Journal of Biodiversity and Environmental Sciences (JBES)
ISSN: 2220-6663 (Print) 2222-3045 (Online)
Vol. 4, No. 5, p. 362-365, 2014
http://www.innspub.net

RESEARCH PAPER OPEN ACCESS

The effect of different salinity levels on leaf length and breadth of 20 genotypes of monogerm and sugar beet polygerm in greenhouse conditions

Bahram Mirzamasoumzadeh[1*], Babak Ahadzadeh[2], Nasim Naderi[2]

[1*]*Young Researchers and Elite Club, Ardabil Branch, Islamic Azad University, Ardabil, Iran*

[2]*Department of Agronomy and Plant Breeding, Ardabil branch, Islamic Azad University, Ardabil, Iran*

Article published on May 23, 2014

Key words: Sugar beet, salinity stress, leaf length and breadth

Abstract

Salinity is one of the most important limiting factors of economic use of grounds for cultivation of agricultural plants and one of the most significant research areas of researchers of the new plant science is the study of biological changes of the plant in stress conditions and the observation of physiologic and morphological changes. Thus, for this purpose, an experiment was carried out so as to evaluate the 20 genotypes of sugar beet in salinity stress conditions as a factorial experiment and a completely randomized block design in three replications in the greenhouse environment. The results showed that salt stress conditions, significant differences were observed in terms of traits. Studies showed that there was a significant difference at the 1% level between evaluated genotypes in terms of all evaluated traits. Salinity stress caused a 20.65% in leaf length and 19.54% in leaf breadth.

***Corresponding Author:** Bahram Mirzamasoumzadeh ✉ bm_masoumzadeh@yahoo.com

Introduction

Salinity stress is considered as one of the non-living stresses that decreases the potential for producing agricultural lands. This stress and fighting it is one of the major issues that mankind has struggled with for thousands of years so far; in a way that we could count it as one of the causes of reduction in the lands' capability for producing agricultural crops. Salinization of land began when humans started farming practices and the quick and improper development of irrigation systems in large scale led to the development of salinity phenomenon in arable lands (Khoshkholgh-Sima and Asgari, 2002). Salinity is one of the most basic limiting factors of growth and production of agricultural crops that face the problem of salinity three times the world area which is three times the area of the lands under cultivation and the sum of salty and sodium soils in Iran is estimated to be about 27 million Hz which is more than half of the arable lands .In agriculture, due to the widespread use of water and soil, the problem of salinity has become more serious. In many areas of the world, the proper sources for usage are on the decline and then again fresh water reserves a part of which is provided by underground reserves, are limited. Due to the increasing consumption of urban societies, industrialization of societies and the increase of consumption per capita, these reserves decrease (Mirzamasoumzadeh, 2013). In fact, salinity-resistant plants remain immune from the negative effects of salinity, due to the expulsion of ions from leaves or by means of the accumulation of ions in vacuoles and keeping away the cell metabolism process, and in case ions with the potential of toxicity are accumulated on the cell surface specially cytoplasm, it will lead to the destruction of the cell and the plant (Khoshkholgh-Sima and Asgari, 2002).

The purpose of this study was The effect of different salinity levels on leaf length and breadth of 20 genotypes of monogerm and sugar beet polygerm in greenhouse conditions.

Materials and methods

Location of test implementation

The greenhouse experiments were carried out in April 2012 in the personal greenhouse located in Ardebil City. In the greenhouse environment to evaluate genotypes in terms of resistance and sensitivity stress conditions, the experiment was conducted as a factorial experiment and a completely randomized block design.

