Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.6631

ISSN: 2320 – 7051

Int. J. Pure App. Biosci. **6 (2):** 1578-1585 (2018)

Research Article

International Journal of Pure & Applied Bioscience

OPEN ACCESS

Influence of Pre-Sowing Treatments on Germination and Seedling vigour of Wheat (*Triticum durum*L.)

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Received: 12.03.2018 | Revised: 18.04.2018 | Accepted: 26.04.2018

ABSTRACT

The Lab experiment was conducted at Laboratory conditions,Department of Genetics and Plant Bredding, Sam Higginbottom University of Agriculture, Technology & Sciences, Uttar Pradesh during Rabi 2017 - 2018 with Wheat variety (RAJ-6560).Influence of Pre-Sowing Treatments on Germination and Seedling vigour of Wheat with eleven treatments and four replications for each treatment including control were laid out in complete randomized Design. Aiming to assess the potential of halo, hydro and hardening seed treatments in improving seed quality and to assess the effect of magnetic water on Wheat seeds. By using different Organic leaf extract and Inorganic chemicals such as Tulasi leaf extract @ 5%, Neem leaf extract @5%, $Cacl_2$ @ (4%), KNO_3 @ (5%), KCL @ (1%), Nacl @ (1%), $Cacl_2$@ (1%), KH_2PO_4 (1000ppm), and Hydro priming, magnetic water. The seeds primed with Organic neem leaf extract (5% solution) for 8hrs was superior as it retained germination percentage, germination index, speed of germination, shoot length, seedling length, seedling fresh weight, seedling dry weight, vigour indices. Root length is found superior in seeds primed with magnetic water apart from leaf extract (5% solution) i.e. tulasi leaf extract and $cacl_2$ (1% solution) for 8hrs are also found superior over unprimed seeds (control).

Key words: *Wheat, Organic leaf extract, Neem leaf extract, Tulasi leaf extract, Inorganic chemicals, $CACL_2$, KNO_3, KCL, NaCL, KH_2PO_4, Hydro priming, magnetic water, Seedling vigour*

INTRODUCTION

Durum wheat is a tetraploid wheat, having 4 sets of chromosomes for a total of 28, unlike hard red winter and hard red spring wheats, which are hexaploid (6 sets of chromosomes) for a total of 42 chromosomes each. Durum wheat originated through intergeneric hybridization and polyploidization involving two diploid (having 2 sets of chromosomes) grass species: T. urartu (2n=2x=14, AA genome) and a B-genome diploid related to Aegilops speltoides (2n=2x=14, SS genome) and is thus an allotetraploid (having 4 sets of chromosomes, from unlike parents) species. Durum is rich in gluten but that is not readily available as the endosperm is hard to break to release that gluten. Durum wheat is thus less used in bread making.

Cite this article: Neha, B., Dayal, A., Bara, M.B. and Ramteke, P. W., Influence of Pre-Sowing Treatments on Germination and Seedling vigour of Wheat (*Triticum durum*L.), *Int. J. Pure App. Biosci.* **6(2):** 1578-1585 (2018). doi: http://dx.doi.org/10.18782/2320-7051.6631

Its protein content is almost as high as that of hard spring or winter wheat and so is its gluten content, necessary for bread to rise.

Seed priming as a pre- sowing treatment in which seeds soaked in an osmotic solution that allows them to imbibe water and go through the first stages of germination but does not permit radicle protrusion through the seed coat the seeds then can be dried to their original moisture contains and stored planted via conventional techniques.

Pre-soaking seeds with optimal concentration of phyto-hormones enhance their germination, growth and yield under stress condition by increasing nutrient reserves mobilization through increased physiological activities and root proliferation.

The primed/hardened treatments proved to be better for vigour improvement than traditional soaking. Seed priming/hardening treatments enhances seeds vigour by protecting structure of the plasma membrane against injury during stress environment.

