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ORIGINAL ARTICLE

Effect of Osmopriming on Harvested Seed Vigor of Maize (Zea Mays L.)

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Mahdi Ghiyasi Mehdi Tajbakhsh Reza Amirnia: Effect of Osmopriming on Harvested Seed Vigor of Maize (Zea Mays L.)

ABSTRACT

In order to study of osmopriming effect's on harvested seeds of maize conducted an experiment in Department of Agronomy, Faculty of Agriculture, Urmia University in 2009. Seeds before planting, primed with PEG8000 solutions. Treatments were Control (non- primed) and three levels of osmotic potential (-0.5, -1.0 and -1.5 MPa). Control and primed seeds planted in the research field. After repining, matured grain yields of all treatments harvested. Germination and vigor tests were done according to ISTA's orders. The experimental design in filed and laboratories were randomized complete block (RCB) and completely randomized design (CRD) respectively with three replications. The results pointed out control treatment were less vigorous than primed seeds in all osmotic potential levels. In addition to, treated seeds with -1.0 MPa displayed best germination and vigor characters.

Key words: Osmopriming, Vigor, Germination, Harvested seed, maize.

Introduction

Maize production based on FAO document's accounts for 2.5% of total cereal's production in Iran, with 1.6 million tons grain production from 0.25 million hectares cultivated land, although the production of hybrid seed is too low.

Osmopriming is a commercially used technique for improving seed germination and vigor. It involves imbibition of seeds in water under controlled conditions to initiate early events of germination, followed by drying the seed back to its initial moisture content. Its benefits include rapid, uniform and increased germination, improved seedling growth under the abroad range of environments resulting in better stand establishment [6,4].

Many studies have shown that osmopriming can lead to the better establishment in tropical crops such as maize, rice, sorghum and chickpea. Seed priming improved germination and crop establishment. It led to crops growing faster [5].

Poor seed germination and crop stand are major problems in many areas and affected yield of different crops [3].

According to published results of different studies, osmopriming improved seedling establishment in the field [1]. This plant is an ecological advantage. At the beginning of the growing season competition between crop and weed has not been serious forms [2]. In addition to environmental inputs such as water and light is abundance for the new established plant. In such a case, rapid germination, early establishment and uniform field of green can make better use of inputs are available [7]. The harvested yield from such farms would be better in terms of quality and quantity.

The purpose of this study was to evaluate the effect of osmopriming on harvested seed vigor of maize.

Material and Methods

This study was conducted in Department of Agronomy, Faculty of Agriculture, Urmia University in 2009. The seeds of maize (SC 704) were provided from West Azerbaijan Agricultural and Natural Resources Research Center.

Osmopriming treatments were three levels of osmotic potential (-0.5, -1.0 and -1.5 MPa). Control seeds were not traded. After priming, seeds were given three surface washings with distilled water and redried to original weight with forced air under the shade at 27± 3 °C. These seeds were then sealed in polythene bags and stored in a refrigerator at 5°C before further use.

It treated and control seeds were planted on 5 May 2009 at the research farm. Crop management operations from planting to harvested stage were done according to with scientific recommendations. After repining, matured grain yields of all treatments

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were harvested separately. Germination and vigor experimental design in filed and laboratories were randomized complete block (RCB) and completely randomized design (CRD) respectively with three replications.

In order to study the germination characters in each treatment 100 seeds were cultured in 9 cm petri dishes between papers in three replications. Petri dishes were irrigated daily with distilled water. Germination was the daily observations and noted. Seed germination was considered that the radical length, It was at last 2 mm. Observation of the germination continued for seven days. For study, the seedling growth immediately after seed germination 30 germinated seed from each treatment were randomly selected and were transferred to plastic boxes (20*15*10) with a lid under three replications (in each replication 10 germinated seed). Germinated seeds in these boxes were grown on moist filter paper for ten days.Mean germination time (MGT) was calculated based on the following equation of Ellis and Roberts.

$$MGT = \frac{\sum Dn}{\sum n}$$

Where n is the number of seed, which were germinated on day D and D is number of days counted from the beginning of germination.
The germination index (GI) was calculated as described in the Association of Official Seed Analysts (AOSA, 1983) by following formula:

$$GI = \frac{\text{No. of germinated seed}}{\text{Days of first count}} + \cdots + \frac{\text{No. of germinated seed}}{\text{Days of final count}}$$

tests were done according to ISTA's orders. The

The time to 50% germination (T50) was calculated according to the following formula of Coolbear *et al.*, modified by [2]:

$$T_{50} = t_i + \frac{\{(N/2) - n_i\}(t_i - t_j)}{n_i - n_j}$$

Where N is the final number of germination and ni, nj cumulative number of seeds germinated by adjacent counts at times ti and tj when ni<N/2< nj.
Experimental data was analyzed by a statistical packet SAS, version 6.12. Treatment's means were compared using the least significant test (LSD) at 5% level of probability.

Result and Discution

Based on the static analysis of results osmopriming has the significant effect on all traits studied in 1% level. The highest final germination percentage (98.33%) was achieved in treated with -1 MPa, which was a significant difference with other treatments (Table 1). The least T50 was obtained from the same treatment (table 1). According to the results, the lowest MGT was recorded of seed treated with 1- Mpa solution (Table 1). Noted GI of seed treated with 1- MPa solution was higher than other treatments and it was statically significant (Table 1). The longest seedling lengths were obtained from seed treated with -1 and -1.5 MPa solutions. However, these treatments were statically identical. Based on the results of this study, osmopriming with polyethylene glycol (PEG) can improve the germination and vigor of maize seed. Conversely, the osmotic potential of the solution used is very important for the best result.

Table1: Effect of Osmopriming of maize seed with different osmotic potential of PEG solutions on germination.

Character / Treatments	Final Germination %	T_{50}	MGT	GI	Seedling length (cm)
Control	97.00 ab	3.50 a	5.54 a	29.63 c	16.93 b
-0.5 MPa	96.67 b	3.12 b	5.03 b	32.16 b	17.67 b
-1 MPa	98.33 a	2.53 c	4.45 c	38.24 a	24.97 a
-1.5 MPa	93.67 c	3.21 b	5.15 ab	29.56 c	22.87 ab

Values followed by the same letter did not differ significantly ($P < 0.05$) according to LSD test.

Osmopriming affected seed water absorption during germination. So that the seed before being placed on their bed, it will absorb water. After this, metabolic reactions of germination are started. This leads to the synthesis or re-activating enzymes are effective in germination. In addition to, gene expression and synthesis of nucleic acids before planting are begun. These series of reactions are leading to improved germination of primed seeds.

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