Plant material

The first treatment was normal salinity (Metropolitan Water District) and the second treatment was the Sodium Chloride salinity of 16 DS m. to provide the used seeds, institute of improvement and the sugar beet seed preparation located in Karaj, was visited after reception, the seeds were pulverized and bracketed, and in the Ardebil institute of production of sugar beet seeds, they were classified into two monogerm and polygerm groups. In the pots with a diameter of 30 cm and a height of 40 cm containing drainage, 20 seeds of each cultivar were planted in the depth of 2/5 cm using forceps in the sifted Perlite environment with a diameter of 4. Among the cultivars with lower viability, 30 seeds were panted. Immediately after planting, irrigation with water was conducted from above the pots and containers with a capacity of 500 cc were applied under each pot, and every 3 days it reached a volume of 500 cc by Metropolitan Water District. In the first month, according to the low need of plant to nutrients thehalf Hoagland concentration solution (table 2-3) was used which was made in the laboratory and with exact ratios according to the table, and in next months, the complete Hoagland concentration solution was used. 30 days after planting (3 to 4 true leaf stage), some Perlirte was added to the surface of pots to help the proper establishment of plants and 60 days after planting (in the 5 to 6 leaf stage), the weak plants were thinned and in each pot 8 plants remained. After 70 days of planting, the implementation of treatments started. The implementation of treatments was carried out by means of solutions beneath the pots. In all solutions, the Hoagland food solution was used for the needed elements of plants to be in their growth environment and no stress be leveled due to the shortage or toxicity of elements to the plant and thus not affect the results of the experiment. The solution under the pots reached a volume of 500 cc every 3 days with the Metropolitan Water District and every 8 times the solution under the pots was changed the containers under the pots were washed and re-filled by a new solution with the determined volume. It must be noted that during the period, in case the electrical conduct of drain resulting from the perlite increased, the electrical conduct of the salty solution was adjusted in proportion to that eventually the electrical conduct of the root environment be adjusted on the 16 DS m. The traits under study include the leaf length and leaf breadth which were measured.

Table 1. Compounds and their levels in the Hoagland food nutrition

Chemical name	Stock solution amount (g/1lit)	Amount of 100 liters(ml)
NH4H2PO4	115	100
KNO3	101	600
Ca(NO3)24H2O	236	400
MgSO47H2O	246	200
Fe-EDTA	5	150
H3BO3	0.38	150
ZnSO47H2O	0.22	150
MnSO44H2O	1.02	1000
CUSO45H2O	0.08	100
(NH4)6MO7O244H2O	0.02	100

Table 2. Genotypes used in this study

Number	Germ type	Name of genotype	Number	Germ type	Name of genotype
1	Poly Germ	30881-88	11	Poly Germ	31270
2	Poly Germ	30883-88	12	Poly Germ	31267
3	Mono Germ	30906	13	Mono Germ	31290
4	Mono Germ	30908	14	Mono Germ	31291
5	Mono Germ	30915-88	15	Mono Germ	31262
6	Poly Germ	30919-88	16	Mono Germ	31266
7	Poly Germ	30920-88	17	Poly Germ	30923-89
8	Poly Germ	30922	18	Poly Germ	Jolge
9	Poly Germ	86213-89	19	Poly Germ	MSC2*7233-P29
10	Poly Germ	31269	20	Poly Germ	7233-P29

Statistical analysis

Before data analysis, establish the assumption of normal distribution of deviations, homogeneity of variance was examined. The mean yield using Duncan test at 5% probability level by SPSS-18 software and graph drawing was done by Excel.

Results and discussion

After analyzing the distribution normality of the data, the Variance analysis of the data resulting from evaluation of studied traits in greenhouse conditions and salinity stress as demonstrated in table 3 showed that in salinity stress conditions the traits of leaf length and leaf breadth were all significant at the 1% level. Analysis showed that between evaluated genotypes, there was a significant difference at the 1% level in terms of all evaluated traits. Salinity stress caused a reduction in leaf length and 19.54% of leaf breadth (fig 1 & 2). Genotypes 15, 17, 18, 19 and 20 had a high value in terms of leaf length and were located in class a, while the genotype 1 had the lowest leaf length among studied genotypes (table 4). Genotypes 17, 18, 19 and 20 had the highest value in terms of leaf breadth, while genotype 1 had the lowest value and was located in class f (table 4). The results of mean comparison between the studied genotypes in terms of this trait indicated (table 4) that the highest value referred to genotypes 1, 2, 3, 6, 7, 8, 16, 17, 18 and 19 and the lowest value was observed in the genotype 12. Khorshidi *et al* (2004) stated that according to the existence of a positive and significant correlation between the dry weight leaf length and breadth and the wet weight with the performance of root and performance of white sugar. Thus, by means of these traits, the cultivars could be evaluated.

