Plant Archives Vol. 18 No. 2, 2018 pp. 1652-1654 **e-ISSN:2581-6063 (online), ISSN:0972-5210**

INFLUENCE OF PRIMING TREATMENTS ON SEED GERMINATION AND SEED VIGOUR IN BLACK GRAM (*VIGNA MUNGO* L.)

Syed Mohmad Afrayeem*, A. K. Chaurasia and Ajay Kumar Pandey

[1]Department of Genetics and Plant Breeding, S.H.U.A.T.S., Allahabad (U.P.), India.

Abstract

The experiment was conducted in laboratory of Seed Science and Technology, SHUATS, Allahabad during 2013, in order standardize the best method of priming specific to Black gram. Seed priming using various method like that *viz*., hydropriming, helopriming and osmoprimong were evaluated by screening a range of duration and concentration *viz*., hydropriming- T_0 Unprimed Control, T_1- Distilled water , helopriming- T_2- NaCl (5%), T_3-$CaCl_2$ (1%), T_4- KCl (5%) and osmopriming- T_5- PEG (25%) for 14 hours. It was found that all the priming method showed signification difference with the control and the highest germination %, seedling length, weight and germination index were observed for PEG priming for 14 hours. Seed priming, its simplicity and no requirement for expensive equipment and chemical could be used as a simple method for overcoming related to a poor germination and seedling establishment and helps in sustaining agriculture.

Key words : Germination, black gram, priming, seed vigour, quality.

Introduction

Pulse crops play an important role in Indian agriculture and India is the largest producer and consumer of pulses in the world. Pulses contain a high percentage of quality protein nearly three times as much as cereals (Upadhayay *et al*., 2006). Thus, they are cheaper source to overcome protein malnutrition among human beings. For vegetarian diet, pulses form the major source of protein. In fact, lysine is the most limiting essential amino acid in cereals which is very well supplemented by the protein of pulses. The pulses are known to improve the physical characteristics of soil through tap root system which opens the soil into the deeper strata and their ability to use atmospheric nitrogen through biological nitrogen fixation which is economically sound and environmentally acceptable. In addition, it also provides nutritious fodder and feed for livestock. Pulses are drought resistant and prevent soil erosion due to their deep root and good ground cover, because of these good characters, pulses is called as "Marvel of Nature". Among legumes, green gram (*Vigna radiata* L.) is widely cultivated in three different seasons in india *i.e.*, *kharif*, *rabi*, zaid. It is grown in rainfed condition during kharif and on residual moisture in rabi in eastern and southern parts of the country. During Rabi, it is cultivated through the plains and upto 1820m elevation. The biochemical composition of green gram consists easily digestible protein (20.0 to 28.4%), 3.3% fat, 5.9% fibre, 51.2% carbohydrate, 3.4% minerals, 0.3% vitamins and 10.2% moisture. Besides, this has also a rich source of amino acids (USDA Nutrient Database).

Seed germination and seedling growth phase of plant are critical for determining the crop stand density and establishment under different condition. Seed germination in a laboratory test is the emergence and development from the seed embryo of those essential structures which; for the kind of seed being tested indicated the ability to develop into a normal plant under favourable condition in the soil. Several groups of chemicals influence seed germination by promoting faster germination inducing greater seedling vigour. Sodium chloride and calcium chloride do promote germination of many seeds.

Materials and Methods

In order to determine the effect of priming of germination and seed vigour in black gram (*Vigna mungo* L.). The experiment was conducted on black gram variety "Shekhar-2" procuresseed from Department Seed

Author for correspondence : E-mail : syedafrayeem@gmail.com

Science and Technology, SHUATS, Allahabad. Chemicals *viz*. NaCl, $CaCl_2$, KCl, PEG and Distilled water were also obtained from Department.

Preparation of solutions

For the preparation of solutions of the chemicals of 5% NaCl, 1% $CaCl_2$, 5% KCl, 25% PEG and Distilled water chemical was taken in a clean beaker. These chemicals were dissolved separately.

