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Effect of priming on germination and seed vigour in wheat (*Triticum aestivum* L.) seed

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Abstract
An experiment on priming was conducted in Post Graduate Laboratory, Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology & Sciences (SHUATS), Allahabad, Uttar Pradesh during 2017 - 2018 on wheat PBW-343. The seeds are treated with different chemicals like (PEG 20%) (KCl 1%), ($CaCl_2$ 1%), (Neem Leaf Extract 5%) and (Eucalyptus Leaf Extract 5%). The treated seeds are soaked for 12hrs for seed germination, shoot length, root length, seedling length, seedling fresh weight and dry weight, seedling vigour index I and II, where data was subjected in completely randomized design. Among the treatments (PEG 20%) (T_2) recorded higher germination percent shoot length, root length, seedling length, fresh weight, dry weight, vigou index I, vigour index II.

Keywords: Wheat, hydro priming, halo priming, osmopriming, organic priming, duration

Introduction
Wheat is one of the most important staple food crops of India grown in diverse agro-climatic conditions from 11^0 N-35^o N latitude and 72^0E-92^0e longitudes. Wheat *(Triticum spp.)* a feeding bowl to mankind occupies a premier position of all the staple food grain crop. It is grown around the world across a wide range of environment and more land is devoted to the production of wheat than any other crop. It is a number one food grain consumed directly by human beings and it is estimated that more than 35 per cent of the world population depends on wheat. It supplies more nutrients, particularly essential amino acids than any other single crop.

The sowing time is the most important factor determining the yield of wheat. The nutrient content in grain and straw has been reported to be increased with delay in sowing of wheat whereas, uptake of these nutrient decreased as the sowing of wheat gets delayed (Kumar *et al*., 1998).

Seed priming is one of the methods of increasing yield in different crops including legume. This priming may be conducted by using water or some chemical substances; increasing seed quality and germination. High germination percentage and simultaneous germination are two desired traits in mechanized agriculture. Complementary seed priming is a water balance dependent process which is conducted by soaking seeds in water for a certain time to accelerate their germination. The complementary seed priming stimulates many metabolic processes related to seed germination (Rastin, 2013) [7].

Seed pretreatment with PEG-6000 increased seed germination and vigour index (Finch-Savage *et al*., 1991) [11].

Priming may be helpful in reducing the risk of poor stand establishment under nursery conditions. Primingn improved seed performance might be attributable in part to the decreased lipid peroxidation and increased antioxidative activities during seed imbibitions. These results are in accordance with the results of other researchers who reported improvement of germination percentage Nadjafi *et al*. (2006) [6].

- To evaluate the effect of different priming method on seedling parameters in wheat.
- To identify suitable priming method for wheat seeds.

Materials and Methods
The present study entitled "Effect of priming on germination and seed vigour in wheat (*Triticum aestivum* L.) seed" under Post graduate laboratory of Seed Science and Technology was conducted in the Department of genetics and plant breeding, Naini Agricultural Institute,

Sam Higginbottom University of Agriculture Technology and Sciences, Allahabad during 2017-2018. The lab experiment was analyzed by using C.R.D. (Complete Randomized Design) with four replications and 6 treatments under laboratory condition. Seed Treated with control, Distilled water, Polyethylene glycol (PEG) (20%), Potessium choloride(KCL) (1%), Calcium chloride($CaCl_2$), Neem Leaf Extract(5%),and Eucalyptus Leaf Extract(5%) soaking for 12 hrs. Afterward, primed seeds were allowed to dry back to their original moisture content under shade to assess the parameters. Seed quality parameters include Germination percentage, root length, shoot length, seedling length, seedling dry weight, seedling vigour index length and seedling vigour index mass.

The observation on the characters *viz.,* Germination percent (ISTA 2004), Root length (cm), Shoot length (cm), Seedling length (cm), seedling Fresh weight (g), seedling dry weight (g), Seedling vigour index Ist, Vigor index IInd (Baki and Anderson 1973) were recorded. The experimental data recorded were subjected to statistical analysis for calculating analysis of variance, range, and mean, critical Difference and coefficient of variation.

3. Results and Discussion

According to the results, all studied traits were affected by the treatments and there was completely significant difference between control (unprimed seeds) and primed seeds (Table-1).

All seedling characters *viz.* Germination percent, Root length (cm), Shoot length (cm), Seedling length (cm), seedling fresh weight (g), seedling dry weight (g), Seedling vigour index Ist, Vigor index IInd were affected by PEG(20%) concentration and significantly recorded maximum.

Significantly higher germination per cent (97.00) reported in treatment T2 PEG (20%) followed by T1 (89.25) primed with Distilled water. Minimum germination percent recorded by T0
(89.00) with unprimed control (Table 2). Seeds were primed for 12 hours at three temperatures (25 °C). Similar finding were also reported by, Ghassemi (2008) [4]. It is reported that the earlier and better synchronized germination is associated with increased metabolic activities in the soaked seeds (Basra *et al.,* 2005) [2].