Table 3. Variance analysis of evaluated greenhouse traits in the studied sugar beet genotypes in salinity stress conditions

S. O. V	df	MS	
		Leaf length	Leaf breadth
Rep	2	14.924*	3.719**
Stress level	1	181/72**	37.241**
Genotypes	19	25.76**	6.663**
Stress level × Genotypes	19	4.329	0.679
Error	78	4.276	1.149
CV (%)		19.37	20.91

* and ** Significantly at $p < 0.05$ and < 0.01, respectively.

Table 4. Mean comparison of studied sugar beet genotypes in terms of the evaluated greenhouse traits in salinity stress conditions

Genotypes	Trait			
	Leaf length		Leaf breadth	
1	7.45	f	3.25	f
2	8.92	def	3.78	ef
3	10.67	cde	4.31	def
4	9.92	def	4.53	cdef
5	10.25	cdef	4.75	cde
6	11.61	bcd	5.94	abc
7	9.08	def	5.14	cde
8	9.22	def	4.97	cde
9	8.67	ef	4.22	def
10	8.72	ef	4.59	cdef
11	9.36	def	4.61	cdef
12	8.64	ef	4.45	def
13	10.53	cde	4.58	cdef
14	10.97	bcde	5.25	bcde
15	12.80	abc	5.50	bcd
16	11.31	bcde	5.44	bcd
17	12.72	abc	6.58	ab
18	14.61	a	7.00	a
19	13.56	ab	7.08	a
20	14.56	a	6.56	ab
Mean	10.68		5.13	

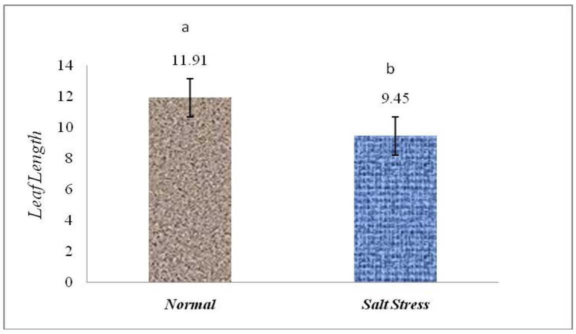

Fig. 1. average of stress level traits of leaf length and the reduction rate in leaf length affected by salinity stress

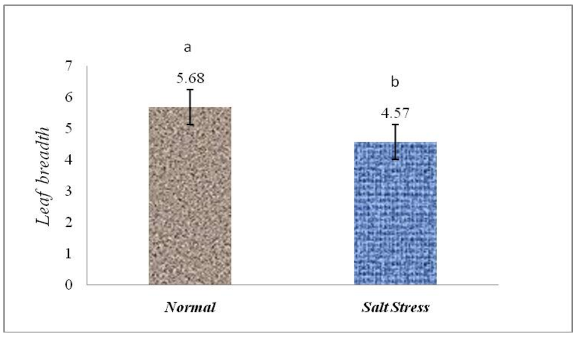

Fig 2. average of stress level traits of leaf breadth and reduction area of leaf breadth affected by salinity stress

Reference

Khorshid A, Mesbah M, Ranji Z, Vahedi S, Mesbah M. 2004. Correlation between Quantative and Qualitative Traits of Sugar Beet in Salinity and Greenhouse Draught Stress Conditions Compared with Quantative and Qualtative Traits of Sugar Beet Compared with Stressless Conditions. Sugar Beet Magazine.No. 17.

Khoshkholgh Sima N, Asgari H. 2002. Different mechanisms of resistance to salinity. Workshop salinity and mechanisms of plant growth, challenges and strategies. 14 to 18 February 2002. Faculty of Agriculture, Ferdowsi University of Mashhad.

Mirzamasoumzadeh B, Imani AA, Khayamim S. 2013. Evaluation of salt tolerance in sugar beet cultivars in dry conditions the glass greenhouse. Master's thesis. Islamic Azad University of Ardabil.