This chemical was added to 1000 ml, of distilled water with constant stirring. The volume of solution was finally constituted to one litter and then it became 1000 ppm stock solution of each chemical. The flasks containing chemicals were covered with muslin cloth to avoid any contamination. For preparation of 60, 80 and 100ppm solution of each gram with chemicals 60, 80 and 100 ml of solution from the stock solution were taken in a clean measuring flask and water is added to constitute to 100 ml. For the preparation of Nacl (5%) solution 50 (g.) Nacl was a taken in a measuring flask made up to 1000 ml. and distilled water, while for $cacl_2$ solution 10 (g.) $cacl_2$ salt, KCl (5%) solution 50 (g) and PEG (25%) was taken in a measuring flask and made up to 1000 ml with distilled water.

Soaking of the seed in solution

After preparation of solution of NaCl, $CaCl_2$, KCl, PEG black gram seeds were soaked in required solution for 14 hour at 25^0C temperature. Simultaneously seeds were soaked in distilled water sewed as control. After 14 hour of soaking the solution was drained out from the beaker and pre soaked seeds were air dried to original weight and then placed for germinationin laboratory under controlled conditions. The observation on the characters *viz*., germination, root length (cm), shoot length (cm), seedling length (cm), fresh weight of seedling (g), dry weight of seedling (g), seedling vigor index and vigor index mass were recorded. The experimental data recorded were subjected to suitable statistical analysis.

Results and Discussion

The partition of total variation was made through analysis of variance for different seedling growth parameters in black gram and is presented in Table1. The mean sum of square due to treatments showed significant difference for all the characters except seedling fresh weight due to priming in black gram indicating significant effects of priming on germination and vigour parameters of the crops.

The response of different priming was differs in germination of black gram. The grand mean of germination was 68.60% in black gram. Significantly highest germination (72.67%) was recorded under the influence of PEG (25%) followed by distilled water hydration (71.67%) and KCl (5%) (71.00%). The lowest germination percentage was reported in control, which was 59.00%. The priming with distilled water, NaCl (5%), CaCl2 (1%), KCl (5%) and PEG (25%) showed statistically similar value for germination percentage in black gram. longest root length (7.20cm) was found under the influence of PEG (25%) in black gram, which was followed by distilled water hydration (7.17cm), KCl (5%) (6.91cm) and $CaCl_2$ (6.89cm). The lowest value for root length was observed in control *i.e.* 4.63cm. Priming with NaCl (5%) (5.67cm) showed statistically *at par* value with control. Soaking with NaCl (5%) resulted in statistically similar shoot length with control. The longest seedling length (28.41cm) was observed in PEG (25%) followed by distilled water (27.66cm), KCl (5%) (26.11cm), $CaCl_2$ (1%) (25.33cm) and NaCl (5%) (17.18cm). Shortest seedling length was recorded in control (12.24 cm).

The maximum seedling fresh weight (3.33g) was found in black gram seedling priming with PEG (25%) followed by distilled water hydration (2.83g), KCl (5%) (2.70g), $CaCl_2$ (1%) (2.67g) and NaCl (5%) (2.60g). Lowest value was found in control (2.53g). In addition, statistically highest seedling dry weight accumulation (0.80g) was found in black gram seedling priming with PEG (25%) and then in distilled water hydration (0.73g). seed primed with KCl (5%) (0.57g), $CaCl_2$ (1%) (0.47g) and NaCl (5%) (0.43g) accumulated statistically *at par* seedling dry weight to each other. Lowest value was found in control (0.30g).

The increment in germination percentage under primed seed might be due to acceleration of metabolic activities by water and certain chemicals which force to rapid cell division and multiplication. Several osmotic, such as PEG, have been shown to have positive effects on germination capability (Dell-Aquila and Taranto, 1986; Lemrasky and Husseini, 2012; Toklu *et al*., 2015). The positive effect of PEG application on increased germination percentage might be explained by an increase in the activity of key enzymes, such as amylase and proteases (Dell-Aquila and Tritto, 1990), which play an important role in the growth and development of the seed embryo. Increased root length in PEG and hydro-priming condition might be due to its positive effect on biochemical changes in the structure of the seeds, such as activation of enzymes related to germination and stand establishment. Jafar *et al*. (2012) reported that osmo-priming seeds (with $CaCl_2$) followed by ascorbate priming treatments also enhanced protease and á-amylase

Table 1 : Mean performance of different priming treatment in black gram.

