INNSPUB

International Journal of Biosciences | IJB |
ISSN: 2220-6655 (Print) 2222-5234 (Online)
http://www.innspub.net
Vol. 4, No. 4, p. 87-91, 2014

RESEARCH PAPER OPEN ACCESS

Seed priming effect on the number of rows per ear, grain weight and economic yield corn in Sistan region

Mohammad Reza Vazirimehr[1], Hamid Reza Ganjali[2], Abbas Keshtehgar[1], Khashayar Rigi[1*]

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

[2] *Department of Agronomy, Islamic Azad University, Zahedan Branch, Zahedan, Iran*

Key words: Priming, potassium nitrate, thousand seed weight.

http://dx.doi.org/10.12692/ijb/4.4.87-91 Article published on February 20, 2014

Abstract

To study the effect of seed priming on maize under drought stress experiment was split plot based on randomized complete block in three replications In 2012 the Research Center Zahak Was conducted. Subplots seed priming with potassium nitrate solution in five levels (control, 0.5%, 1%, 1.5% and 2%) and three levels of stress as a major factor (control, drought stress at vegetative stage (5 leaflets) to enter the reproductive phase, drought stress at reproductive stage until harvest), respectively. Maximum number of rows per ear on average compared to non-stress conditions (14.27) was observed. The results of the analysis of variance showed that the priming effect on the number of rows per ear was statistically significant at the one percent level. So that a comparison can be inferred from the table, the highest number of seeds in a row, the concentration of potassium nitrate (15.04), respectively. So that the comparison is taken out of Length of ear in terms of highest stress (20.92 cm) was observed. So that the comparison is taken out one of the highest concentrations of nitrate in Length of ear (22.05 cm), respectively. So that the comparison is taken out of Length of ear in terms of highest stress (225.67 mg) was observed. So that the comparison is taken out top thousand seed weight percent potassium nitrate at a concentration (269.7 g), respectively. So that the comparison is taken out of the economic performance of the highest non-stress conditions (2.28 t/ha) was observed. So that the comparison is taken out of the economic performance of the highest concentration of potassium nitrate (3.02 ton/ ha), respectively.

* **Corresponding Author:** Khashayar Rigi ✉ krigi66@yahoo.com

Introduction

The most important factor limiting crop yield globally water shortage (Beg and Turner, 1976). About 40 precent of Earth's land is arid and semiarid (Meigs, 1953). Drought resistance is the ability of plants to adapt to drought and completion of growth and reproduction In dry conditions, due to having attributes that affect the environment during their evolution and natural selection have acquired (Henckel, 1964). The economic importance of the cultivation of corn and has introduced thousands of years ago, is well known. Because all its parts, including seeds and foliage, and tassels cob and it is used in human food, livestock feed and in the pharmaceutical industry and has many uses (Mirhadi, 2002). Cereals such as maize useful tropical and temperate world. Maize production in the world after wheat and rice is the third most important cereal (Ashofteh *et al.*, 2011). Drought typically shortens plant height, internode growth retardation, reduced leaf area and root causes. The flowering phase is highly sensitive to drought stress. Research has shown that a seven-day drought stress in wheat with high temperatures can reduce grain yield by 50 precent (Waldern and flowerday, 1982). Effect of water deficit in the period after pollination, the stress and time it occurs depends on the interaction with the plant's genetics (Hamblin *et al.*, 1990). Plants that root length, number of lateral roots, root length density and root to shoot ratio and higher have a higher tole tolerance against drought (Sign *et al.*, 2005). Under these stress components is one way to increase germination and seedling emergence technique is priming (Demir *et al.*, 2006). Seed priming is a technique to improve performance. Priming is allowed in the early stages of germination of the seeds so that they do absorb some water, but not root out. In other words, the second seed going into the third stage of the process, but they are not. After treatment, priming, dry seeds and seeds of the untreated control cultures are stored (Mc Donald, 1999).Various reports indicate that priming increases of speed and uniformity of germination and seedling are emergence (Murugu *et al.*, 2003). Priming treatments to shorten the time of planting to protect seeds from biotic and abiotic factors in the emergence and seedling establishment are critical stages. Also consistent emergence treatments cause that led to the establishment and improvement of the product are uniform (Basra *et al.*, 2004).

