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Study of the relationships between traits of 20 genotypes mono germ and poly-germ sugar beet in terms of osmotic stress

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Abstract

Due to exposure to Iran in a semi-arid and dry and use the basic properties of numbers and the ability to resist stress is very important. So test to evaluate 20 sugar beet genotypes under osmotic stress factorial experiment in a randomized complete block design with three replications was conducted in a laboratory environment. 14 characteristics were evaluated in the laboratory. The results showed that the correlation of Velocity of Germination and Germination Rate Index, Final Germination Percent, Mean Germination Term, root length, seedling fresh weight, seedling dry weight, root dry weight and total dry weight were positive and significant, and the Mean Germination Term was negative and significant. Correlation between traits for Germination Rate Index, Mean Germination Term, Final Germination Percent, root length, seedling fresh weight, seedling dry weight, root dry weight and total dry weight were significant positive and negative and significant for Mean Germination Term. The relationship between Mean Germination Terms was the most significant negative characteristics. Relation to root length, seedling fresh weight, seedling dry weight, root dry weight and total dry weight were positive and significant. The relationship between root length and seedling fresh weight, seedling dry weight, root dry weight and total dry weight were positive and significant.

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Introduction

Environmental stresses such as drought and salinity is a limiting factor in plant growth and yield is reduced by increasing world population, the loss of arable land, fresh and salt water tolerant plants in exploring the possibility of creating an environment made necessary conditions (Radaei al-Ameli *et al.,* 2010). Sugar beet is a plant in the first two years in procumbent without forming stem growth, and during this period large roots and sugar accumulation in the roots is used. Reproductive structures of sugar beet production in the third year after vernalization path way and subsequently starting their reproductive growth and flowering stem produces (Abdollahyan Noghabi, 2000). Drought is one of the critical stages of germination; the successful establishment of plants in areas where the land is difficult, reform is an important breeding objective traits related to germination (Rauf *et al*, 2007 and Bayioumy *et al*., 2008). Germination process is controlled by hormonal and environmental factors and the environmental factors of light, oxygen, and temperature and water availability are important (Finch *et al*, 2001). Germination ability of plants under stress, and odds are provoked higher density leads to increased performance as a result. Some physiological and agronomic traits in drought tolerance in plants and the role of these features are used in the selection of drought tolerant genotypes. The most important characteristics related to drought resistance can be developed to power the germination and seedling growth under water deficits can be pointed out. Seedling establishment in the appropriate field and strong seedling production plant indirectly associated with higher performance (Balbeky *et al*, 1999). Characteristics such as weight, volume, length, diameter, depth and distribution in the soil, degree of branching and number of lateral roots are different aspects of root development. Although many substances in plant tissues are used to create tension but creates stress in vitro of polyethylene glycol used.

Given the relationship complex traits together the final judgment cannot be made on the basis of simple correlation coefficients and is required with the application of multivariate statistical analysis techniques to understand the deeper the relationships between traits. According to this communication by taking advantage of their different characteristics for the selected data is presented.

Materials and Methods

Methods

Providing seeds used for preparation of modified sugar beet seed company located in Tehran were selected and receipt of seeds (Table 1) were rubbed and the Institute of Sugar Beet Seed Production Ardabil germ mono and poly-germ seeds were classified into two categories. This research began in the Persian date 2012, osmotic stress Labs as dry polyethylene glycol 6000 at a concentration of 30% was applied. The design used for experiment was randomized complete blocks with three replications.

Fig. 1. Test steps.

Method of computations

whereas at the end of last day, indices for germination and seedling growth such as final germination percentage (FGP), coefficient of velocity of germination (CVG), germination index (GI), germination rate index (GRI), mean germination time (MGT), velocity of germination (Rs) and mean daily germination (MDG). The calculations were done using the following equations:

Coefficient of velocity of germination (CVG):

$CVG = 100 \times \sum Ni / \sum NiTi$

Where, Ni is the number of germinated seeds for each day, Ti is number of days as of the start of experiment, Germination index (GI):

$GI = (13 \times N1) + (12 \times N2) + ... + (1 \times N13)$

where, N1 and N2 and ... are the number of germinated seeds in first and second days, respectively, and so forth; numbers 10, 9 and ... are weights applied on the number of germinated seeds at first and second days and so forth.

