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## Effect of vermiwash and panchagavya on growth and yield of black gram

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### Abstract

A field experiment was conducted during *Kharif* 2023 at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (U.P.) on the topic “Effect of Vermiwash and Panchagavya on Growth and Yield of Black gram”, to study treatments consisting of three levels of Vermiwash *viz.* 2%, 5%, 7% and three levels of Panchagavya *viz.* 4%, 5% and 6%. The soil of the experimental plot was sandy loam in texture, nearly neutral in soil reaction (pH 7.1), organic carbon (0.75%), available N (269.96 kg/ha), available P (33.10 kg/ha), and available K (336 kg/ha). There were 10 treatments each being replicated thrice and laid out in Randomized Block Design. The results revealed that treatment 9 (Vermiwash – 7% + Panchagavya – 6%) recorded significantly higher plant height (41.54 cm), plant dry weight (7.12 g), number of nodules/plant (9.33), number of pods/plant (18.00), number of seeds/pod(5.51), seed yield (877.68 kg/ha), Stover yield (1986.41 t/ha). Maximum in gross returns (1,29,875.20), net returns (85,210.20) and B:C ratio (1.90) as compared to other treatments.

**Keywords:** Vermiwash, panchagavya, growth, yield, economics, black gram

### Introduction

Black gram (*Vigna mungo* L.) is one of the most widely grown grain legumes and belongs to the family Fabaceae and assumes considerable importance from the point of nutritional security. It is an annual herbaceous plant consumed in the form of ‘dal’ and also used as a nutritive fodder for mulch cattle. Black gram is rich in its nutritive value with 24 percent protein and is the richest source of phosphoric acid among pulses. In India, black gram is grown in an area of 761.3 thousand of hectares, with a production of 678.6 thousand tonnes and with a productivity of 891.0 kg/ ha. In Andhra Pradesh, it covers an area of 296 thousand of hectares, with a production of 277 thousand of tonnes and with a productivity of 936 kg/ha.

Vermiwash obtained from dissolution of organic matter by earthworm is also found as good liquid manure and affects significantly the growth and productivity of crop during foliar spray. Vermiwash contains 0.50 percent nitrogen, 0.39 percent phosphorus and 0.46 percent potassium (Jasmin, 1999) [3]. Apart from organic acids, it also contains a rich source of soluble plant nutrients stimulating crop growth (Shivsubramanian and Ganesh Kumar, 2004) [9].

The use of fermented cow dung, urine, milk fat, curd and milk with the name of Panchagavya is getting adaptive popularity in Indian agriculture largely through the efforts of small groups of farmers. Role of foliar applied Panchagavya in production of many plantation crops had been well documented in India. The present investigation was hypothesized to examine the effect of foliar application of 3 percent Panchagavya on different physiological parameters, yield and yield attributes of black gram (*Vigna mungo* L.). Panchagavya, an organic product is the potential source that play the role of promoting growth and providing immunity in plant system. Panchagavya is a bio promoter with a combination of five products obtained from cow *viz.*, dung, urine, milk, curd, and ghee. Panchagavya acts as growth promoter (75%) and immunity booster (25%) and fills the missing link to sustain the organic farming without any yield loss (Selvaraj, 2003) [8].

## Materials and Methods

A field experiment was conducted during *Kharif-2023* at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (U.P). The soil of the experimental plot was sandy loam in texture, nearly neutral in soil reaction (pH 7.1), organic carbon (0.75%), available N (269.96 kg/ha), available P (33.10 kg/ha), and available K (336 kg/ha). The treatments consisting of three levels of Vermiwash viz. 2%, 5% and 7%. and Panchagavya viz. 4%, 5% and 6%. The experiment was laid out in Randomized Block Design with ten treatments each replicated thrice. The treatment combinations treatment 1 - Vermiwash – 2% + Panchagavya – 4%, treatment 2 - Vermiwash – 2% + Panchagavya 5%, treatment 3 - Vermiwash – 2% + Panchagavya – 6%, treatment 4 - Vermiwash – 5% + Panchagavya – 4%, treatment 5 - Vermiwash – 5% + Panchagavya – 5%, treatment 6 - Vermiwash – 5% + Panchagavya – 6%, treatment 7 - Vermiwash – 7% + Panchagavya – 4%. treatment 8 - Vermiwash – 7% + Panchagavya – 5%, treatment 9 - Vermiwash – 7% + Panchagavya – 6%, treatment 10 - Control (FYM t/ha). The growth parameters and yield, production was recorded at harvest from randomly selected plants in each plot. The data was computed and analysed by following statistical method of Gomez and Gomez (1984) [2].

