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Effect of seed pelleting and foliar application of Seaweeds and Botanical powders on seed quality and yield parameters in black gram [*Vigna mungo (*L.)] hepper

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ABSTRACT

A field experiment was conducted during the *kharif* season of 2020 at the Plant Breeding Farm, Department of Genetics and Plant Breeding, Annamalai University to study the effect of seed pelleting and foliar application of seaweed powder and botanical powders on seed quality and yield parameters in black gram [*Vigna mungo* (L.)] *var*. VBN10. The seeds were pelleted with seaweed powders and botanical powders *viz., Kappaphycusalvarezii*, *Gracilaria* sp, neem leaf powder,arappu leaf powder, moringa leaf powder, custard apple leaf powder, *prosopis* leaf powder to study the effect on seed quality and yield characteristics like germination percentage, root length, shoot length, seedling length, seedling fresh weight, seedling dry weight, vigour index I, vigour index II, plant height, number of leaves per plant, number of branches per plant, number of nodules per plant, days to first flowering, number of cluster per plant, number of pods per plant, pod weight per plant, pod length, number of seeds per pod, number of seeds per pod, number of seeds per plant, test weight and pod yield per plant. The results showed that black gram seed spelleted with T_2 *Kappaphycus alvarezii* and foliar application @ 5% improved higher seed yield and quality parameters when compared to other treatments and control.

Key words : *Black gram, Seed pelleting, Foliar application, Yield parameter, Seed germination.*

Introduction

Pulses are the most important legume crop in India. Black gram (*Vigna mungo* L. Hepper) is known as urd bean or mash, is a grain legume domesticated from *Vigna Mungo* var. *Silvestre's*. It belongs to the family Leguminosae with chromosome number 2n = 22. In India, it is cultivated in an area of about 46.7 lakh hectares, with production of 23.4 lakh tonnes and productivity of 501Kg ha^{-1}(2020-2021). (agricoop.nic.in). The low productivity is due to the fact that pulses are grown mostly in marginal and rainfed areas, the inadequacy of soil moisture and poor fertility status of the soiland availability of poor-quality seeds. (Karivaratharaju and Ramakrishnan, 1985). It can be overcome by seed management practices like seed pelleting, seed hardening and other seed treatments like seaweed powders.

Seed pelleting is the process of enclosing a seed with small quantity of inert material just large enough to produce globular unit of standard size to provide small amount of nutrients to young seedlings (Krishnasamy, 2003). Seed pelleting is a pre-

sowing treatment to the seeds,which act as boon to the farmers in dryland agriculture. Botanicals are the substances from naturally occurring sources based on botanical ingredients. It induces early germination, better root and seedling growth, reduces seedling mortality, increases crop population and thereby enhances the yield potential of the crop varieties. Malarkodi (2003) revealed that the macro and micro nutrients present in the leaf powder is cause for invigourative effect of botanicals treatments. In addition plant leaf powder contains the growth promoting substances like gibberellins, saponins and nutrients (Lu *et al.,* 1983). Hence, a study was undertaken in blackgram *var*VBN 10 with an objective of evaluating the effect of seed pelleting with various leaf powders and seaweed powder on seed quality and yield parameters.

Materials and Method

The present investigation was carried out in thePlant Breeding Farm, Department of Genetics and Plant Breeding, Annamalai University, during 2020. Freshly harvested seeds of black gram *var*.VBN 10 was obtained from Tamil Nadu Pulses Research Station,Vamban, India, served as the base material utilized in this study.

Preparation of plant leaf extract

The fresh leaves of the concerned plants were collected separately and dried under shade. The shade dried leaves were powdered using mortar and pestle. Then one gram of leaf powder was dissolved in 100 ml of distilled water which was measured already in the beaker to make 1% leaf extract. The leaf extract was filtered by using muslin cloth to remove unwanted material and leaf debris.

Treatment details;

T_0- Control
T_1- *Kappaphycus alvarezii* @ 2.5%
T_2 - *Kappaphycus alvarezii* @ 5%
T_3- *Gracilaria sp* @ 2.5%
T_4 - *Gracilaria sp* @ 5%
T_5- Neem leaf extract @ 1%
T_6- Arappu leaf extract @ 1%
T_7- Moringa leaf extract @ 1%
T_8- Custard apple leaf extract @ 1%
T_9-*Prosopis* leaf extract @ 1%