Germination rate index (GRI):

GRI = G1/1 + G2/2 + ... + Gx/x

G1 = germination percentage at first day

G2 = germination percentage at second day and so forth

Mean germination time (MGT): (Andalibi et al., 2005)

MGT = ∑NiTi / ∑Ni = 100 / CVG

Where, Ni is number of germinated seeds for each day, Ti is number of days as of the start of experiment, Final germination percentage (FGP): (Al-Mudaris, 1998; Gharineh et al., 2004)

FGP = Ng / Nt × 100

Where, Ng is total number of germinated seeds, Nt is total number of evaluated seeds, Germination speed (Rs): was estimated based on Magour method and by using the following equation, (Rajabi and Poustini, 2005)

Rs = ∑Si / Di

Where, Si is the number of germinated seeds in ith day, Di is day number to nth counting Mean daily germination (MDG), which is an index of daily germination and is calculated using the following equation:

MDG = FGP/d

Table 1. 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

Correlation coefficients between different traits are presented in Table 2. The coefficient of correlation between germination rate and germination index traits, Mean Germination Term, germination, root length, fresh weight, small plant, tiny plant dry weight, root dry weight, total dry weight of small and significant and positive and negative and significant Mean Germination Term. Correlation between traits for Germination Rate Index, Final Germination Percent, root length, fresh weight, small plant, tiny plant dry weight, root dry weight, total dry weight of small and significant and positive and negative and significant for germination. The relationship between Mean Germination Terms was the most significant negative characteristics. Relationship between root length, fresh weight, small plant, tiny plant dry weight, root dry weight and total dry weight were positive and significant, was small. In terms of salinity in the root yield of white sugar yield, root and shoot dry weight was positive and significant.

Based on the results of correlations between traits were so many changes with the changing environment, some positive and some negative

changes (Abdolmajid Khorshid *et al*, 2003). The results showed that applying any level of drought and salinity will significantly change the morphological characteristics and proline content. Decreased significantly with increasing levels of drought and salinity on plant height, leaf number, tiller number, vigor and Final Germination Percent was observed. But rising levels of water stress and salinity increase in the amount of proline (Kamal Khani *et al*, 2002).

Table 2. Correlation coefficients were evaluated under drought stress.

	mean daily germination (1)	velocity of germination (2)	mean germination time (3)	final germination percentage (4)	germination index (5)	coefficient of velocity of germination (6)	Cotyledon length (7)	Root length (8)	Seedling fresh weight (9)	Weight of rootlet (10)	Seedling dry weight (11)	Dry weight of rootlet (12)	The total fresh weight (13)	Total dry weight (14)
1	1													
2	0.953**	1												
3	0.263	0.47*	1											
4	-0.984**	-0.899**	-.207	1										
5	1**	0.953**	0.264	-.984**	1									
6	0.542*	0.718**	0.607**	-.46*	0.54*	1								
7	0.618**	0.612**	0.161	-.609**	0.620**	0.294	1							
8	0.714**	0.724**	0.1	-.653**	0.713**	0.447*	0.828**	1						
9	0.469*	0.457*	0.018	-.451*	0.472*	0.239	0.844**	0.725**	1					
10	0.218	0.152	0.049	-.238	0.217	0.057	-0.045	0.062	0.063	1				
11	0.5*	0.472*	0.004	-.451*	0.505*	0.027	0.582**	0.629**	0.69**	0.243	1			
12	0.635**	0.617**	0.033	-.616**	0.635**	0.465*	0.750**	0.766**	0.773**	-.112	0.373	1		
13	0.397	0.335	0.051	-.407	0.399	0.156	0.337	0.376	0.5*	0.896**	0.518*	0.247	1	
14	0.654**	0.625**	0.017	-.609**	0.658**	0.225	0.765**	0.808**	0.856**	0.132	0.913**	0.719**	0.496*	1

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

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