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Influence of different priming treatments on seedling parameters of blackgram (*Vigna mungo* L.) Seeds

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Abstract
The study was carried out to investigate the Influence of Different Priming Treatments on Seedling Parameters of Blackgram (*Vigna mungo* L.) Seeds during 2017-2018 in the post-graduation experiment laboratory of Seed Science at the Department of Genetic and Plant Breeding, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, Uttar Pradesh. The seeds were treated with un-soaked seed (control), Hydro-priming (soaked with distilled water for 12 hrs and with Magnetized water for 7 hrs & 14 hrs), Thermopriming (30^0C & 40^0C for 30 & 15 minutes), Halopriming with $CaCl_2$ - 2%, $Ca(NO_3)_2$ - 1%, KNO_3 - 150ppm, KCl - 150ppm soaked for 12 hrs. $CaCl_2$ - 2% primed seed recorded higher germination per cent (90.50%),energy of emergence (78.75), seedling length (18.04cm), seedling dry weight (0.56 gm/10 seedlings), Vigour index I (1632.62) & Vigour index II (50.67). The seeds treated with $CaCl_2$ - 2% followed by Magnetized water (7 hours) and KNO_3 - 150ppm recorded numerically higher values compared to control. It was found that all the priming treatment showed significance difference over the control.

Keywords: Triclosan, TCS, determination, detection, sensor

Introduction
India's economy has been dominated by agriculture. Pulses have great importance in Indian agriculture as they are rich source of protein as compared to that of cereals. Keeping in view many benefits of pulses for human health, United Nations has proclaimed 2016 as the International Year of Pulses. Thus, due attention is required to enhance the production of pulses for not only meet the dietary requirement of protein but also to raise the awareness about pulses for achieving nutritional, food security and environmental sustainability. India is producing 14.76 million tons of pulses from an area of 23.63 million hectare, which is one of the largest pulses producing countries in the world. Thus, there is a need to increase production and productivity of pulses in the country by more intensive interventions.

Among the Pulses, Blackgram is a third most important pulse crop of India representing 15% of the total pulse area and 10% total pulse production. Black gram (*Vigna mungo* L.) also known as Urad dal belongs to family Fabaceae (Leguminaceae) having chromosome number 2n = 22 and native to India. It contains vegetable protein and supplement to cereal based diet, it contains about 26% protein, which is almost three times that of cereals and other minerals and vitamins. Besides, it is also used as nutritive fodder, especially for mulch animals. India is the world's largest producer as well as consumer of black gram and is mainly cultivated in Asiatic countries including Pakisthan, Myanmar and parts of Southern Asia. About 70% of worlds blackgram production comes from India. Urad production in the country is largely concentrated in five states viz, Uttar Pradesh (UP), Andhra Pradesh, Maharashtra, Madhya Pradesh and Tamil Nadu. These five states together contribute for about 65% of total urad production in the country. (Source: Ministry of Agriculture, GOI).

The low productivity in pulses is due to the reason that pulses are grown mostly in marginal and rainfed areas. The main constraint in raising the productivity levels of pulses in dry lands are inadequate soil moisture and poor fertility status of the soil. Pulses are most susceptible for imbibitional injury due to the delicate seed coat character and to overcome the adverse environmental conditions like low rainfall and low soil moisture which prevent the germination and establishment of seedlings.

Seed Priming is given as a pre-sowing treatment and followed to enhance seed performance with respect to rate and uniformity of germination. wetting and drying appears to impart drought tolerance and increase seed germination followed by better and quicker seedling emergence, reduces seedling mortality, increases crop population and thereby enhances the yield potential of the crop varieties. All the priming treatments showed improved germination as compared to non-primed seeds which was due to increased shoot and root length of seedlings from primed seeds and so much more vigourous than also suggested that priming treatments improves the vigour of the seeds.

