Journal of Novel Applied Sciences
Available online at www.jnasci.org
©2013 JNAS Journal-2013-2-7/169-171
ISSN 2322-5149 ©2013 JNAS

Effects of polyethylene glycol on three of zea mayz genotypes

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ABSTRACT: To study the effects of Drought stress on the germination of zea mayz cultivars, a test was conducted in randomized complete block design with three replications in Biotechnology Laboratory of Ardabil Islamic Azad University in 2012. In this experiment, the first factor, were Drought concentrations and the second were cultivars. Results showed that there was a significant difference in the level of one percent between the experimental conditions and studied genotypes, in terms of all parameters measured. Finally, the results indicated the superiority of the cultivar Tabas in terms of all germination indices and study on the Drought concentrations, showed that water in normal conditions had the highest average in all of index apart from the average index during germination.

***Keywords*:** Zea mayz, Drought stress, germination index.

INTRODUCTION

Zea mayz is considered the most important crop in terms of oil and protein production around the world. Value of zea mayz grain is high in terms of minerals and vitamins and its protein contains all essential amino acids for humans and livestock feeding (Raei and et al. 2008). Low germination is one of the serious problems of zea mayz producers. The use of high quality seeds is essential for the establishment of appropriate plant populations in a zea mayz field and seeds with high germination power that germinate faster and more uniformly, able to withstand the inappropriate environmental conditions after emergence (Ajouri and et al. 2008). Germination stage of plants is one of the most important steps during their growth that is often affected by environmental stresses, especially and Drought and drought. Drought is caused a delay in onset, decrease speed and non-uniform increase in germination that ends in decrease of plant growth and ultimate yield (Ashraf and Foolad. 2005). Plant which can show more resistant to Drought at germination stage would be more successful during the first period of growth (Bradford. 1986). Although Drought stress can affect all of the plant growth stages but the stages of grain germination and growth is known very sensitive for most plant species. Seeds that are able to effectively respond to environmental conditions and change their germination behavior are very natural that remain. Drought tolerance is important during plant germination in salt soils of arid and semiarid areas (Ungar. 1995). Seeds with the rapid germination may show more resistance to Drought stress and thus have more products (Munns. 2002). Germination is one of the first physiological processes in the plants. This process has several consequences on characteristics after germination, ecological niches and geographic range of plants (Donohue and et al. 2008).
The aim of this study is investigation of the effects of Drought stress on germination indices of zea mayz cultivars in different concentrations.

MATERIALS AND METHODS

To study the effects of Drought stress on the germination of zea mayz cultivars, a test was conducted in randomized complete block design with three replications in biotechnology laboratory of Ardabil Islamic Azad University in ardabil 2012, that in this experiment, the first factor, were Drought concentrations and the second were cultivars and was used concentrations of 0, 0.1, 0.2, 0.4, 0.6, 0.8 and 0.10 Mm Polyethylene glycol. In order to measure germination index, germinated seeds were counted every day. Coefficient of germination rate (CGR),

germination rate index (GRI), mean germination time (MGT), final germination percentage (FGP) and germination rate (GR) were calculated by using the formula concerned (Table 1):

Table 1. The formula used to calculate the index of germination

Germination indices	The Formula used
Coefficient Velocity Germination (CVG)	$\sum NiTi / \sum Ni \times 100$ CVG [8] =
germination rate index (GRI)	X /Gx + …. + G2 / 2 + G1 / 1 = GRI [9]
final germination percent (FGP)	$100 \times Ng / Nt = FGP$ [9]
mean germination time (MGT)	$\sum Ni = 100 / CVG / \sum NiTi = MGT$ [10]
germination rate (RS)	1 / MTG = Rs [11]

Analysis of variance and mean comparisons were performed using SAS software and means were compared using Duncan test in the level of 5%.

RESULTS AND DISCUSSION

According to the analysis of variance (Table 2) was observed that there was significant difference in the level of one percent between the experimental conditions and studied genotypes in terms of all parameters measured. Also, there was no significant difference between the interactions of studied condition × genotype, in any of the studied traits.

The results of the comparison data (Figure 1) on the Drought concentrations showed that water in normal conditions with a mean of 19.04 and in terms of coefficient of germination rate index had the highest rank and was in class A, also, concentrations of 0.10 and 0.08, respectively, with a mean of 17.97 and 17.80 had the lowest rank and were in class D.

The results of germination mean index showed that the concentrations of 0.08 and 0.10, respectively, with a mean of 5.62 and 5.56 had the highest average and were in class A; water also in normal condition with a mean of 5.25 had the lowest mean. Concentrations of 0.08 and 0.10, respectively, with a mean of 0.178 and 0.179, had the lowest rate of germination.

Water in normal conditions in terms of percentage of final germination and with a mean of 100 had the highest percentage of germination and also the Drought concentration of 0.02 with an average of 98.88 along with normal conditions were in class A, also Drought concentration of 0.10 with a mean of 61.11 had the lowest percentage of germination.

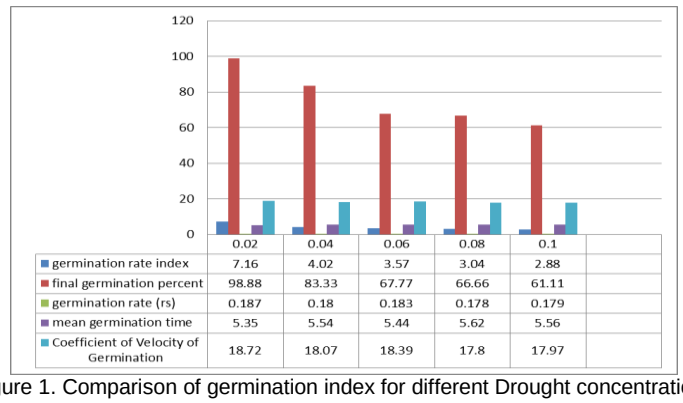
The Study on germination rate index also showed that water in normal conditions with an average of 8.55 had the highest rank and was in class A, and Drought concentration of 0.10 with a mean of 2.88 had the lowest rank.

