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Effect of Seed Priming on Germination and initial Seedling Growth of Cowpea Seeds (*Vigna unguiculata* L.)

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ABSTRACT: To overcome several seed enhancement techniques are available for quality up gradation we was conducted experiment in post graduate Seed Testing Laboratory, Department of Genetics and Plant Breeding, SHUATS, Prayagraj (U.P.) during *Kharif* season 2020-2021 standardize the suitable pre-sowing seed treatment for Cowpea. Different pre-sowing seed treatments with control (Unhardened) were evaluated by screening of 10 hours viz., T_0- Control, T_1- Neem leaf extract @ 3%, T_2- Neem leaf extract @ 5%, T_3- Tulsi leaf extract @ 3%, T_4- Tulsi leaf extract @ 5%, T_5- Beejamurtha @ 3%, T_6- Beejamurtha @ 5%, T_7- Coconut water @ 2%, T_8- Coconut water @ 4%, T_9- Cow urine @ 2%, T_{10}- Cow urine @ 4%, T_{11}- Ginger extract @ 1%, T_{12}- Ginger extract @ 2%. It was resulted that the pre-sowing seed treatments are significance difference with the control, in seed quality parameters highest germination %, seedling length and vigour attributes in leaf extract: Neem (5%) followed by leaf extract: Tulsi (5%), Beejamurtha (3%), Coconut water (4%), and Cow urine (4%) significantly increased the germination and vigour parameters of cowpea and found to be lowest in Control (untreated seed).

Keywords: Cowpea seeds, Neem leaf extract, Tulsi leaf extract, Beejamurtha, Coconut water, Cow urine, Ginger extract, germination, seedling and vigour parameters.

INTRODUCTION

Cowpea (*Vigna unguiculata* (L.) Walp.) is an most important vegetable crop (legume) of India. It is also grown for its grain, vegetable and also for fodder purpose. Cowpea is adapted to warm weather and required less rainfall than other crops. Cowpea has also the ability to be intercropped with cereals such as millet and sorghum. It has quick growth and rapid ground cover have made cowpea an essential component of sustainable subsistence agriculture. Being a drought tolerant and hot weather crop, cowpea is well-adapted to the semi- arid regions of the tropics where other food legumes do not perform well (Debashri and Tamal 2012).

In India vegetable cowpea is occupies an area of 23,012 ha with production of 1, 33,587 tons of green pod and productivity of 5.8 t/ha. U.P., Bihar, Jharkhand, West Bengal, Odisha etc are the leading states. Cowpea is also called as vegetable meat due to more amount of protein in grain with best biological value on dry weight basis. It is a crop of prosperity and sustainability. Beside its use as pulse, vegetable and fodder it can also be used as nitrogen fixer, green manure, cover crop and leafy vegetable.

The primed seeds can be a technological tool to provide excellent seedling performance in the field (Singh, 2013) by reversing some of the ageing inducing deteriorating events and there by promote sustainable farming systems especially in marginal environments. For resource poor farmers and indigenous people, who live and farm in marginal environmental, where rainfall is unpredictable and erratic, soil quality is poor and access to inputs is limited, the use of good quality seed can enhance the performance of the crops. The rate of germination and improvement of seedling stands were also accelerated as a result of seed priming in tomato (Karthika and Vanangamudi 2013). Variation in the results depend on temperature, priming duration, concentration of the priming chemical and the crop type. An important factor is to determine how long the benefits last during dry storage of seeds following priming (Sajjan *et al.*, 2017).

The jeevamruth, panchagavya and Beejamruth are economic eco-friendly organic preparations which made from cow products. The Beejamruth is an maximum productivity with minimum expenses and plant growth stimulant that enhances the biological efficiency of crops. It is also used to activate soil and protect the plants from disease and also increase the nutritional quality of fruits and vegetables. It is also used as a foliar spray, as soil application along with irrigation water, seed or seedling treatment etc. (Choudhary *et al.*, 2017).

However the general rule in this connection is that primed seeds should be considered vigorous but without prolonged storage periods. This rule was obvious with many plants such as sweet corn (Wu *et al.*, 2019). But the literature available in this context is very scanty. Therefore in the present investigation an attempt has been made to study the response of cowpea

seeds to priming and post priming storage duration with different pre-sowing seed treatments.