Material and methods

Plant material collection

The research in crop year 2012 Zahak city located at the Agricultural Research Station in Zabol city (In Iran) 24 km south-east of longitude 61 degrees 41 minutes east and latitude 30 degrees 54 minutes north and 483 meters altitude above the sea level were performed. The area was planted in warmer climate is dry. The average annual rainfall is 55 mm and the annual evaporation rate of 4500 to 5000 mm, maximum temperature 2.48 at least -7 degrees Celsius.

Seed type

Varieties of maize hybrids grown corn that was used was 704.

Type of design and treatments

To study the effect of seed priming on germination, yield and yield components of maize under drought stress experiment was split plot based on randomized complete block with three replications. Subplots seed priming with potassium nitrate solution in five levels (0, 0.5%, 1%, 1.5%, 2%) And three levels of water stress as main factor Include: Control (no stress), Water stress at vegetative stage (5 leaflets) to enter the reproductive phase and Stress at reproductive stage until harvest. This was done to experiments the Seeds in 5 different surface concentrations of 0 (Control), 0.5%, 1%, 1.5%, 2% potassium nitrate for 24 hours at 25 ° C, priming and then washed with distilled water until all seed and weight primary were dried at room temperature under dark conditions.

Statistical analysis

Data collected were subjected to statistical analysis by using a computer program MSTATC. Least Significant Difference test (LSD) at 5 % probability

level was applied to compare the differences among treatments` means.

Results and discussion

Number of rows per ear

The results of the analysis of variance showed that the effect of drought on the number of rows per ear was statistically significant at the one percent level (Table 2). So that the table can be inferred maximum number of rows per ear on average compared to non-stress conditions (14.27) was observed (Table 3). Water stress during the vegetative growth stage, causing the smaller female inflorescence and seed rows per ear may be less and therefore reduces the corn rows that correspond with the results of other investigators (Brein, 2007). A sharp increase in the stress field between an thesis to silk emergence and reduce the number of rows per ear and ultimately the seed yield (Bruce *et al.*, 2002). The results of the analysis of variance showed that the priming effect on the number of rows per ear was statistically significant at the one precent level (Table 2). So that a comparison can be inferred from the table, the highest number of seeds in a row, the concentration of potassium nitrate (15.04), respectively (Table 3). The study found that priming increases the number of rows per ear, compared to control (non-primed) were (Subedi and Ma, 2005).

Table 1. Soil characteristics of the experiment during 2011 area growing season.

Year	Depth of soil (cm)	pH	Ec(ds /m)	N (%)	Ca(ppm)	K(ppm)	Sand	Silt	Clay
2012	0-30	8.2	4.2	4.81mg/lit	11.3	241	59	29	12

Length of ear

The results of the analysis of variance showed that the effect of drought on ear length was statistically significant at the one per cent level (Table 2). So that the comparison is taken out of Length of ear in terms of highest stress (20.92 cm) was observed (Table 3). It seems that drought stress reduced the grain and assimilate delay stage provides for the development of ear, ear length was reduced. The study found that water deficit reduction Length of the ear. Stress to interfere with photosynthesis, protein synthesis, enzyme activities and metabolites leads to the displacement of the affected ear and ear length is reduced (Ouattar, 1987). The results of the analysis of variance showed that the priming effect on ear length of statistically significant at the one per cent level (Table 2). So that the comparison is taken out one of the highest concentrations of nitrate in Length of ear (22.05 cm), respectively. Priming the shortening of time from sowing seed emergence and preservation of biotic and abiotic factors in critical step Length of deployment resulting in ear primed seeds compared to control (non-primed) were higher (Murugu *et al.*, 2003).

