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Standardization of Various Biological Seed Priming on Seed Quality Parameters in Black Gram (*Vigna mungo*)

A. Midhul Rana, G. Sathiyanarayanan

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ABSTRACT

Urdbean, also known as Black gram (*Vigna mungo* (L.) Hepper) 2n=22, is the most popular species. The protein content of Fabaceae is three times higher than that of cereals, and it contains about 26%. The vegetarian population requires a substantial amount of protein from black gram. Application of trading chemicals for seed enhancement is highly effective and farmers cannot afford it. In the latest years, chemical fertilizers and other inorganic inputs are used more to enhance the production of the crops. The current study aimed to study the standardization of various biopriming on crop growth in black gram. A laboratory experiment was conducted with three replications by using Factorial Completely Randomized Design (FCRD) using various concentrations (2%, 3%, 4% and 5%) as first factor and different durations (4 and 6 h) of priming as second factor and different organics such as Panchagavya, cow urine, goat urine, vermiwash, curry leaf extract and *Azospirillum* as third factor. Seeds were primed with different organics in various concentrations and in different duration evaluated for its quality parameters to find out deserved seed priming technique. Among all treatments seed priming with Panchagavya 5% for 6 hours recorded higher germination (96%), longest seedling length (root length (20.14 cm), shoot length (18.87 cm), higher seedling dry matter (1.23 g seedlings^{-10}), fresh weight (9.24 g seedlings^{-10}) and vigor index (3732) than control under laboratory experiment. The results indicate that use of Panchagavya 5% for 6 hours enhances the seed performance regarding seed quality characters.

Keywords Biological priming, Panchagavya, Seed quality, Vermiwash, Cow urine.

INTRODUCTION

Leguminosae classifies black gram (*Vigna mungo*) as a member of the family. It has a chromosome count of 2n = 22. It is a common pulse crop in India and is native to central Asia. The West Indies, Japan, and tropical and sub-tropical countries have experienced significant growth in this plant. In Maharashtra, Andhra Pradesh, Madhya Pradesh, Tamil Nadu, Uttar Pradesh, and Bihar, black gram is cultivated with great popularity. It contains larger amount of protein (24-26%) and vitamin (A, B1, B3) and minerals (phosphorus, potassium, calcium and sodium) and it is highly nutritious. Diabetes, digestive system disorders, rheumatic afflictions, and nervous disorders can be treated with its medicinal properties. In the year 2021, India will produce approximately 24.5 lakh tonnes of Urd bean annually in an area of around 4.6 million hectares, with an average productivity of over 533 kg per hectare (Anonymous 2020). It not only helps in increasing soil fertility by fixing bio-

A. Midhul Rana[1]*, G. Sathiyanarayanan[2]

[1]PhD Scholar, [2]Associate Professor
Department of Genetics and Plant Breeding, Faculty of Agriculture, Annamalai University, Annamalai Nagar 608002, India

Email: midulrana0909@gmail.com
*Corresponding author

logical nitrogen in soil but also improves the yield of the following crop. It grows in a temperature of about 27-30ºC and an annual rainfall of 600-1000 mm. The primary reason for the low production of pulses may be due to the use of minor seed, bad crop management and farming in dry and marginal soils (Sathiya *et al.* 2017). To reduce the risk of weather damage a dry harvest period is preferable. It prefers to grow with pH 6-7.

In small seeded grasses and vegetables, seed priming improves germination and emergence in seeds. Seed priming has presented amazing result for legume seeds. Organic farming has been drawing the attention of the world for the past few years. It is an environmentally friendly, sustainable way of farming with zero use of chemicals. Adoption to eco friendly and sustainable farming practices like use of botanical and organic treatments will help in environment protection. Botanical and organic seed treatments reduce the use of chemicals and protects plants from seed borne diseases and pest (Maheswari *et al.* 2017). According to Choudhary *et al.* (2017), in cluster beans organic seed treatments like panchagavya, beejamruth, jeevamruth, vermiwash and botanical seed treatments viz., neem leaf extract showed better results in yield and seedling parameters. These are rich in sources of beneficial microorganisms and nutrients which help in the plant growth, help in getting good quality yield, increase in the germination percent in the laboratory (Chandu *et al.* 2020). Hence the present study was undertaken to study the effect of various biopriming treatment on seed quality in black gram crop.

