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EFFECT OF SEED PRIMING ON GERMINATION AND QUALITY OF SOYBEAN (*GLYCINE MAX* L. MERRILL.)

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ABSTRACT

An investigation was carried out at experimental laboratory of Department of Agril. Botany, College of Agriculture, Parbhani during *kharif* season . Entitled "Effect of seed priming on germination and quality of soybean [*Glycine max* (L.) Merrill.]" different priming treatments are given before one day of sowing with seven treatments and three replication such as hydropriming, osmopriming, halopriming and control.Results indicated relatively higher mean performance of hydropriming for one hour in seed germination and seed quality such as germination percentage, root length, shoot length, seedling fresh weight, seedling dry weight, vigour index.
***Keywords*:** Soybean, Seed priming, Seed quality.

Introduction

Soybean contributes significantly to the Indian edible oil pool. Presently soybean contributes 43 % to the total oilseeds and 25% to the total oil production in the country. Currently, India ranks 4th in respect to production of soybean in the world. It usually fetches higher income to the farmers owing to the huge export market for soybean de-oiled cake. Soybean (*Glycine max* L.) is the only major crop that has witnessed an impressive expansion in acreage and production at the global level. Major soybean growing states in India are Madhya Pradesh, Uttar Pradesh, Maharashtra, Gujarat, Rajasthan, Karnataka and Andhra Pradesh. Soybean was introduced in Maharashtra during the year 1985. Maharashtra ranks 2nd in terms of production of soybean after Madhya Pradesh. In India area under soybean in *kharif* 2016 was 109.71 lakh hectares with production of 114.90 lakh tonnes. In Maharashtra soybean production during *kharif* 2016 was 39.45 lakh metric tonnes from an area of 35.80 lakh hectares with the productivity of 1102 kg ha^{-1}. Whereas, in Marathwada the area under soybean was 15.94 lakh hectares with production of 12.87 lakh tonnes and productivity is 1010 kg ha^{-1}. Mehran Salami *et al*. (2013).

Soybean has proved to be an important crop among oilseed crops in the state but productivity of soybean continuous to be low than its potential. One of the critical factors for low productivity of soybean is low germination. Productivity of crop depends on high germination and better crop stand. Now a days, there is much problem related to poor germination and crop establishment. Seed priming is a tool to enhance the germination and retain high vigour. Several experiments have been conducted which shows advantage of seed priming. Seed priming is not a new technology and has been a recommended practice in many crops in India. But farmers do not appreciate the wide range of benefits from this low-cost, low-risk practice. Miladinovo *et al*. (2014)

Material and Methods

An investigation entitled "Effect of seed priming on germination and quality of soybean [*Glycine max* (L.) Merrill.]" was carried out at experimental laboratory of Department of Agril. Botany, College of Agriculture, Parbhani during *kharif*. The experimental design was randomized block design with three replications and seven treatments such as T_1 -Hydro priming for 30 minutes, T_2-Hydro priming for 1 hour,T_3-0.5% KNO_3 (Osmo priming for 30 min),T_4-1% KNO_3 (Osmo priming for 1 hour),T_5- 0.1% NaCl (Halo priming for 30 min),T_6 -0.2% NaCl (Halo priming for 1 hour), T_7-Control.All the treatments are given before one day of testing.

Germination percentage (%): It was recorded by using rolled towel paper method. From each treatment 100 seeds were placed in three replications on moist towel paper, rolled properly and kept in seed germinator at constant temperature (25°C) and relative humidity (80 %) first count of germination was taken on 5th day, whereas, final germination recorded on 10th day and germination expressed in percentage. (ISTA, 1999).

$$\text{Germination (\%)} = \frac{\text{Number of normal seedlings}}{\text{number of seeds put for germination test}} \text{X } 100$$

Root length (cm)

Ten normal seedlings selected randomly in each treatment from all the replications on eight day of germination test. The root length was measured from tip of primary root to base of hypocotyle with the help of scale and mean root length was expressed in centimeters.

Shoot length (cm)

Ten normal seedlings used for root length measurement, also used for the measurement of shoot length. The root length was measured from base of primary leaf to base of hypocotyle and mean shoot length was expressed in centimeters.

Seedling fresh weight (g)

The same fresh samples selected for root and shoot length where weighed on electronic balance. The mean fresh weight of seedlings was recorded and expressed in grams.