S. no.	Treatments	Germination %	Root length (cm)	Shoot length (cm)	Seedling length (cm)	Seedling fresh weight (g)	Seedling dry weight (g)
1	T_0: Control	59.00	4.63	7.61	12.24	2.53	0.30
2	T_1: Distilled water	71.67	7.17	20.49	27.66	2.83	0.73
3	T_2: NaCl (5%)	68.33	5.67	11.51	17.18	2.60	0.43
4	T_3: $CaCl_2$ (1%)	68.67	6.89	18.43	25.33	2.67	0.47
5	T_4: KCl (5%)	71.00	6.91	19.20	26.11	2.70	0.57
6	T_5: PEG (25%)	72.67	7.20	21.21	28.41	3.33	0.80
Grand mean		68.60	6.41	16.41	22.82	2.78	0.56
SEM		2.55	0.37	1.27	1.32	0.23	0.06
CD (5%)		7.87	1.13	3.90	4.06	0.72	0.18
CV(%)		6.50	9.90	13.40	10.00	14.50	18.00

activities, which in turn helped to improve carbohydrate metabolism, leading to better assimilate translocation. This causes positive effect on the cell multiplication and elongation. Osmo-priming seeds (with $CaCl_2$) followed by ascorbate priming treatments enhanced protease and á-amylase activities, which in turn helped to improve carbohydrate metabolism, leading to better assimilate translocation (Jafar *et al.*, 2012). This causes positive effect on the cell multiplication and elongation. Dry matter accumulation is accelerated by the priming methods which might be due to faster release of enzymes and hydrolysis of stored materials that increase growth rapidly as reflected by the higher dry matter accumulation under PEG, KCl, $CaCl_2$ compared to control. Jie *et al*. (2002) reported that PEG application activates several compounds that promote germination which ultimately resulted in high dry matter accumulation in root and shoot.

Conclusion

It is concluded from the present study that different priming methods have significant effects on the expression of the seedling characters. As the many of the parameters like germination %, root length, shoot length, seedling for length, seedling dry weight, were found significant effect high with the PEG (25%) treatment. Soaking of seed with PEG solution is advantageous to obtain healthy seedlings. The second best option for priming is hydration with distilled water. The priming with PEG and distilled water is ecofriendly and economic in use.

References

Dell'Aquila, A. and G. Taranto (1986). Cell division and DNA synthesis during osmopriming treatment and following germination aged wheat embryos. *Seed Science and Technology*, **14** : 333–341.

Giri, G. S. and W. F. Schillinger (2003). Seed priming winter wheat for germination, emergence and yield. *Crop Science*, **43** : 2135–2141.

Jafar, M. Z., M. Farooq, M. A. Cheema, I. Afzal, S. M. A. Basra, M. A. Wahid, T. Aziz and M. Shahid (2012). Improving the performance of wheat by seed priming under saline conditions.*Journal of Agronomy and Crop Science*, **198** : 38–45.

Karssen, C. M., A. Haigh, P. Van der Toom and R. Weges (1989). Physiological mechanisms involved in seed priming. In: *Recent Advances in the Development and Germination of Seeds* (Taylorson RB, ed.). New York, NY, USA: Plenum Press, pp. 269–280.

Lemrasky, M. G. and S. Z. Hosseini (2012). Effect of seed priming on the germination behavior of wheat. *International Journal of Agriculture and Crop Science*, **4** : 564–567.

Toklu, F., F. S. Baloch, T. Karaköy and H. Özkan (2015). Effects of different priming applications on seed germination and some agro-morphological characteristics of bread wheat (*Triticum aestivum* L.). *Turkish Journal of Agriculture and Forestry*, **39** : 1005-1013.

USDA Nutrient Database (2015). Composition of Foods Raw, Processed, Prepared.

Upadhyaya, H. D., S. Kumar, C. L. L. Gowda and S. Singh (2006). Two major genes for seed size in chickpea (*Cicer arietinum* L.). *Euphytica*, **147** : 311-315.