MATERIALS AND METHODS

Genetically pure seeds of black gram (*Vigna mungo*) cv VBN 8 obtained from ICAR - Krishi Vigyan Kendra, Sandhiyur, Salem worked as the base material for the study. Experimental work was done in the Seed Science and Technology Laboratory, Department of Genetics and Plant Breeding, Faculty of Agriculture, Annamalai University to conduct lab experiments.

Treatment details:

T0-Control
T1-Bio priming with Panchagavya 2%, 3%, 4%, 5%
T2-Bio priming with Cow urine 2%, 3%, 4%, 5%
T3-Bio priming with Goat urine 2%, 3%, 4%, 5%
T4-Bio priming with Vermiwash 2%, 3%, 4%, 5%
T5-Bio priming with Curry leaf extract 2%, 3%, 4%, 5%
T6-Bio priming with *Azospirillum* 2%, 3%, 4%, 5%
Soaking duration: D1- 4h, D2- 6h.

The seeds were subjected to separate priming solutions at different concentrations for four and six hours after cleaning and grading. To preserve their original moisture content, the seeds were dried under shade and can be used for sowing. The primed seeds were evaluated for the following seed quality characters i.e., germination percentage (%), seedling length (root length and shoot length (cm)), fresh weight (g seedlings^{-10}), dry weight (g seedlings $^{-10}$) and vigour index along with unprimed seeds. Four replications were conducted for the experiment using a Factorial Completely Randomized Design (FCRD).

RESULTS AND DISCUSSION

In the present study, the primed seeds showed greater germination pattern and high vigor level than unprimed seeds. The rate and uniformity of emergence and crop establishment can be increased with the help of seed priming, an effective method of invigoration. Nowadays, the consumption of chemicals such as pesticides and fertilizers has become more for the improvement of productivity of crops. The crop productivity has been enlarged after the initiation of green revolution in worldwide. By the consumption of these chemicals, it causes great harm to human beings, animals and plants which leads to various diseases and also causes great harm to the environment in the form of pollution. In agriculture, heavy consumption of chemicals has weakened the ecological bases, it losses dignity in soil, water recourses and quality of the food. The best way to treat the ailments of modern chemical agriculture is through organic farming.

Panchagavya is an organic product that can be used as manure. It can be prepared by using five main components such as cow urine, cow milk, cow dung, cow ghee and curd. It is used for organic farming and it plays a vital role in the growth of plants and

Table 1. Effect of various biopriming on germination (%) of black gram seeds.

Treatment	4 hrs					6 hrs					B×C interaction				
	2%	3%	4%	5%	Mean	2%	3%	4%	5%	Mean	2%	3%	4%	5%	Grand mean
T0	83	79	87	85	83	87	**79**	82	84	83	85	79	84	85	83
T1	81	84	87	89	85	92	87	84	**96**	90	86	85	86	93	88
T2	89	86	84	81	86	90	88	84	81	86	90	87	84	81	86
T3	85	89	82	79	84	80	90	86	83	85	83	90	84	81	84
T4	88	85	90	83	87	85	81	**93**	87	87	87	83	92	85	87
T5	80	83	85	88	83	91	80	85	90	86	85	82	86	89	85
T6	89	86	81	84	85	80	87	89	89	86	85	86	85	87	86
Mean	85	84	85	83	85	87	85	86	87	86	86	85	86	85	86

	T	C	D	TC	CD	TD	TCD
SEd	0.37	0.28	0.20	0.74	0.40	0.53	1.05
CD (p=0.05)	0.74	0.56	0.39	1.47	0.79	1.04	2.08
CD (p=0.01)	0.97	0.74	0.52	1.95	1.04	1.38	2.75

enlarging the immunity of plants. It promotes growth and immune to plant system. Proper mixing and usage can lead to miraculous effects. Panchagavya sprayed plants showed bigger leaves and develop denser canopy (Palankar *et al.* 2017). To keep the genetic diversity of both the crop and the environment intact, Panchagavya is used and to uplift the biological cycle within the farming system microbes can be used and to encourage the renewable use of natural resources, to maintain the ecological balance between livestock and crop production, for producing high-quality yield in enough quantity (Kumar *et al.* 2020). Panchagavya's goal is to increase profits and liberate organic farmers from loans by reducing or restoring costly chemical inputs.

Among the various bio priming, germination percentage was highest for Panchagavya 5% (6 hrs) primed seeds recorded 96 % followed by Vermiwash 4% (93%) (6 hrs) and the lowest value was recorded for Control 3% (79 %) (6 hrs) (Table 1). Panchagavya's physico-chemical properties may be the reason why all the nutrients needed for crop growth, including major, minor, and growth hormones (IAA and GA) are present. Fermentation microorganisms such as yeast and lactobacillus can grow as a result of low pH levels, milk products, and jaggery/sugarcane juice being added. The presence of different types

Table 2. Effect of various biopriming on dry weight (g seedling^{-10}) of black gram seeds.