Halopriming is treating the seed with salt and Thermopriming is the warming of seed prior to sowing. Water possesses particular properties that cannot be found in other materials and that are required for life giving processes. These properties are brought about by the hydrogen-bonded environment particularly evident in liquid water. The hydrogen bond in liquid water is highly affected by electrical and magnetic fields. It is found that some physical and chemical properties changed when water pass through magnetic field. Therefore the so called "Magnetized water" has different chemical and physical properties and action than ordinary water. N.Hirota.*et al* 1999 [5] have studied the effect of a magnetic field on the germination of different seeds.

Materials and Methods

The present study entitled "Influence of Different Priming Treatments on Seedling Parameters of Blackgram (*Vigna mungo* L.*)* Seeds" 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. Allahabad is located in South Eastern part of Uttar Pradesh, India. The side of experiment is located at 25.57^0N latitude, 81.56^0N longitude and 98 meters above mean sea level. The lab experiment was analyzed by using C.R.D. (Complete Randomized Design) with four replications and 10 treatments under laboratory conditions. Freshly harvested seeds of black gram cv. LBG 642 were imposed with the following seed treatments. T_0 - Control, T_1 - Water soaking (Distilled Water), T_2 - Electromagnetic water(7 hours), T_3 - Electromagnetic water(14 hours), T_4 - $CaCl_2$ - 2%, T_5 - $Ca(NO_3)_2$ - 1%, T_6 - KCl - 150ppm, T_7 - KNO_3 - 150ppm, T_8 - 30^0 C Temperature, T_9 - 40^0 C Temperature.

Halopriming, for the preparation of Calcium chloride ($CaCl_2$ - 2%) solution 20 (gm) $CaCl_2$ was taken in a measuring flask and made up to 1000 ml distilled water, while for Calcium nitrate $Ca(NO_3)_2$ - 1% solution 10 (gm) $Ca(NO_3)_2$ salt was taken in 1000 ml distilled water and for Potassium nitrate(KNO3 - 150ppm) & Potassium chloride (KCl - 150ppm) solution add 0.15 (gm) was taken in a measuring flask and made up to 1000 ml with distilled. After preparation of solutions Blackgram seeds were soaked of each solution separately for 12 hour at 25^0C temperature. Hydropriming - Black gram seeds were soaked for 12 hours in 100ml Distilled water. Magnetized water - A Digital Gauss meter model DGM-20. The probe made of indium arsenide crystal and encapsulated to non-magnetic sheet. The pre-sowing magnetic treatments were administered using an electro- magnet. When electric current passed through the coils, a non-uniform and static magnetic field was generated in the air space between the two bars. This was adjusted by moving one of the bars up or down until the required working strength was achieved. Seeds were placed in a rectangular shaped bottle or container with water in the space between the two bars of the electromagnet. 500 gauss (50mT) magnetic field is used for soaking of seeds at 7 hours and 14 hours. Thermopriming-Blackgram seeds were placed in Hot Air Oven for 30 mins at 30^0C and for 15 mins at 40^0C.

Fig 1: Digital Gauss meter model DGM-20

Fig 2: Seeds placed in a rectangular shaped bottle with water in the space between the two bars of the electromagnet

The observation on the characters *viz.*, Germination percent (ISTA 1999), Speed of germination, Germination energy, Root length (cm), Shoot length (cm), Seedling length (cm), Seedling Fresh weight (g), Seedling dry weight (g), Seedling vigour index I, Vigor index II (Baki and Anderson 1973) were recorded. The experimental data recorded were subjected to statistical analysis for calculating analysis of variance, range, mean, critical difference and coefficient of variation (Fisher 1936).

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 were affected by $CaCl_2$ - 2% and it was followed by T_2 - Electromagnetic water (7 hours) with 1485.68 and T_7 - KNO_3 - 150 ppm are significantly recorded maximum(Table -2). The results are conformity with findings of (Kalyanrao *et al.*, 2017) [14].

Table 1: Analysis of Variance for 10 Seedling characters in Blackgram.