The purpose of seed hardening is to impact resistance against stress conditions like drought and cold to the emerging seedlings. Magnetic fields (MFs) can alter plant growth and development one way of applying MF is by magnetizing water thus creating magnetic water (MW) This review focuses on the use of Magnetic water in a bid to alter growth and development irrigation with magnetic water can improve the growth and development of plants both quantitatively and qualitatively.

MATERIAL AND METHODS

The experiment was carried out on "Influence of Pre-sowing Treatments on Germination and seedling vigour of wheat (*Triticum duram*). The experiment was conducted in completely randomized design with four replications having 11 treatments. Combined and individual involving chemicals and organic leaf extracts along with control. The different chemicals and organic leaf extracts treatments tried were T_0 control,T_1 hydro priming,T_2 magnetic water, T_3 $Cacl_2$ (4%) for 1 minute, T_4 KNO_3(5%) for 24 hrs , T_5 Kcl (1 %) for 24 hrs, T_6 Nacl (1%) for 8 hrs, T_7 Tulasi leaf extract (5%) for 8 hrs, T_8 Neem leaf extract (5%) for 8 hrs, T_9 $Cacl_2$ (1%) for 8 hrs and T_{10} KH_2PO4 (100 ppm) for 8 hrs.the experiment was done in between paper method in 4 replications. The observations are on germination percentage, speed of germination, root length(cm), shoot length(cm), seedling length(cm), fresh weight of seedling(g), dry weight of seedling(g), seedling vigour indices and electrical conductivity.

RESULTS AND DISCUSSION

The results provided in the table indicates the significant effect of treatments on the seed quality of wheat variety (RAJ 6560), under various parameters.

Germination per cent (%):

Significant difference in germination percentage due to different priming treatments were observed on one wheat variety. Significantly higher germination percentage was recorded with seeds primed with magnetic water 5% solution (T_2) at 8 hrs. of priming duration (98.25%).Significantly lower germination percentage was recorded at one minute of priming duration with $Cacl_2$ (T_3) which recorded germination percentage (96.75%).

Seeds primed in aerated solutions of magnetic water germinated earlier, were more in synchrony and had a great percent emergence than non primed seeds over wide rage water potentials Rao *et al* [5].

Similar findings were reported by Ghassemi-Golezani *et al.*[44, 45, 46, 47] in lentil and Haigh, A.M *et al.*[49] in various vegetables. Similar results were also reported by Hamdollah Eskandari[50] in different cereal crops.

Speed of germination (BRI):

The speed of germination estimated based on Bartlet rate index (BRI) showed significant variation among the different priming treatments over control. Among the different priming treatments higher BRI was observed in neem leaf extract (87.00) followed by tulasi leaf extract (86.00) and Nacl (84.00).at 8 hrs. of priming duration.

Magnetic water may be attribute to stimulate of hydrolytic enzyme activity known to be induced by germination percentage speed of germination may be due to greater hydration of colloids higher viscosity and elasticity of protoplasm offer an increase in bound water content. Lower water deficit and increased metabolic activity. Similar findings were reported by Ghassemi-Golezani *et al.*[44, 45, 46, 47] Harris.

Root length (cm):

The data pertaining to Root length as influenced by different treatment combinations of different priming treatments of wheat variety at 8hrs, 24hrs of priming duration.

Significant variations in Root length were noticed among the treatment combinations, soaking periods and interaction between them. Among treatments highest root length was observed in Neem leaf extract T_8 (15.9 cm) followed by magnetic water T_2 (15.60 cm) and lowest in T_0 (6.98cm) I.e. control with 8 hrs. of duration. The minimum root length was recorded in non-primed seeds which may be due to ion toxicity.

Similar findings were reported by Nath *et al.*[1] in wheat. Similar results were also reported by Krishnakumary [47] in cowpea.

Shoot length (cm):

Significant variations in shoot length were noticed among the treatment combinations, soaking periods and interaction between them. Among treatments highest shoot length was observed in T_5 (11.57) followed by T_2 (11.11) T_8 (9.15) T_7 (9.05) T_4 (8.09) and lowest in T_0 i.e. control (5.36). Maximum shoot length was observed in seeds subjected to hardening which was similar to hydro primed seeds.