Treatment	4 hrs					6 hrs					B×C interaction				
	2%	3%	4%	5%	Mean	2%	3%	4%	5%	Mean	2%	3%	4%	5%	Grand mean
T0	0.99	0.87	0.90	0.94	0.93	0.96	**0.87**	0.90	0.92	0.90	0.98	0.88	0.90	0.93	0.92
T1	0.94	1.09	1.07	1.10	1.04	1.03	0.95	0.90	**1.23**	1.03	0.98	1.03	0.99	1.18	1.04
T2	0.92	0.97	1.09	0.72	0.93	1.05	0.88	1.09	0.89	0.98	0.97	0.93	1.09	0.80	0.95
T3	0.90	1.08	0.96	1.00	0.98	0.91	1.14	0.98	1.08	1.02	0.90	1.11	0.97	1.04	1.01
T4	0.99	0.93	1.12	1.07	1.06	1.12	0.93	**1.16**	1.03	1.06	1.06	0.93	1.16	1.05	1.04
T5	0.90	1.09	0.95	1.00	0.98	0.95	0.91	1.02	1.14	1.00	0.92	0.99	0.98	1.07	1.00
T6	0.96	0.91	1.02	1.11	0.99	1.11	0.93	0.90	0.97	0.97	1.03	0.92	0.96	1.04	0.98
Mean	0.94	0.99	1.02	0.99	0.98	1.02	0.94	0.99	1.04	0.99	0.98	0.97	1.01	1.02	0.99

	T	C	D	TC	CD	TD	TCD
SEd	0.02	0.01	0.02	0.04	0.02	0.03	0.06
CD (p=0.05)	0.04	0.03	0.04	0.08	0.04	0.06	0.13
CD (p=0.01)	0.05	0.04	0.05	0.12	0.06	0.08	0.17

Table 3. Effect of various biopriming on fresh weight (g seedling^{-10}) of black gram seeds.

Treatment	4 hrs					6 hrs					B×C interaction				
	2%	3%	4%	5%	Mean	2%	3%	4%	5%	Mean	2%	3%	4%	5%	Grand mean
T0	8.86	8.81	8.78	8.75	8.80	8.83	**8.79**	8.89	8.96	8.87	8.84	8.85	8.78	8.85	8.83
T1	8.87	8.93	9.02	9.09	8.98	8.97	8.88	9.08	**9.24**	9.04	8.92	8.91	9.05	9.17	9.01
T2	8.81	9.07	8.91	8.80	8.90	8.83	8.92	9.09	9.04	8.97	8.82	8.99	9.00	8.92	8.93
T3	8.91	8.87	9.08	8.99	8.96	9.06	8.81	8.94	8.88	8.92	8.98	8.84	9.01	8.93	8.94
T4	9.05	8.94	9.12	8.90	9.00	8.98	8.87	**9.16**	9.08	9.02	9.01	8.90	9.14	8.98	9.00
T5	8.89	9.04	8.96	9.10	8.99	8.84	9.03	9.10	8.94	8.98	8.86	9.03	9.02	9.01	8.98
T6	8.94	8.86	9.00	9.11	8.97	9.07	8.94	8.88	8.85	8.94	9.00	8.90	8.94	8.98	8.95
Mean	8.90	8.93	8.98	8.96	8.94	8.94	8.91	9.01	9.00	8.96	8.92	8.91	8.99	8.98	8.95

	T	C	D	TC	CD	TD	TCD
SEd	0.008	0.006	0.004	0.016	0.08	0.011	0.023
CD (p=0.05)	0.016	0.012	0.008	0.032	0.17	0.022	0.045
CD (p=0.01)	0.021	0.016	0.011	0.042	0.22	0.030	0.060

of growth hormones such as ABA, IAA, and GA in Panchagavya is the probable reason for increasing germination percentage (Choudry *et al*. 2017). Similar results were found to be Shrimal and Khan (2017) in bengal gram and Sravani *et al.* (2023) in green gram.