## Results and Discussion

### Growth parameters

**Plant height (cm)** the data revealed that, significantly higher plant height (41.54 cm) was recorded with the application of Vermiwash – 7% + Panchagavya – 6%, whereas treatment Vermiwash – 2% + Panchagavya – 6% and Vermiwash – 7% + Panchagavya – 5% was statistically at par with the treatment Vermiwash – 7% + Panchagavya – 5%. It significantly increased the growth of *Vigna mungo* at 1:5, 1:10, and 1:20 dilution in trails. Increases the growth was recorded at 1:5 dilution of coconut leaf vermiwash. Increasing the population of the soil microorganisms, particularly plant beneficial ones, and their activities which would have facilitated increased uptake of the nutrients by the plants resulting in higher growth and yield reported by Priya and Ezhilarasi (2015) [7]. The IAA and GA present in panchagavya when applied as foliar spray could have

created stimuli in the plant system and increased the production of growth regulators in cell system and the action of growth regulators in plant system ultimately stimulated the necessary growth and development. Similar findings were also reported by Patel (2013) [5].

Plant dry weight (g) the data observed that, significantly the maximum dry matter accumulation (7.12 g) was recorded with treatment with Vermiwash – 7% + Panchagavya – 6%, whereas treatment Vermiwash – 7% + Panchagavya – 5% was statistically at par with the treatment Vermiwash 7% + Panchagavya – 6%. Significant and higher plant dry weight was with the application of Panchagavya might be due to the fermented solution of panchagavya contains various salts rich in N, P, K, S and micronutrients in plant available form. Hence, availability of these nutrients to plants helps in the higher dry matter production in plants reported by Khan *et al.* (2022) [4]. The probable reason for higher dry matter production might the application of vermicompost stimulated the plant growth due the higher microbial activity and soil reaction and large portion of nitrogen in vermiwash in organic fractions and contains various salts rich in N, P, K, S and micronutrients in plant available form. Hence, availability of these nutrients to plants helps in the higher dry matter production in plants. Similar results were reported by Chavan *et al.* (2023) [1]. Number of nodules/plants the data observed that, significantly the maximum number of nodules/plant (9.33) was recorded with treatment with Vermiwash – 7% + Panchagavya – 6%, whereas treatment Vermiwash – 7% + Panchagavya – 5% was statistically at par with the treatment Vermiwash – 7% + Panchagavya – 6%. increase in number of nodules per plant might be due to direct addition and slow release of nutrients from panchagavya. The more content of phosphorous and its solubility in soil helped in better root proliferation and formation of nodules. The results were found to be in resonance with Khan *et al.*, (2022) [4]. The greater photosynthesis production of metabolites and enzymatic activities due to vermiwash application might have influenced into increased nodulation due the availability of Phosphorus through organic source helped in higher root growth which increased nodulation reported by Chavan *et al.* (2023) [1].

**Table 1:** Effect of vermiwash and panchagavya on growth attributes and yield attributes of black gram

S. No.	Treatment combinations	Plant Height (cm)	Dry Weight (gm/plant)	Number of nodules per plant	Number of pods/ plants	Number of seeds /pods	Test weight	Seed yield (Kg/ha)
1.	Vermiwash – 2% + Panchagavya – 4%	36.79	5.61	6.20	16.00	4.43	27.73	637.44
2.	Vermiwash – 2% + Panchagavya – 5%	37.93	5.87	7.33	17.33	4.77	28.68	728.67
3.	Vermiwash – 2% + Panchagavya – 6%	38.75	6.30	7.87	17.37	5.23	30.87	751.03
4.	Vermiwash – 5% + Panchagavya – 4%	37.41	5.91	6.07	15.41	4.33	29.67	635.61
5.	Vermiwash – 5% + Panchagavya – 5%	37.97	6.07	7.27	16.67	4.60	29.44	715.52
6.	Vermiwash – 5% + Panchagavya – 6%	38.95	6.57	8.25	17.00	4.57	30.72	757.96
7.	Vermiwash – 7% + Panchagavya – 4%	37.81	6.13	5.87	17.33	5.10	30.18	804.51
8.	Vermiwash – 7% + Panchagavya – 5%	39.47	6.86	8.67	16.67	5.30	30.24	852.79
9.	Vermiwash – 7% + Panchagavya – 6%	41.54	7.12	9.33	18.00	5.51	31.19	877.68
10.	Control (FYM 10t/ha)	34.17	5.12	5.93	13.67	4.60	24.65	447.64
	F- test	S	S	S	S	NS	S	S
	S.Em (±)	1.10	0.31	0.44	0.55	0.66	0.86	31.56
	CD (p=0.05)	3.27	0.94	1.56	1.65	---	2.56	93.77