Table 1: Analysis of variance for seedling traits in wheat (*Triticum aestivum* L.) seed.

S. No.	Characters	Mean sum of squares	
		Treatment (d.f. =6)	Error (d.f.=21)
1	Germination %	31.95*	9.48
2	Seedling dry weight	0.113*	0.007
3	Seedling fresh weight	0.069*	0.015
4	Seedling vigour index 1	378050.54*	52794.10
5	Seedling vigour index 2	1190.02*	38.98
6	Root length	7.676*	2.615
7	Shoot length	6.685*	1.000
8	Seedling length	34.761*	8.039

*Significant at 5% level of significance

Table 2: Mean comparison of Germination and vigour Traits in Wheat (*Triticum aestivum L.)* seed

Treatments	Germination percentage	Seedling dry weight (g)	Seedling Fresh weight (g)	Seedling Vigour index I	Seedling Vigour index II	Root length (cm.)	Shoot length (cm.)	Seedling length (cm.)
T_0	89.00	0.54	1.39	1938.48	47.99	12.43	9.59	22.03
T_1	89.25	0.50	1.37	1891.52	44.76	11.32	9.84	21.17
T_2	97.00	0.82	1.53	2590.45	79.42	13.75	12.47	26.72
T_3	92.50	0.36	1.41	2269.28	34.01	12.54	11.96	24.51
T_4	92.75	0.41	1.36	1917.23	38.05	10.77	9.89	20.66
T_5	90.00	0.35	1.20	1757.07	32.21	10.68	9.02	18.04
T_6	90.25	0.31	1.18	1742.81	28.46	9.68	9.96	19.64
Grand mean	91.53	0.47	1.34	2015.26	43.55	11.59	10.39	21.82
SE	0.78	3.73	0.91	70.68	2.67	0.83	0.73	1.12
CD 5%	4.53	0.10	0.16	337.94	9.18	2.37	1.47	4.16
CV	3.36	14.58	8.29	11.40	14.33	13.93	9.63	12.98
Max	97	0.82	1.53	2590.45	79.42	13.75	12.47	26.72
Min	89	0.31	1.18	1742.81	28.46	9.68	9.02	18.04

Maximum root length (13.75cm) recorded by T2 treatment PEG (20%) followed by T0 (12.43cm) unprimed. Minimum root length recorded by T6 (9.68cm) primed with eucalyptus leaf extract. Maximum shoot length (12.47cm) recorded by T2 treatment primed with PEG (20%) and it followed by T0 (9.59cm) unprimed. Minimum shoot length founded in T5 primed with neem leaf extract (9.02cm). Maximum seedling length (26.72cm) recorded by T2 primed with PEG (20%) followed by T0 (22.03cm) unprimed. Shortest seedling length recorded in T5 neem leaf extract (18.04cm) (Table 2). *Demir and Oztokat* 2003 also found that root and shoot lengths increased in seeds due to osmopriming as compared to non-primed seeds. Similar finding were also reported by *Farooq* (2007) [10]. Maximum seedling fresh weight (1.53 g) reported by T2 treatment primed with PEG (20%) followed by T0 (1.39g) unprimed with. Lowest value of seedling fresh weight founded in T6 primed with eucalyptus leaf extract (1.18g). Maximum seedling dry weight (0.82g) recorded by T2 primed with PEG (20%) followed by T0 (0.54g) unprimed. Lowest value of seedling dry weight founded in T6 primed with eucalyptus leaf extract (0.31g) (Table 2). Maximum seedling vigour index Ist (2590.45) recorded by T2 primed with PEG (20%) followed by T0 (2281.181938.48) uprimed. Minimum seedling vigour index Ist recorded by T6 primed with eucalyptus leaf extract (1742.81) (Table 2) the osmo-priming, halopriming has positive effect on the seed germination and their consequences. They help to release in enzymes and accelerate seed metabolism and physiological activities. Maximum seedling vigour index IInd (79.42) recorded by T2 primed with PEG (20%0 and it was followed by T0 (47.99) unprimed. Minimum seedling vigour index IInd recorded by eucalyptus leaf extract T6 (28.46) (Table 2). Similar finding were also reported by *Bakht* (2011). It has been reported that primed seeds showed better germination pattern and higher vigour level than non- primed (Ruan *et al*., 2002) [8].

4. Conclusion

It is concluded from the present experiment, that among that the seed primed with Polyethylene glycol (PEG) 20% was found to be the best among all priming treatments *i.e.* Potassium chloride (KCL) 1%, Calcium chloride ($CaCl_2$) 1%, Neem Leaf Extract 5%, and Eucalyptus Leaf Extract 5% for the variety of PBW 343 of wheat for germination percentage and seed vigour in wheat.

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