For dry weight, seeds primed with Panchagavya 5% recorded higher value 1.23 g seedling^{-10} for 6 hours followed by Vermiwash 4% (1.16 g seedling^{-10}) (6 hrs) and the least value were recorded for control 3% (6 hrs) (0.87 g seedling^{-10}) (Table 2). Similarly, for fresh weight Panchagavya 5% recorded higher value (9.24 g seedling^{-10}) for 6 hours and control recorded lowest value (8.79 g seedling^{-10}) (Table 3). Other pathogenic microorganisms and their growth are effectively inhibited by lactobacillus' production of beneficial metabolites, including organic salts, hydrogen peroxide, and antibiotics. The reason for increasing dry weight might be due to various salts rich in fermented solution of panchagavya contains N, P, K, S and micronutrients in plant. Hence, availability of these nutrients helps in the higher dry matter production in plants. Similar results were found in Shrimal and Khan (2017) in Bengal gram, Sravani *et al.* (2023) in green gram and Vaishnavi *et al.* (2021) in chickpea.

For root length, seeds primed with Panchagavya 5 % recorded higher value for 6 hours (20.14 cm) followed by Vermiwash 4% (19.69 cm) (6 hrs) and

Table 4. Effect of various biopriming on root length (cm) of black gram seeds.

Treatment	4 hrs					6 hrs					B×C interaction				
	2%	3%	4%	5%	Mean	2%	3%	4%	5%	Mean	2%	3%	4%	5%	Grand mean
T0	18.79	18.97	19.17	19.33	19.06	19.38	**18.78**	18.91	19.13	19.05	19.09	18.88	19.04	19.23	19.06
T1	19.17	19.37	19.61	19.67	19.45	19.24	19.38	19.53	**20.14**	19.57	19.21	19.37	19.57	19.91	19.51
T2	18.86	19.48	19.08	19.33	19.18	18.87	19.12	19.37	19.54	19.22	18.87	19.30	19.22	19.43	19.21
T3	19.26	18.94	19.57	19.44	19.30	18.97	19.53	19.31	18.80	19.15	19.12	19.23	19.44	19.12	19.23
T4	19.02	19.37	19.62	19.56	19.41	18.94	19.49	**19.69**	19.28	19.35	18.98	19.43	19.68	19.42	19.38
T5	19.17	18.86	19.36	19.56	19.24	18.99	19.25	19.66	19.48	19.34	19.08	19.06	19.51	19.52	19.29
T6	18.92	19.37	19.17	19.57	19.26	19.51	19.32	19.08	18.85	19.19	19.21	19.36	19.12	19.20	19.22
Mean	19.03	19.20	19.37	19.50	19.27	19.13	19.27	19.36	19.32	19.29	19.08	19.23	19.37	19.41	19.27

	T	C	D	TC	CD	TD	TCD
SEd	0.02	0.015	0.01	0.04	0.02	0.03	0.05
CD (p=0.05)	0.04	0.030	0.02	0.08	0.04	0.06	0.11
CD (p=0.01)	0.05	0.040	0.03	0.10	0.05	0.08	0.15

Table 5. Effect of various biopriming on shoot length (cm) of black gram seeds.

Treatment	4 hrs					6 hrs					B×C interaction				
	2%	3%	4%	5%	Mean	2%	3%	4%	5%	Mean	2%	3%	4%	5%	Grand mean
T0	16.80	16.99	17.26	17.56	17.15	17.35	**16.85**	17.38	17.37	17.24	17.07	16.92	17.32	17.47	17.20
T1	17.96	17.63	18.18	18.40	18.04	17.92	18.21	18.53	**18.87**	18.38	17.94	17.92	18.36	18.64	18.21
T2	18.35	18.05	17.72	17.17	17.83	18.01	18.37	17.62	17.31	17.83	18.18	18.21	17.67	17.24	17.83
T3	17.33	16.91	18.15	17.79	17.54	18.06	17.73	17.22	16.89	17.47	17.69	17.32	17.68	17.32	17.50
T4	18.25	17.94	18.56	18.42	18.29	18.52	17.72	**18.72**	18.08	18.26	18.38	17.83	18.64	18.24	18.28
T5	16.87	17.20	17.63	18.09	17.45	17.51	17.80	18.05	18.47	17.96	17.19	17.49	17.84	18.28	17.70
T6	17.07	18.16	17.81	17.41	17.61	18.07	18.46	17.71	17.35	17.89	17.57	18.31	17.76	17.80	17.75
Mean	17.52	17.56	17.90	17.83	17.70	17.92	17.88	17.89	17.76	17.86	17.72	17.71	17.89	17.79	17.78

