plumule Length to Radicle Length
Red Clover	Testifier (*)	15.74ab	18.53ab	1.16bc
	150	9.14c	9.09cd	1.03cd
	300	4.73e	3.37e	0.766d
Persian Clover	Testifier (*)	25.83a	20.20a	0.800cd
	150	15.74ab	21.93a	1.5a
	300	8.34cd	10.13cd	1.233ab
Egyptian Clover	Testifier (*)	10.17bc	17.94ab	1.266ab
	150	10.46bc	12.96bc	1.266ab
	300	7.94de	6.73de	0.866cd

**Ratio of Plumule length to Radicle length:**

Based on results shown in (Table 1), clover cultivars been meaningful at 5% level of various NaCl concentration. According to Table (2) the maximum ratio of plumule length to radicle length of Persian clover is (1.7g) and the minimum ratio rate of plumule length to radicle length of Red clover is (0.98). Also, the maximum ratio rate of plumule to radicle relating to NaCl concentration of 150 mM is (1.266) and the minimum ratio rate of plumule length to radicle length relating to NaCl concentration of 300 mM is (0.95). Also, the testifier (control) rate of (0.95) has no meaningful difference with 150 mM. Interaction effect in (Table 3) showed that the various cultivars of clover show different responses in respect of various NaCl concentrations. Persian clover has the maximum ratio in 150 mM NaCl (1.5) and the Red clover has the lowest ratio, (0.76), in 300 mM concentration. [9] declared that the increase of salinity in chickpeas is more effective on reducing the length of stem than the root. Also considering that the different cultivars of clover have shown ratio of plumule to radicle differently, it could be said that the roots of plants are more tolerant to salinity than aerial organ of the plant and would be. an adaptive mechanism for root in

salty environment. Therefore, in certain plants, the length of radicle may be more than length of plumule and consequently this ratio may be lower compared to other plants [12].

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