The results of the comparison data (Figure 2) showed that genotype Tabas with a mean of 19.03 had the maximum germination rate and genotype SC704 also with an average of 17.63 was the lowest. Genotype Tabas with a mean of 5.67 in terms of the average index of germination time had the highest mean and genotype SC704 was the lowest. The study on the germination rate index showed that genotype Tabas with an average of 0.19 achieved the highest rate of germination and was in class A, and genotype SC704 also had the lowest rank in terms of this index. Genotype Tabas with an average of 83.33 and in terms of percentage of final germination had the highest average and was in class A along with genotype ‘sc630’; genotype SC704 was also lowest in terms of this index. Finally, the study on the germination rate index showed that genotype Tabas with a mean of 6.186 achieved the highest mean and genotype SC704 was the lowest.

Table 2. Analysis of variance for Germination index

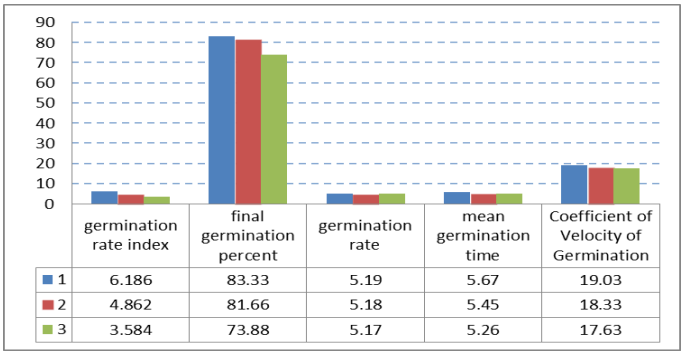
Source of Variations	df	Mean Square				
		Coefficient of Velocity of Germination	mean germination time	germination rate	final germination percent	germination rate index
Condition	5	2.0433 **	0.176 **	0.0002 **	2611.851 **	51.299 **
Genotype	2	8.7473 **	0.766 **	0.0008 **	457.407 **	30.463 **
C×G	10	0.1929 ns	0.014 ns	0.00001 ns	61.851 ns	1.518 ns
Error	36	0.1367	0.012	0.0004	72.222	0.383
CV (%)	-	2.01	2.04	2.01	10.67	12.69

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



	0.02	0.04	0.06	0.08	0.1
germination rate index	7.16	4.02	3.57	3.04	2.88
final germination percent	98.88	83.33	67.77	66.66	61.11
germination rate (rs)	0.187	0.18	0.183	0.178	0.179
mean germination time	5.35	5.54	5.44	5.62	5.56
Coefficient of Velocity of Germination	18.72	18.07	18.39	17.8	17.97

Figure 1. Comparison of germination index for different Drought concentrations



	germination rate index	final germination percent	germination rate	mean germination time	Coefficient of Velocity of Germination
1	6.186	83.33	5.19	5.67	19.03
2	4.862	81.66	5.18	5.45	18.33
3	3.584	73.88	5.17	5.26	17.63

Figure 2. Comparison of traits for zea mayz varieties

CONCULSION

The results showed that cultivar Tabas in terms of all germination indices had the highest average. The study on the concentrations of Drought also showed that water in normal conditions except the germination average index in all indices achieved the highest average.

REFERENCES

Ajouri, A., A. Haben and M. Becker. 2004. Seed priming enhances germination and seedling growth of barley under conditions of P and Zn deficiency. Journal of Plant Nutrition and Soil Science, 167: 630-636.

Ashraf, M., Foolad, M. R. 2005. Pre-sowing seed treatment a shotgun approach to improve germination growth and crop yield under saline and none-saline conditions. Advan. Agron. 88: 223-271.

Bradford, K.J. 1986. Manipulation of seed water relations via osmotic priming to improve germination under stress conditions. Hort. Science, 21: 1105-1112.

Donohue K, Rubio de Casas R, Burghardt L, Kovach K, Willis CG. 2010. Germination, post germination adaptation, and species ecological ranges. Annual Review of Ecology, Evolution, and Systematics. 41:293-319.

Kulkarni MG, Street RA, Staden JV. 2007. Germination and seedling growth requirements for propagation of Diosscorea dregeana (Kunth) Dur. and Schinz-A tuberous medicinal plant, S Afr. J. Botan. 33: 131-13.

Munns, R. 2002. Comparative physiology of salt and water stress. Plant Cell and Environment 25: 239-250.

Raei. Y, M. Sedghi and R. Sharifi. 2008. Rhizobial Inoculation, Urea Application and Weed on Growth and Seed Filling Rate in Zea mayz. Science and Technology of Agriculture and Natural Resources (12 years), 43 (A).

Rajabi R, Poostini K. 2004. Effects of NaCl Drought on seed germination of 20 wheat cultivars. J. Agric Sci. 28: 28- 44.

Ruan S, Xue Q, Tylkowska K. 2002. The influence of priming on germination of rice seeds and seedling emergence and performance in flooded soil. Seed Sci. & Tech. 30:61-67.

Scott SJ, Jones RA, Willams WA, 1984. Review of data analysis methods for seed germination. Crop Sci. 24: 1192-1199.

Ungar , I. A. 1995. Seed Germination and Seed - Bank Ecology in Halophytes. In Seed Development and Germination . Edited by Kigel , J. and Galili , G. , Marcel Dekker , New York , pp : 529 - 544 .