Germination test was conducted with 4 × 100 seeds of each treatment, tested in Randomized Block Design (RBD), in sand media. Germination room was maintained at a temperature of 25 ± 1°C RH of 96 ± 2% with diffused light. The final count based on normal seedling was recorded on seventh day and the mean germination was recorded in percentage (ISTA, 1999). Observations on seed and seed yield characters *i.e.* Plant height (cm), Number of leavesper plant, Number of branches per plant, Number of nodules per plant,Days to first flowering, Number of cluster per plant, Number of pods per plant, Pod weight per plant(g), Pod length(cm), Number of seeds per pod,Number of seeds per plant, Seed yield per plant (g), Testweight (g) and Pod yield per plant(g) were recorded. After harvest, standard germination tests for seeds obtained from control and treated plots were carried out between two layers of moist filter paper according to International Seed Testing Association (ISTA, 2011) rulesto evaluate treatment effect on seed germination capacity. Observations on seed quality parameters, *i.e.* Germination percentage, Root length (cm), Shoot length (cm), Seedling length (cm), Seedling fresh weight (mg/10 seedlings), Seedling dry weight (mg/10 seedlings), Vigour Index-I and Vigour Index-II were recorded. Based on the results obtained, the vigour index values were computed as per Abdul-Baki and Anderson (1973), and the values were reported as whole number without unit. The data were analysed statistically using ANOVA, Panse and Sukhatme, 1985.

Results and Discussion

Seed pelleting is one of the pre-sowing seed enhancement techniques which had a significantly positive effect on different aspects of seed and seedling quality characteristics under laboratory and field conditions. In the present study, seeds were evaluated for their physiological and morphological qualities. The minimum days to first flowering was observed in T_2 (26.50)followed by T_9 (28.80), (T_0) (31.10) control recorded the maximum days to first flowering (Table 1). The maximum plant height was observed in T_2(18.50 cm) followed by T_9 (17.25cm), while theminimum plant height was recorded in control T_0 (14.20 cm) (Table 1). The increase in plant height might be due to stimulation of cell elongation, cell division and enlargement as reported by Karivartharaju and Ramakrishnan (1985). The maximum number of leaves per plantwas observed in T_2 (26.50) followed by T_9 (23.06),while the minimum number of leaves was recorded in control T_0 (17.00) (Table 1). Higher number of leaves was recorded

with seed pelleted with *Kappaphycus alvarezii* due to increase in cell division, cell enlargement and increase more extensive and denser network of veins and ribs. Similar results were reported by Ginzo *et al.* (1977) in chick pea and Prakash *et al*. (2013) in rice. Data was recorded for yield parameters in the field showed significant differences among different treatments.

The maximum number of branches per plant was observed in T_2 (4.05) followed by T_9 (3.76), while the minimum number of branches per plant was recorded incontrol T_0 (2.50) (Table 1). The maximum number of pod length was observed in T_2 (5.00) followed by T_9 (4.35), while the minimum number of pod length was observed in control T_0 (3.42)(Table 2). The maximum pod weight per plant was observed in T_2 (14.00) followed by T_9 (13.20) and the minimum pod weight per plantwas observed in control T_0 (11.50) (Table 2). The maximum number of seeds per podwas observed in T_2 (160.25) followed by T_9 (158.60), while the minimum number of seeds per pod was recorded in control T_0 (146.25) (Table 2). The maximum seed yield per plant was observed in T_2 (4.20) followed by T_9 (3.86) and the minimum seed yield per plantwas observed in control T_0 (2.50)(Table 2). The increase in seed yield with respect to seed pelleting treatments was probably due tomaximum water absorbing capacity of seeds, more intense photosynthetic activity as well as more tissue hydration and thereby, enabling the plant to resist soil moisture stress more efficiently was recorded. The maximum test weight was observed in T_2 (40.63) followed by T_9 (36.20), while control recorded in T_0 (32.87)(Table 2).

Data was recorded for yield parameters in the laboratory showed significant differences among different treatments forseed yield parameters. The maximum germination percentage was observed in T_2 (94) followed by T_9 (92), while the minimum germination percentage was recorded in T_0 (77)(Table 3), and might be due to the biochemical changes like enzyme activation involved in cell wall modification, gibberellins like substances biosynthesis (Lee *et al.,* 1998; Lee and Kim, 2000; Basra *et al.,* 2005). The maximum root length was observed in in T_2 (18.50) followed by T_9(17.50), while the control recorded the minimum root length T_0 (15.60) (Table 3). The maximum shoot length was observed in T_2 (20.20) followed by T_9(19.36) and to recorded minimum shoot length in control T_0 (16.60) (Table 3). The increase in root length and shoot length might be due to the fertilizing effect of *kapppaphycus alvarezzi* @ 5% resulting from the nutrient release from damaged or decayed tissue of storage organ by hydrolysis (Orr *et al.,* 2005). The maximum seedling length was observed in T_2 (38.70) followed by T_9(35.34), while the minimum shoot length was recorded in control T_0 (32.20) (Table 3). The maximum seedling fresh weight was observed in in T_2 (1.34) followed by T_9(1.30), while the control T_0 (0.86) recorded in minimum seedling fresh weight (Table 3). The maximum seedling dry weight was observed in T_2 (0.16) followed by T_9(0.15), while control recorded minimum seedling dry weight T_0 (0.10) (Table 3). The maximum vigour Index-I was observed in T_2 (3657.15) followed by T_9(3361.63), and minimum vigour In-

Table 1. Effect of different seed pelleting treatment on various growth parameters in black gram.