**Table 2:** Effect of vermiwash and panchagavya on yield attributes and economics of black gram

S. No	Treatment combinations	Stover yield (Kg/ha)	Harvest index (%)	Gross return (INR/ha)	Net return (INR/ha)	Benefit: Cost Ratio(B:C)
1.	Vermiwash – 2% + Panchagavya – 4%	1552.55	29.12	82,867.20	43,452.20	1.10
2.	Vermiwash – 2% + Panchagavya – 5%	1634.86	30.08	94,727.10	54,112.10	1.34
3.	Vermiwash – 2% + Panchagavya – 6%	1661.49	31.13	97,633.90	56,618.90	1.38
4.	Vermiwash – 5% + Panchagavya – 4%	1595.32	28.50	93,017.60	51,152.60	1.22
5.	Vermiwash – 5% + Panchagavya – 5%	1674.67	29.93	98,534.80	56,219.80	1.32
6.	Vermiwash – 5% + Panchagavya – 6%	1755.98	30.15	98,534.80	55,869.80	1.30
7.	Vermiwash – 7% + Panchagavya – 4%	1834.47	30.22	1,11,231.40	67,066.40	1.57
8.	Vermiwash – 7% + Panchagavya – 5%	1916.52	30.79	1,19,390.60	75,475.60	1.71
9.	Vermiwash – 7% + Panchagavya – 6%	1986.41	31.82	1,29,875.20	85,210.20	1.90
10.	Control (FYM 10t/ha)	1253.38	26.34	58,193.20	27,778.20	0.91
	F – Test	S	NS	---	---	---
	SE m (±) CD (p=0.05)	58.23 173.03	0.78 ---	---	---	---

### Yield & Yield attributes

Number of pods/plants the data revealed that, Treatment with Vermiwash – 7% + Panchagavya – 6% recorded significantly highest Number of pods per plant (18.00). However, treatment Vermiwash – 7% + Panchagavya – 5% was statistically at par with the treatment Vermiwash – 7% + Panchagavya – 6%. Test Weight (g) treatment with Vermiwash – 7% + Panchagavya – 6% recorded significantly highest Number of seeds per pods (31.19). However, treatment Vermiwash – 7% + Panchagavya – 5% was statistically at par with the treatment Vermiwash – 7% + Panchagavya – 6%.

Seed yield (kg/ha) the data revealed that, Significantly Maximum seed yield (877.68 kg/ha) was recorded with the treatment Vermiwash – 7% + Panchagavya – 6% over all the treatments. However, the treatments Vermiwash – 7% + Panchagavya – 5% was statistically at par with the treatment Vermiwash – 7% + Panchagavya – 6%. Stover yield (kg/ha) the data revealed that, Significantly Maximum stover yield (1986.41 kg/ha) was recorded with the treatment application of Vermiwash – 7% + Panchagavya – 6% over all the treatments. However, the treatments Vermiwash – 7% + Panchagavya – 5% was statistically at par with the treatment Vermiwash – 7% + Panchagavya – 6%. The seed yield increased due to the application of panchagavya and vermicompost might be due to it contains smaller amounts of plant growth regulators like IAA, GA and it also contains many nutrients and the foliar application helped plant to utilize all these nutrients efficiently and helped in increase in yield attributes which eventually helped in increase in seed yield. Crop yield is the complex function of physiological processes and biochemical activities, which modify plant anatomy and morphology of the growing plants. Seed and stover yield of chickpea were significantly influenced by different treatments of panchagavya application reported by Chavan et al. (2023) [1]. Vermiwash can boost chickpea straw production because it has a high concentration of nutrients such as nitrogen, phosphate, potassium, and other micronutrients. These nutrients are necessary for plant growth and development, and they can aid in the creation of healthier, more productive plants. Vermiwash is a rich source of vitamins, hormones, enzymes, macronutrients and micronutrients when applied to plants help in efficient growth. The comparative study was done on the effect of vermiwash on crop production capacities of soil by improve the physiochemical property of soil and reduced the insect-pest infestation which would have facilitated increased uptake of the nutrients by the plants resulting in higher growth and yield. It also helps in sustainable crop production reported by Sudhanshu Verma et al. (2018) [10] and Chavan et al. (2023) [1].

### Economics analysis

Gross return, Net return and benefit cost ratio of different treatments are depicted in (Table 2).

Gross return (INR/ha) Highest Gross returns observed in the treatment Vermiwash - 7% + Panchagavya - 6% (INR 1,29,875.20). Net returns (INR/ha) Net return maximum net returns were seen in the treatment Vermiwash - 7% +Panchagavya - 6% (INR 85,210.20) as compared to other treatments. Benefit cost ratio (B:C) Benefit cost Highest B: C Ratio was recorded with the treatment Vermiwash - 7% +Panchagavya - 6% (1.90) and lowest B: C Ratio was seen in the treatment control (0.91).

### Conclusion

It is concluded that is blackgram with the combination of Vermiwash - 7% +Panchagavya - 6% in treatment-9 was observed higher growth, Yield and Benefit cost ratio.

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