Similar findings were reported by Ghassemi-Golezani *et al.*[44, 45, 46, 47] in lentil and Haigh, A.M *et al.*[49] in various vegetables. Similar results were also reported by Hamdollah Eskandari[50] in different cereal crops.

Seedling length (cm):

Significant variations in seedling length were noticed among the treatment combinations, soaking periods and interaction between them. Among treatments highest shoot length was observed in T_8 (24.05) followed by T_2 (26.71) and lowest in T_0 i.e. control (12.40).

The increase in the Seedling length percent may be due to pre sowing seed treatments, increase in root and shoot length and seedling dry weight and higher electrical conductivity. Higher seedling length in organic leaf extract treatments is due to more germination, root and shoot length, seedling dry weight and lesser germination percent is seen in control. Similar findings were reported by Ghassemi-Golezani *et al.* [44, 45, 46, 47].

Electrical Conductivity:

Significant variations in shoot length were noticed among the treatment combinations, soaking periods and interaction between them. Among treatments highest electrical conductivity was observed in T_7 (1.33) followed by T_9 (1.28) and lowest in T_8 i.e. Neem leaf extract (0.96).

Effect of different pre-sowing seed treatment on solute leakage of wheat seeds. Hardening treatment had minimum electrical conductivity on all measuring periods than all other treatment overall results of EC test shows that EC of seed leachates was decreased by most pre sowing treatments.

Similar findings were reported by Basra for wheat seeds and Agerich and Bradford[8, 9, 10] for tomato seeds.

Seedling Fresh weight (g):

Significant variations in shoot length were noticed among the treatment combinations, soaking periods and interaction between them. Among treatments highest shoot length was observed in T_3 (3.08) followed by T_2 (2.99) and lowest in T_0 i.e. control (1.79).Maximum seedling fresh weight was obtained from seed hardening and halo priming followed by hydro priming as compared to non primed seed control treatment maximum fresh and dry seedling weight from pre sowing treatment may be attribute to more synchronize germination which resulted in early stand establishment.

Similar findings were reported by Haigh, A.M *et al.*[49] in various vegetables. Similar results were also reported by

Hamdollah Eskandari[50] in different cereal crops.

Seedling dry weight (g):

Significant variations in shoot length were noticed among the treatment combinations, soaking periods and interaction between them. Among treatments highest shoot length was observed in T_8 (1.59) and lowest in T_0 i.e. control (0.455).

Effect of seed priming increase in the seedling dry weight percent may be due to pre sowing seed treatments.Maximum seedling fresh weight was obtained from seed hardening and halo priming followed by hydro priming as compared to non primed seed control treatment maximum fresh and dry seedling weight from pre sowing treatment may be attribute to more synchronize germination which resulted in early stand establishment.

Similar findings were reported by Ghassemi-Golezani *et al.* [44, 45, 46, 47] in lentil and Haigh, A.M *et al.*[49] in various vegetables. Similar results were also reported by Hamdollah Eskandari[50] in different cereal crops.

Seedling vigour index length:

Significant variations in shoot length were noticed among the treatment combinations, soaking periods and interaction between them. Among treatments highest shoot length was observed in T_2 (148.30) and lowest in T_0 i.e. control (44.10)

Seedling vigour index length mass:

Significant variations in shoot length were noticed among the treatment combinations, soaking periods and interaction between them. Among treatments highest shoot length was observed in T_2 (98.25) ad lowest in T_1 (97.00).

Effect of seed priming increase in the seedling vigour index length mass may be due to pre sowing seed treatments, increase in root and shoot length and seedling dry weight and higher electrical conductivity. Higher seedling vigour index length mass in organic leaf extract treatments is due to more germination, root and shoot length, seedling dry weight and lesser germination percent is seen in control.