MATERIALS AND METHODS

Conducted study at the Seed Testing Laboratory of Sam Higginbottom University of Agricultural Technology and Sciences (SHUATS), Department of Genetics and Plant Breeding, Naini Agricultural Institute (NAI), Prayagaraj (U.P.). The current experiment was done using a randomized block design with 13 treatments including control. Cowpea variety "CO-6" seeds has been used experimentally from T_0 to T_{12} for various organic seed treatments. Lab experiment data analysis was evaluated by two-way ANOVA (salinity and Treatment), following a completely randomized design (Fisher, 1936) process.

Treatments: T_0-Control, T_1- Neem leaf extract @ 3%, T_2-Neem leaf extract @ 5%, T_3- Tulsi leaf extract @ 3%, T_4- Tulsi leaf extract @ 5%, T_5- Beejamurtha @ 3%, T_6- Beejamurtha @ 5%, T_7- Coconut water @ 2%, T_8- Coconut water @ 4%, T_9- Cow urine @ 2%, T_{10}- Cow urine @ 4%, T_{11}- Ginger extract @ 1%, T_{12}- Ginger extract @ 2%.

METHODOLOGY

After the completion of cleaning and grading, seeds were soaked in priming solutions at different volume of seeds for ten hours. Then air dried under the shade to bring back to their original moisture content and used for sowing.

Prepration of Solution: For preparation of solution, the required chemicals have been collected from Department of Genetics and Plant Breeding, Prayagraj and fresh leaves and rhizomes for organic priming were collected from Department of Horticulture Research Fields, SHUATS.

Neem leaf extract: For the preparation of solution of the leaf extract, Neem leaves were collected from the Horticulture research fields, SHUATS. The leaves were washed thoroughly in tap water and crushed into fine paste by using mortar and pestle, 5g of the sample was ground by a blender with 100 ml of distilled water. The ground mixture is filtered through a fine cotton cloth which constitutes 5% Neem Leaf Extract and so on. To avoid contamination, the flasks containing extract were covered with muslin cloth.

Beejamurtha

Ingredients:

- For 10 kg seed use water 2 liter
- Use cow urine 250 ml for one liter of water
- Use Cow dung 250 grams for one liter of water
- Use Lime 2.5 g per liter of water
- Use soil-like dikes or clay bundles, which do not have any stone.

Preparation method of Beejamurtha: With the help of plastic box, mix all the ingredients in it, and make sure that there is no lump in cow's dung, and with the help of a wooden stick mixture the ingredients. The mixture should be rotated to the clockwise direction, so that positive energy spreads in the mixture. The mixture box is Cover with a jute sack or poly net, and the box should be kept in the shadow place, and be ensured that the box is not directly exposed to the sunlight and rainwater. After one day (24 hrs) the Beejamrutha is ready and it can be used for seed treatment.

After prepare the solution of beejamurtha, 3 ml beejamurtha solution was taken in a beaker and 100ml distilled water were stirred in liquid. The final volume of solution will be prepared to one litter, and then it became 3% stock solution of beejamurtha. To avoid contamination, the flasks containing beejamurtha were covered with muslin cloth.

Coconut water: Prepare 2% of coconut water for preparation of solution, 2 ml water from green coconut fruit were taken and the liquid were added in 100 ml. of distilled water. The finally solution will constitute to one liter, and it became 2% stock solution of coconut water. To avoid contamination, the flasks containing coconut water were covered with muslin cloth.

Cow urine: Prepare 4% solution of cow urine, 4 ml Gomutara (cow urine) were taken in a glass beaker and the liquid were added in 100 ml. of distilled water. The finally solution will constitute to one liter, and then it became 4% stock solution of Cow urine. The flasks covered with muslin cloth to avoid any contamination which contains cow urine.

Ginger extract: Ginger (rhizome) was collected from the Horticulture research fields, SHUATS for the preparation of solution of the ginger extract. The rhizomes were washed thoroughly in tap water and crushed into fine paste by using mortar and pestle, 1g of the sample was ground by a blender with 100 ml of distilled water. The ground mixture is filtered through a fine cotton cloth which constitutes 1% Ginger Extract. The flasks covered with muslin cloth to avoid contamination.

Placing Seeds on Germination Paper.

RESULTS AND DISCUSSIONS

The maximum % of germination (92.00%) was recorded by T_2 (Neem leaf extract @ 5%) followed by T_4(Tulsi leaf extract @ 5%) (89.50%), T_5 (Beejamurtha @ 3%) (88.00%) and T_8(Coconut water @ 4%) (87.00%). Minimum germination% was recorded by T_0 (Control) (76.75%). The increment in germination % under primed seed might be due to acceleration of metabolic activities by water and certain chemicals which force to rapid cell division and multiplication. Similar results of germination % were found in Arif *et al.*, (2008).