Table 2. Analysis of variance for maize (SC704) characteristic as affected by reduce watering and Potassium nitrate treatments.

		MS			
S.O.V	df	Number of rows per ear	Length of ear	Thousand weight	seed Economic yield
Replication	2	0.15^{ns}	0.16^{ns}	1413.60^{ns}	0.17ns
watering Reduce (A)	2	1.32^{**}	2.86^{**}	977.40^{ns}	0.72^{**}
Error (a)	4	0.003	0.004	1518.10	0.01
Potassium nitrate (B)	4	6.72^{**}	15.54^{**}	2171.20^{ns}	5.97^{**}
A*B	8	0.22^{**}	0.51^{**}	1213.31^{ns}	0.03ns
Error (b)	24	0.03	0.02	1382.29	0.015
C.V (%)	-	1.42	0.16^{ns}	14.92	5.94

*, **, ns: significant at $p<0.05$ and $p<0.01$ and non-significant, respectively.

C.V: Coefficient of Variation.

Thousand seed weight

The results of the analysis of variance showed that there was no significant effect of drought on grain weight (Table 2). So that the comparison is taken out of Length of ear in terms of highest stress (225.67 mg) was observed (Table 3). The study found that drought stress in maize thousand seed weight decreased 18 per cent compared to the control treatment (no stress) were (Waldern and flowerday, 1982) The results of the analysis of variance showed that the effect of priming on thousand seed weight was not statistically significant (Table 2). So that the comparison is taken out top thousand seed weight precent potassium nitrate at a concentration (269.7 g), respectively (Table 3). It has been reported that priming increased the total content of chlorophyll in leaves of wheat plants and thereby increase the availability of assimilates and thousand seed weight were increased (Roy and Srivastava, 2000).

Table 3. Means comparison of maize (SC704) characteristic as affected by reduce watering and Potassium nitrate treatments

Treatments	Number of rows per ear	Length of ear	Thousand seed weight	Economic yield
	watering Reduce			
Control	14.27a	20.92a	255.67a	2.28a
SI	13.97b	20.52b	251.47a	2.08b
SE	13.68c	20.04c	240.07a	1.85c
		Potassium nitrate		
Control	14.00c	20.75c	254.0a	1.96c
0.5%	14.45b	21.06b	254.4a	2.77b
1%	15.04a	22.05a	269.7a	3.02a
1.5%	13.62d	20.08d	234.4a	1.51d
2%	12.75e	18.51e	232.6a	1.10e

Any two means not sharing a common letter differ significantly from each other at 5% probability.

SI: Stop of irrigation from sowing to heading , SE: Stop of irrigation from ear emergence to full maturity.

Economic yield

The results of the analysis of variance showed that the effect of drought on economic yield difference was significant at the one precent level (Table 2). So that the comparison is taken out of the economic performance of the highest non-stress conditions (2.28 t/ha) was observed (Table 3). The results of the analysis of variance showed that the priming effect on economic performance, the difference was significant at the one percent level (Table 2). So that the comparison is taken out of the economic performance of the highest concentration of potassium nitrate (3.02 ton/ ha), respectively (Table 3). Priming in maize were reported compared with 13 per cent of economic yield increase (Moradi Dezfuli *et al.*, 2008).

Conclusions

According to the above results, it was found that the number of rows per ear was reduced by drought. Priming the number of rows per ear increased. Ear length decreased with increased water stress, drought stress seems to be a delay in the reduction of assimilates to growing corn and grain growth, reduced the length of the ear was. Also stress to interfere with the process of photosynthesis, enzyme activity and protein synthesis leads to the displacement of metabolites may be affected ear and ear length is reduced. The priming effect of ear length increased relative to the control .increased grain yield by reducing kernel weight was reduced. Seems to be the main cause economic yield loss in drought treatments significantly reduced the number of grains per ear. Drought generally reduces yield and yield increases were primed.