Seedling dry weight (g)

The same samples used for seedling fresh weight were dried in oven at 80°c for 24 hours. Later they were removed and allowed to cool for 30 minutes. The mean dry weight of the seedlings was recorded and expressed in grams.

Vigour Index

Seedling vigour was determined in terms of vigour index. For calculating vigour index, average root and shoot length of randomly selected ten normal seedlings was taken. Vigour index was calculated by using the formula suggested by Abdul-Baki and Anderson (1973).

Vigour index = Germination (%) × [Average root length (cm) + Average shoot length (cm)]

Results and Discussion

Germination percentage is presented Table 1, indicated that there were significant differences among the treatments in mean seed germination percentage. All the seed priming treatments produced more germination percentage than control. The treatment T_2 - hydro priming for 1 hour was found significantly superior over all the treatment to germination percentage followed by treatment T_4 - 1% KNO_3 for 1 hour. The present findings are in accordance with Nalawadi *et al*. (1973) in soybean, Salinas (1996) in soybean, Basu and Choudhari (2005) in soybean, Arif (2005) in soybean, Abbasdokht *et al*. (2010) in wheat, Miladinovo *et al*. (2014) in soybean, Mehri Shahram (2015) in soybean.

Root length (cm) and Shoot length (cm)

Seed priming have the significant effect on root length and shoot length. Data on root length and shoot length is presented in Table 1. All the treatments were significant in increasing root length than control. Data revealed that Treatment T_2 – hydropriming for 1 hour recorded the highest root length and shoot length over rest of treatments and control followed by treatment T_4-1% KNO_3 for 1 hour. The present findings are in accordance with Nalawadi *et al*. (1973) in soybean.

Seedling fresh weight (g) and dry weight

Data on seedling fresh weight is presented in Table1. All the seed priming treatments have the significant effect on seedling fresh weight and dry weight. Treatment T_2-hydropriming for 1 hour recorded highest seedling fresh weight and dry weight over rest of treatments and control followed by Treatment T_4 -1% KNO_3 for 1 hour. All the treatments were significant in increasing seedling fresh weight over control.

The results of root length, shoot length, seedling fresh and dry weight are in conformity with Basu and Choudhari (2005) in soybean, Wahid *et al*. (2008), Vajanti Mala Pahoja *et al*. (2013) in sunflower, Mehran Salami *et al*.(2013) in maize, Kujur *et al*.

(2015) in soybean, Anubha Benedicta Kujur (2015) in soybean.

Vigour index

Data on vigour index is presented in Table 1. All the seed priming treatments have the significant effect on vigour index. Treatment T_2- hydropriming for 1 hour (2748.39) recorded highest vigour index over rest of treatments and control (2091.43) followed by treatment T_4 - 1% KNO_3 for 1 hour (2307.16). All the treatments were significant in increasing vigour index over control. The present findings are in accordance with Kasra Maroufi and Hosseein Aliabadi Farahani (2011) in soybean, Mehran Salami *et al*. (2013) in maize, Miladinovo *et al*. (2014) in soybean.

Conclusion

The treatment T_2–6% hydro priming for 1 hour was found significantly superior for germination and seed quality followed by other treatments.

Table 1: Effect of seed priming on germination percentage, root length, shoot length, seedling fresh weight, seedling dry weight, vigour index

Treatments	Germination percentage	Root length (cm)	Shoot length (cm)	Seedling fresh weight (g)	Seedling dry weight (g)	Vigour index
T_1 (Hydro priming for 30 minutes)	85.33	16.79	10.46	0.94	0.08	2350.91
T_2 (Hydro priming for 1 hour)	90.00	18.82	11.72	1.14	0.10	2748.39
T_3 (0.5% KNO_3 for 30 minutes)	84.67	16.59	10.32	0.84	0.08	2290.06
T_4 (1% KNO_3 for 1 hour)	88.67	17.82	11.05	1.09	0.09	2307.16
T_5 (0.1% NaCl for 30 minutes)	83.33	16.53	9.91	0.88	0.07	2237.77
T_6 (0.2% NaCl for 1 hour)	87.67	17.43	10.76	0.95	0.08	2497.04
T_7 (control)	80.33	16.12	8.20	0.79	0.07	2091.43
SE (m) ±	**1.21**	**0.12**	**0.06**	**0.01**	**0.0006**	**33.16**
CD at 1%	**5.11**	**0.52**	**0.29**	**0.07**	**0.002**	**139.64**

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