Treatments	Plant height (cm)	No. of leaves per plant	No. of branches per plant	No. of nodules per plant	Days to first flowering	No of cluster per plant	No of pods per plant
T_0	14.20	17.00	2.50	5.60	31.10	6.00	20.55
T_1	15.90	22.25	3.50	6.30	29.70	6.80	24.66
T_2	18.50	26.50	4.05	7.20	26.50	7.50	26.25
T_3	15.75	24.20	3.60	6.60	27.50	6.50	23.67
T_4	16.25	22.30	3.46	6.50	27.60	6.70	24.20
T_5	16.50	23.50	3.55	6.40	27.56	6.56	23.75
T_6	16.70	22.80	3.36	6.36	27.66	6.60	23.99
T_7	16.80	23.00	3.66	6.39	28.00	6.46	23.70
T_8	15.80	24.10	3.57	6.45	27.00	6.39	24.00
T_9	17.25	25.00	3.76	6.75	28.80	7.00	25.02
MEAN	16.36	23.06	3.50	6.45	28.14	6.65	23.97
SED	0.3972	0.4845	0.1041	0.1415	0.4336	0.0786	0.2951
CD(p=0.05)	0.8341	1.0175	0.2186	0.2971	0.9106	0.1650	0.6197

Table 2. Effect of different seed pelleting treatment on various growth and yield parametersin Blackgram.

Treatments	Pod weight per plant(g)	Pod length (cm)	No of seeds per pod	No. of seeds per plant	Seed yield per plant (g)	Test weight	Pod yield per plant (g)
T_0	11.50	3.42	3.80	146.25	2.50	32.87	4.70
T_1	12.66	3.82	4.02	150.49	3.39	34.60	5.35
T_2	14.00	5.00	6.80	160.25	4.20	40.63	6.88
T_3	12.50	3.72	4.66	152.66	3.44	35.52	5.46
T_4	12.80	3.66	4.72	154.50	3.56	37.00	5.39
T_5	12.70	3.59	5.00	153.75	3.66	34.88	5.50
T_6	12.66	3.86	4.82	155.60	3.60	36.50	5.38
T_7	12.86	3.92	4.60	155.79	3.59	35.86	5.49
T_8	12.77	3.84	4.90	156.26	3.62	36.25	5.66
T_9	13.20	4.35	5.60	158.60	3.86	37.90	6.00
MEAN	12.76	3.91	4.89	154.41	3.54	36.20	5.58
SED	0.2889	0.4070	0.2143	0.6259	0.3139	0.4924	0.3202
CD(p=0.05)	0.6066	0.8548	0.4500	1.3143	0.6713	1.0341	0.6725

Table 3. Effect of different seed pelleting treatment on seed quality parameters of Black gram.

Treatments	Germination percentage (%)	Root length (cm)	Shoot length (cm)	Seedling length (cm)	Seedling fresh weight (g)	Seedling dry weight (g)	Vigour Index-I	Vigour Index-II
T_0	77.00	15.60	16.60	32.20	0.86	0.10	2495.50	7.50
T_1	83.00	16.25	17.80	34.05	1.26	0.14	2836.36	11.62
T_2	94.00	18.50	20.20	38.70	1.34	0.16	3657.15	15.04
T_3	86.00	17.02	18.26	35.28	1.28	0.13	3058.77	11.18
T_4	88.00	16.50	18.50	35.00	1.20	0.15	3088.75	13.20
T_5	87.00	16.66	19.05	35.71	1.25	0.12	3137.48	10.44
T_6	89.00	15.26	18.88	35.14	1.18	0.11	3145.03	9.79
T_7	87.00	16.36	18.76	35.12	1.28	0.10	3073.00	8.70
T_8	86.00	16.75	18.60	35.35	1.29	0.14	3073.68	12.04
T_9	92.00	17.50	19.36	36.86	1.30	0.15	3361.63	13.80
MEAN	86.90	16.64	18.60	35.34	1.22	0.13	3092.73	11.33
SED	0.6885	0.2771	0.3884	0.5506	0.0470	0.0261	1.1634	0.1254
CD(p=0.05)	1.4459	0.5819	0.8157	1.1562	0.0987	0.0549	2.4432	0.2633

dex-I was observed incontrol T_0 (2495.50) (Table 3). These results are conformity with the finding of Sathiya (2016) in black gram. The maximum vigour Index-II was observed in T_2 (15.04) followed by T_9(13.80), while control T_0 (7.50) recorded minimum vigour Index-II (Table 3). Similar results were reported by Srimathi *et al*., 2013 in jatropha and Maheshwari (1996) in soybean.