	T	C	D	TC	CD	TD	TCD
SEd	0.04	0.03	0.01	0.07	0.04	0.05	0.10
CD (p=0.05)	0.07	0.06	0.03	0.14	0.08	0.10	0.20
CD (p=0.01)	0.09	0.07	0.05	0.19	0.10	0.13	0.26

control recorded lowest value 3% (18.78 cm) (6 hrs) (Table 4). Similarly for shoot length, seeds primed with Panchagavya 5% recorded higher value (18.87 cm) (6 hrs) followed by Vermiwash 4% (18.72 cm) (6 hrs) and control recorded lowest value 3% (16.85 cm) (Table 5). The probable reason for increasing shoot length and root in panchagavya may be due to the bacteria which produces plant growth promoting substances in it. In panchagavya, microbes such as *Trichoderma, Azotobacters, Azospirillum*, phosphorus solubilizing bacteria, rhizobium and pseudomonas act as liquid bio-pesticides and bio fertilizers. Shoot length and root length may be reduced with increasing levels of concentration and duration with organic fortification which might be due to optimal dose of the organic product which is normally specific to crop. According to Suchitra *et al.* (2017), pre-soaking at a concentration of panchagavya, the germination and meristic growth of brinjal was high when compared to control. An increased seed invigoration in panchagavya pre-treated seeds might be due to chemical constituents in the panchagavya (Dhasarathan *et al.* 2018). Similar results were found to be Shrimal and Khan (2017) in Bengal gram and Sravani *et al*. (2023) in green gram.

For vigor index, seeds primed with Panchagavya 5% (3732) (6 hrs) recorded highest value followed

Table 6. Effect of various biopriming on vigour index of black gram seeds.

Treatment	4 hrs					6 hrs					B×C interaction				
	2%	3%	4%	5%	Mean	2%	3%	4%	5%	Mean	2%	3%	4%	5%	Grand mean
T0	2966	2841	3169	3136	3028	3196	**2838**	2976	3054	3016	3081	2840	3072	3095	3022
T1	3007	3120	3288	3402	3205	3406	3283	3222	**3732**	3411	3207	3201	3255	3567	3307
T2	3312	3239	3092	2956	3150	3331	3311	3119	3009	3193	3322	3276	3106	2982	3171
T3	3123	3191	3106	2965	3096	2975	3353	3142	2959	3107	3049	3272	3123	2962	3102
T4	3280	3185	3504	3152	3280	3196	3014	**3584**	3262	3264	3237	3099	3544	3207	3272
T5	2871	2981	3144	3313	3077	3310	2964	3205	3402	3220	3090	2973	3175	3358	3149
T6	3215	3228	2995	3106	3135	3018	3274	3286	3234	3203	3116	3251	3141	3169	3170
Mean	3110	3112	3185	3147	3138	3205	3148	3219	3236	3202	3158	3130	3202	3192	3170

	T	C	D	TC	CD	TD	TCD
SEd	14.02	10.59	7.49	28.04	14.98	19.82	39.65
CD (p=0.05)	27.78	21.00	14.84	55.56	29.69	39.28	78.57
CD (p=0.01)	36.74	27.77	19.63	73.48	39.27	51.96	103.92

by Vermiwash 4% (3584) (6hrs) and lowest value recorded by control 3% (2838) (Table 6). The propable reason for increasing vigor index may be due to increasing germination percentage and seedling dry weight. Panchagavya's presence of IAA and GA3 has the potential to stimulate the plant system. Plant growth regulators can enhance the production of cells, and their actions in the plant system can enhance the necessary growth and development of crops. Panchagavya is being sought for the purpose of enhancing crop establishment and health (Vijay *et al.* 2020). Similar results were found to be Shrimal and Khan (2017) in Bengal gram and Sravani *et al.* (2023) in green gram.

Significant differences were observed due to bio seed priming treatments, concentration and soaking durations in a variety Black gram VBN 8. Between the soaking durations, Panchagavya 5 % 6 h recorded higher germination (96 %), longest root length (20.14 cm), shoot length (18.87 cm), higher seedling dry matter production (1.23g seedlings^{-10}), fresh weight (9.24 g seedlings^{-10}) and vigor index (3732) whereas 4 h soaking recorded higher germination (90%), longest root length (19.62 cm), shoot length (18.56 cm), higher seedling dry matter production (1.12 g seedlings $^{-10}$), fresh weight (9.12 g seedlings $^{-10}$) and vigor index (3504).

CONCLUSION

Thus, the standardization of various bio priming seed treatment on seed quality in Black gram cv VBN 8 revealed that Panchagavya 5% concentration for 6 hours recorded the higher seeds qualities when compared to other treatments and control.

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