		Mean Sum of Squares	
S.No	**Characters**	**Treatments (df = 9)**	**Error (df = 30)**
1.	Germination %	204.447**	9.525
2.	Speed of germination	436.915**	0.468
3.	Root length	8.742**	0.639
4.	Shoot length	5.197**	0.257

5.	Seedling length	26.217**	1.221
6.	Seedling fresh weight	0.683**	0.015
7.	Seedling dry weight	0.036**	0.000
8.	Vigour index - I	359767.337**	12329.721
9.	Vigour index - II	432.513**	1.914
10	Germination energy	249.069**	31.892

** And * significant at 5% and 1% level of significance, respectively

Significantly higher germination percent (90.50) reported in treatment T_4 - $CaCl_2$ - 2% followed by T_2 - Electromagnetic water (7 hours) (87.25) and T_7 - KNO_3 - 150ppm - (83.00). Higher Speed of Germination reported in T_4 - $CaCl_2$ - 2% (85.70) followed by T_2 - Electromagnetic water (7 hours) (79.44) and T_7 - KNO_3 - 150ppm (78.13). Maximum root length (10.57cm) was recorded by T_4 and it was followed by T_2 with 10.02 cm and T_7 with 9.59 cm. Maximum shoot length (7.47 cm) was recorded by T_4 and it was followed by T_2 (7.00 cm) and T_7 (6.90 cm). The results are conformity with findings of (Nasher 2008) [12].

Table 2: Mean Performances of different priming treatments

Treatment	Germination Percent (%)	Seedling Length (cm)	Seedling Fresh Weight (gm)	Seedling Dry Weight (gm)	Vigour Index-I	Vigour Index–II	Germination Energy (%)	Speed of Germination
T_0	65.25	10.44	2.15	0.28	680.91	18.30	48.00	51.12
T_1	75.50	11.23	2.33	0.32	850.05	24.13	53.00	60.72
T_2	87.25	17.02	3.00	0.52	1485.68	45.36	69.00	78.13
T_3	76.00	13.54	2.35	0.36	1030.04	27.37	64.00	66.12
T_4	90.50	18.04	3.30	0.56	1632.62	50.67	70.00	85.70
T_5	81.25	14.94	2.83	0.46	1228.58	37.36	65.75	76.77
T_6	80.00	15.05	2.73	0.42	1203.88	33.60	63.00	71.13
T_7	83.00	16.49	3.25	0.49	1369.89	40.67	66.00	79.44
T_8	79.25	13.99	2.48	0.40	1108.67	31.70	60.00	69.10
T_9	73.75	11.69	2.30	0.31	866.25	22.87	50.00	61.29
Grand Mean	79.18	14.24	2.67	0.41	1145.65	33.20	60.88	69.95
C.D. (5%)	4.457	1.596	0.179	0.017	160.352	1.998	8.155	0.988
SE(m)	1.543	0.553	0.062	0.006	55.520	0.692	2.824	0.342
C.V.	3.898	7.759	4.638	2.803	9.692	4.167	9.277	0.978

Maximum seedling length (18.04 cm) found in T_4 and it was followed by T_2 (17.02 cm) and T_7 (16.49 cm) and minimum seedling length in T_0 (10.44).Maximum Fresh weight (2.67 gm) was recorded by T_4 with treatment of $CaCl_2$ - 2% Maximum dry weight (0.56 gm) was recorded by T_4 with treatment of $CaCl_2$ - 2%. Maximum vigour index - I (1632.62) was recorded by $CaCl_2$ - 2% and it was followed by Electromagnetic water (7 hours) with 1485.68 and KNO_3 - 150ppm with 1369.89. Maximum vigour index – II 1632. 62 was recorded by T_4 and it was followed by T_2 (45.36) and T_7 (40.67). Minimum seedling characters were observed in control (T_0) and (T_9) 40^0C.

Conclusion

On the basis of above findings it can be concluded that the different priming treatments showed significant effect on seedling parameters. Priming with $CaCl_2$ - 2% increased seedling parameters in blackgram followed by Magnetized Water -7hrs and KNO_3.Improvement of seed quality by seed priming with 2% $CaCl_2$ is a simple and easy approach and magnetized water technique is a safety, simplicity and environmentally friendliness and not proven harmful effects to enhance the seed performances and agricultural productivity. Among all the priming methods, Halopriming and Magnetized water (Hydropriming) showed best result in comparison to Thermopriming. These conclusions are based on the results of laboratory investigation.

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