Similar findings were reported by Ghassemi-Golezani *et al.*[44, 45, 46, 47] in lentil and Haigh, A.M *et al.*[49] in various vegetables. Similar results were also reported by Hamdollah Eskandari[50] in different cereal crops.

Table 1: Analysis of variance for nine characters of wheat variety

S. No.	Characters	Mean squares	
		Treatments (d.f =10)	Error (d.f=33)
1.	Germination percentage	1.050*	0.379
2.	Speed of germination	1053.05***	86.45
3.	Root length	34.191**	5.289
4.	Shoot length	14.326**	1.675
5.	Fresh seedling weight	0.590*	0.237
6.	Dry seedling weight	0.689**	0.031
7.	Seedling vigour index I	677464.30***	50159.710
8.	Seedling vigour index II	6613.439***	234.816
9.	Electrical conductivity	0.058	0.071

Table 2: Mean Performance of different pre sowing treatments on seed quality parameters of *Triticum duram* variety

Treatments	Germination	Fresh Weight	Dry Weight	Root Length	Shoot Length	Seeding Length
Control	97.250	1.795	0.455	6.987	5.367	12.405
Hydro Priming	97.000	2.603	0.632	7.345	6.635	14.048
Magnetic Water	98.250	2.993	1.510	15.602	11.115	26.718
CaCl2 @4%for 1 min	96.750	3.085	0.725	13.143	6.910	20.253
KNO3@ 5% for 24 Hrs	98.250	2.502	1.325	11.955	8.097	20.052
Kcl @ 1% for 24 Hrs	97.000	2.680	1.270	12.462	7.663	20.125
Nacl @ 1% for 8 Hrs	97.500	2.205	1.317	10.725	11.575	22.300
Tulasi leaf ext @ 5% for 8 Hrs	97.750	2.273	1.487	11.080	9.050	18.630
Neem leaf ext @ 5 % for 8 Hrs	98.000	2.437	1.593	15.900	9.150	24.050
CaCl2 @ 1% for 8 Hrs	97.250	2.863	1.575	13.100	7.325	20.497
KH2PO4 @ (100 ppm) for 8 Hrs	97.500	2.220	1.542	9.352	7.150	16.502
Mean	**97.500**	**2.514**	**1.221**	**11.605**	**8.185**	**19.598**
C.V.	0.631	19.381	14.531	19.818	15.810	12.508
F Prob.	0.013	0.024	0.000	0.000	0.000	0.000
S.E.M.	0.308	0.244	0.089	1.150	0.647	1.226
C.D. 5%	0.885	0.701	0.255	3.309	1.862	3.527

Table.3. Mean Performance of different pre sowing treatments on seed quality parameters of *Triticum duram* variety

	Speed of Germination	**Electrical conductivity**	**Seedling Vigour Index Length**	**Seedling Vigour index Length Mass**
Control	43.000	1.215	1206.363	44.108
Hydro Priming	50.000	1.103	1362.658	61.275
Magnetic Water	83.500	1.243	2624.967	148.305
CaCl2 @4%for 1 min	47.500	1.132	1959.250	70.148
KNO3@ 5% for 24 Hrs	63.500	1.241	2018.938	130.150
Kcl @ 1% for 24 Hrs	66.000	1.041	1952.850	123.100
Nacl @ 1% for 8 Hrs	84.000	1.013	2199.625	128.480
Tulasi leaf ext @ 5% for 8 Hrs	86.000	1.336	1830.180	145.397
Neem leaf ext @ 5 % for 8 Hrs	87.000	0.965	2363.000	155.947
CaCl2 @ 1% for 8 Hrs	75.500	1.280	2068.688	153.153
KH2PO4 @ (100 ppm) for 8 Hrs	71.000	1.233	1672.020	148.797
Gen. Mean	68.818	1.164	1932.594	118.987
C.V.	13.518	22.853	11.589	12.878
F Prob.	0.000	0.614	0.000	0.000
S.E.M.	4.651	0.133	111.982	7.662
C.D. 5%	13.383	_	322.198	22.045

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