Maximum root length (11.69 cm) was recorded by T_7 (Coconut water @ 2%) followed by T_8(Coconut water @ 4%) (11.46 cm), T_2 (Neem leaf extract @ 5%) (11.41 cm) and T_4 (Tulsi leaf extract @ 5%) (11.27 cm). Minimum root length was recorded by T_0(Control) (8.32 cm). Maximum shoot length (17.49 cm) was recorded by T_2 (Neem leaf extract @ 5%) followed by T_4(Tulsi leaf extract @ 5%) (16.92 cm), T_5 (Beejamurtha @ 3%) (15.72 cm) and T_8 (Coconut water @ 4%) (14.63 cm). Minimum shoot length was recorded by T_0(Control) (10.72 cm). Maximum seedling length (28.90 cm) was recorded by T_2(Neem leaf extract @ 5%) followed by T_4 (Tulsi leaf extract @ 5%) (28.19 cm), T_5 (Beejamurtha @ 3%) (26.61 cm) and T_8(Coconut water @ 4%)(26.09 cm). Minimum seedling length was recorded by T_0 – Control (19.03 cm). Similar results of root, shoot and seedling length were found in Ambika and Balakrishnan, (2015); Aamir, (2015); Araujo *et al.*, (2016).

Maximum fresh weight of seedling (5.17 g) was recorded by T_2 (Neem leaf extract @ 5%) followed by T_4(Tulsi leaf extract @ 5%) (5.04 g), T_5 (Beejamurtha @ 3% (4.76 g) and T_7 (Coconut water @ 2%) (4.69 g). Minimum fresh weight of seedling was recorded by T_0(Control) (2.69 g). Maximum seedling dry weight(0.078 g) was recorded by T_2(Neem leaf extract @ 5%) followed by T_4 (Tulsi leaf extract @ 5%) (0.73 g), T_5 (Beejamurtha @ 3%) (0.67 g) and T_{10}(Cow urine @ 4%) (0.67 g). Minimum dry weight of seedling was recorded by T_0 (Control) (0.032 g). Abdelhady and Aly, (2012) also reported to the results regarding root and shoot fresh weights are in agreement with those of who reported that fresh and dry weights of seedlings from primed seeds were significantly higher, as compared to other unprimed seeds. Similar results of weight of seedling were found in Ahanger *et al.*, (2013); Mubarak *et al.*, (2019).

Maximum seed vigour index-I (2662.35) was recorded by T_2 (Neem leaf extract @ 5%) followed by T_4 (Tulsi leaf extract @ 5%) (2522.76), T_5 (Beejamurtha @ 3%) (2338.36) and T_8(Coconut water @ 4%) (2273.78). Minimum seed vigour index-I was recorded by T_0 (Control) (1459.41). The higher seed vigour index I under Neem leaf extract compared to control is due to their promotional effects on seed germination and seedling length. It has been reported that primed seeds showed better germination pattern and higher vigour level than non-primed Afzal *et al.*, (2011); (Kangana *et al.*, (2012).

The maximum seed vigour index-II (72.09) was recorded in T_2 (Neem leaf extract @ 5%) followed by T_4 (Tulsi leaf extract @ 5%) (65.73), T_5 (Beejamurtha @ 3%) (59.37) and T_8 (Coconut water @ 4%) (54.11).Minimum seed vigour index-II was recorded by T_0 (Control) (24.51). The improvement in vigour of low-vigour seed may be due to reserve mobilization of activation, food material, and re-synthesis of some enzymes DNA and RNA synthesis start during priming. Identical results of Seed vigour index-II were found in Yucel *et al.*, (2012); Daniel, (2012); Abbasi *et al.*, (2013).

Table 1: Analysis of variance: 8 seedling characters in cowpea.

Sr. No.	Characters	Mean sum of squares	
		Treatments (df=12)	Error (df=36)
1.	Germination %	77.48*	5.47
2.	Root length	3.86*	1.35
3.	Shoot length	24.10*	5.29
4.	Seedling length	40.35*	6.11
5.	Seedling weight (Fresh)	2.66*	0.09
6.	Seedling weight (Dry)	0.09*	0.04
7.	Seed vigour index-I	514687.75*	50589.97
8.	Seed vigour index-II	867.02*	346.89

* Significant at 5% level of significance

Table 2: Mean performance of cowpea for 8 seedling characters.