References

Lak SH. 2006. Effects of water deficit on yield of corn hybrid SC 704 at different levels of nitrogen and plant density on the climate of Khuzestan. PhD thesis Crop physiology., Science and Research Branch, Islamic Azad University, Khuzestan. 330 pages.

Brien J. 2007. Dry condition Effect of corn growth and yield.Published agricold agronomy.

Bruce WB, Edmeades GO, Barker TC. 2002. Molecular and physiological approaches to maize improvement for drought tolerance. Journal of Experimental Botany **53,** 13-25.

ECK HV. 2004. Effects of water deficits on yield, yield components, and water use efficiency of irrigated corn. Agron J. **78,** 1035-1040.

Moradi Dezfuli P, sharif–zadeh F, Janmohammadi M. 2008. Influence of priming technigues on seed germination behavior of Maize inbred lines (zea mays L.).ARPN Journal of Agri cultural and Biological science. vol. **3,** No. 3, May 2008.

Murugu FS, Nyamugafata P, Chiduza C, Clark, LJ, Whalley WR. 2003. Effects of seed priming, aggregate size and matric potential on emergence of cotton (Gossypium hirsutum L.) and maize (Zea mays L.). Soil and Tillage Research **74,** 161-168.

Ouattar S, Jones RJ, Crookston RK, Kajeiou M. 1987. Effect of drought on water relations of developing maize kernels. Crop Science **27,** 730-735.

Roy NK, Srivastava AK. 2000. Adverse effect of salt stress conditions on chlorophyll content in wheat (Triticum aestivum L.) leaves and its amelioration through pre-soaking treatments. Indian journal of Agricultural Science **70,** 777-778.

Subedi KD, Ma BL. 2005. Seed priming does not improve corn Yield in a humid temperate environment. Agron. J. **97,** 211-218.

Basra SMA, Ashraf M, Iqbal N, Khaliq A, Ahmad R. 2004. Physiological and biochemical aspects of pre- sowing heat stress on cotton seed. Seed Sci and Technol. **32,**765- 774.

Ashraf M, Rauf H. 2001. Inducing salt tolerate in maize (Zea mays L.) throght seed priming with chloride salts: growth and ion transport at early growth stages. Acta Physiol. Plant. **23,** 407- 414.

Demir Kaya M, Okçu Gamze, Atak M, Çikili Y, Kolsarici Ö. 2006. Seed treatment to overcome salt and drought stress during germination in sunflower (Helianthus annuus L.). Eur. J. Agronomy **24,** 291-295.

McDonald MB. 1999. Seed deterioration: physiology, repair and assessment. Seed Sci and Technol. **27,** 177–237.

Ashofteh Beiragi M, Ebrahimi M, Mostafavi Kh, Golbashy M, Khavari Khorasani S. 2011 a. A Study of Morphological Basis of corn (Zea mays L.) yield under drought stress condition using Correlation and Path Coefficient Analysis. Journal of Cereals and Oilseeds. **2(2),** 32-37.

Begg JE, Turner NC. 1976. Crop water deficits. Advances in Agronomy **28,** 161-217.

Hamblin A, Tennant D, Perry MW. 1990. The cost of stress: Dry matter partitioning changes with seasonal supply of water and nitrogen to dryland wheat. Plant and Soil **122,** 47-58.

Waldern RP, flowerday AD. 1982. .Introductory crop science Burgress publishing company ,minneapolis, 194 p.

Henckel PA. 1964. Physiology of plants under drought, Ann, Rev, Plant Physiol. **15,** 363-386.

Singh G, Sekhon HS, Kolar JS. 2005. Pulses. Agrotech Publishing Academy. Udaipur, India. 329 p.

Meigs P. 1953. Word distribution of arid and semi-arid homoclimates. Arid zone Research **1,** 203-220.

Mirhadi MJ. 2002. Corn. Organization of promoting agricultural research and education Publication, p. 199.