Conclusion

The study revealed thatseed pelleting with *Kappaphycus alvarezii* @5% and foliar application of pelleted seeds recorded the higher seed yield and seed quality when compared to other treatments and control.

References

Abdul Baki, A.A. and Anderson, J.D. 1973.Vigour determination in soybean seed by multiple criteria. *Crop. Sci.* 13: 630-633.

Basra, S. M. A., Farooq, M. and Tabassum, R. 2005. Physiological and biochemical aspects of seed vigour enhancement treatments in fine rice (*Oryza sativa* L.). *Seed Sci. Technol.* 3: 25-29.

ISTA. International rules for seed testing. *Seed Sci. Technol.* 1999 (Supplement Rules); 27:25-30.

Ginzo, H.D., Carcellas, M.S. and Fonseca, E. 1977. CCC (2-chloroethyl trimethyl ammonium chloride) and the regulation of plant water status in wheat (*Triticum aestivum* L.). *Phyton Argentina.* 35: 82-92.

Karivartharaju, T.V. and Ramakrishnan, V. 1985. Effect of pre-soaking seed treatment with chemical growth

regulaters on seed yield and quality in red gram (*Cajanuscajan* L.). *Madras Agricultural Journal*. 72(5): 249-55.

Karivaratharaju, T.V. and Ramakrishnan, V. 1985. Seed hardening studies in two varieties of ragi (*Eluescinecoracana*). *Indian J Pl Physio.* l28(3) : 243-248.

Khatun, A., Kabir, G., Bhuiyan, M.A.H. and Khanam, D. 2011. Effect of preserved seeds using different botanicals on seed quality of lentil. Bangladesh *J Agric. Res*. 36(3): 381-387.

Krishnasamy, V. 2003. Seed pelleting Principles and Practices. ICAR Short Course on Seed Hardening and Pelleting Technologies for Rainfed / Garden Land Ecosystems, Tamil Nadu Agricultural University, Coimbatore, 96.

Lee, S. S., Kim, J. H., Hong, S. B., Yun, S. H. and Park, E. H. 1998. Priming effect of rice seeds on seedling establishment under adverse soil conditions. Korean *J. Crop Sci.* 43: 194-198.

Lee, S. S. and Kim, J. H. 2000. Total sugar, a-amylase activity and emergence after priming of normal and aged rice seeds. Korean *J. Crop Sci.* 45: 108-111.

Lu, S., Ming, D. and Jiang, T. 1983. A preliminary report on the effect of $CaCO_3$ pelleted seeds of Chinese milk vetch on its yield. *Shanghai Agric. Sci. and Technol.* 6: 9170-9173.

Malarkodi, K. 2003. *Integrated management techniques for seed storage in green gram* (*Vigna radiate* L. Wilczek). Ph.D. Thesis, Tamil Nadu Agricultural University, Coimbatore.

Maheshwari, R. 1996. *Seed production technology in soybean under rice follow and method to control seed deterioration in soybean cv.* CO 1 (*Glycine max* L). M.Sc. (Ag.) Thesis, Tamil Nadu Agriculture University, Coimbatore, Tamil Nadu, India.

Orr, S. P., Jenifer, A., Rudgers, A. and Clay, K. 2005. Invasive plant can inhibit native tree seedling: Testing potential alleopathic mechanisms. *Pl. Eco.* 181: 153-165.

Panse, V.G. and Sukatme, P.V. 1985. *Statistical Methods for Agricultural Workers.* ICAR publication, New Delhi, 359.

Prakash, M., Narayanan, G., Sunil, B. and Kamaraj, A. 2013. Effect of seed hardening and pelleting on seed quality and physiology of rice in aerobic condition. *Agriculture Science Digest.* 33(3): 172-77.

Selvakumar, G., Reetha, S. and Thamizhiniyan, P. 2012. Response of biofertilizers on growth, yield attributes and associated protein profiling changes of blackgram (*Vigna mungo* L. Hepper). *World Appl. Sci. J.* 16(10): 1368-1374.

Srimathi, P., Mariappan, N., Sumdarmoorthy, L. and Paramathma, M. 2013. Effect of organic seed pelleting on seed storability and quality seedling production in biofuel tree species. *Journal of Horticulture.* 5(5): 68-73.