Sr. No.	Treatments	Germination%	Root Length (cm)	Shoot Length (cm)	Seedling Length (cm)	Fresh Weight of Seedling (gm)	Dry Weight of Seedling (gm)	Seed Vigour Index-I	Seed Vigour Index-II
1.	T_0	76.75	8.32	10.72	19.03	2.69	0.32	1459.41	24.51
2.	T_1	84.25	9.22	10.89	20.11	3.74	0.37	1696.07	31.37
3.	T_2	92.00	11.41	17.49	28.90	5.17	0.78	2662.35	72.09
4.	T_3	81.75	10.77	13.48	24.25	4.46	0.41	1986.56	33.30
5.	T_4	89.50	11.27	16.92	28.19	5.04	0.73	2522.76	65.73
6.	T_5	88.00	10.90	15.72	26.61	4.76	0.67	2338.36	59.37
7.	T_6	84.50	11.16	11.43	22.59	4.45	0.51	1908.61	43.31
8.	T_7	78.25	11.69	12.61	24.30	4.69	0.36	1900.54	27.73
9.	T_8	87.00	11.46	14.63	26.09	3.78	0.42	2273.38	36.31
10.	T_9	86.00	10.52	11.57	22.09	3.06	0.56	1899.29	47.62
11.	T_{10}	80.75	9.84	10.78	20.61	4.40	0.67	1666.20	54.11
12.	T_{11}	83.50	9.93	11.13	21.05	3.31	0.53	1756.56	44.46
13.	T_{12}	81.25	10.52	11.07	21.58	3.14	0.49	1752.15	40.10
Grand Mean		84.11	10.53	12.95	23.49	4.05	0.52	1986.32	44.61
C.D. (5%)		3.34	1.66	3.29	3.53	0.43	0.29	321.69	26.63
SE(m)		1.16	0.58	1.15	1.23	0.15	0.10	112.46	9.31
SE(d)		1.65	0.82	1.62	1.74	0.21	0.14	159.04	13.16
C.V.		2.78	11.04	17.75	10.52	7.47	39.88	11.32	41.74

SUMMARY

Germination per cent (92.00%) was highest in T_2 (Neem leaf extract @ 5%) followed by T_4 (Tulsi leaf extract @ 5%) (89.50%) and found to be lowest in T_0(Control) (76.75%). Root length (11.69 cm) was highest in T_7(Coconut water @ 2%) followed by T_8 (Coconut water @ 4%) (11.46 cm) and found to be lowest in T_0 (Control) (8.32 cm). Shoot length (17.49 cm) was highest in T_2 (Neem leaf extract @ 5%) followed by T_4 (Tulsi leaf extract @ 5%) (16.92 cm) and found to be lowest in T_0 (Control) (10.72 cm). Seedling length (28.90 cm) was highest in T_2 (Neem leaf extract @ 5%) followed by T_4 (Tulsi leaf extract @ 5%) (28.19 cm) and found to be lowest in T_0 (Control) (19.03 cm). Fresh weight of seedling (5.17 g) was highest in T_2 (Neem leaf extract @ 5%) followed byT_4 (Tulsi leaf extract @ 5%) (5.04 g) and found to be lowest in T_0 (Control) (2.69 g). Dry weight of seedling (0.078 g) was highest in T_2 (Neem leaf extract @ 5%) followed by T_4 (Tulsi leaf extract @ 5%) (0.073 g) and found to be lowest in T_0 (Control) (0.032 g). Seed vigour index-I (2662.35) was highest in T_2 (Neem leaf extract @ 5%) followed by T_4 (Tulsi leaf extract @ 5%) (2522.76) and found to be lowest in T_0 (Control) (1459.41). Seed vigour index-II (72.09) was highest in T_2 (Neem leaf extract @ 5%) followed by T_4 (Tulsi leaf extract @ 5%) (65.73) and found to be lowest in T_0 (Control) (24.51).

CONCLUSION

Pre-sowing seed treatment increases the germinability and vigour of cowpea seeds and found to be significantly all data in laboratory condition. Neem leaf extract (5%) followed by Tulsi leaf extract (5%), Beejamurtha (3%), Coconut water (4%), and Cow urine (4%) significantly increased the germination and vigour parameters of cowpea and found to be lowest in Control (untreated seed). Neem leaf extract (5%) showed maximum increase in germination, seedling dry weight and vigour parameters. Neem leaf extract (5%) showed best treatment among all the treatments for cowpea. All these conclusions are based on the investigation for six months and therefore further investigation is needed to arrive valid recommendations.

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Conflict of interest. Nil.

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