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Effect of panchagavya and organic manures on growth and yield of blackgram (*Vigna mungo* L.)

Pathan Muddassir Ibrahim Khan, Raksha Verma, Joy Dawson and Manisha Singh

Abstract

A field experiment was conducted during *Kharif* 2021 at SMOF (SHIATS Model Organic Farm), Department of Agronomy, SHUATS, and Prayagraj (U.P). The experimental site was uniform in topography and sandy loam in texture, nearly neutral in soil reaction (pH 7.1), low in organic carbon (0.36%), available N (171.48 kg/ha), available P (15.2 kg/ha) and available K (232.5 kg/ha). The experiment was laid out in Randomized Block Design with nine treatments each replicated thrice on the basis of one year experimentation. The treatments which are T1: Foliar spray of Panchagavya 2% + FYM 4 t/ha, T2: Foliar spray of Panchagavya 2% + Poultry manure 1 t/ha, T3: Foliar spray of Panchagavya 2% + Vermicompost 1 t/ha, T4: Foliar spray of Panchagavya 4% + FYM 4 t/ha, T5: Foliar spray of Panchagavya 4% + Poultry manure 1 t/ha, T6: Foliar spray of Panchagavya 4% + Vermicompost 1 t/ha, T7: Foliar spray of Panchagavya 6% + FYM 4 t/ha, T8: Foliar spray of Panchagavya 6% + Poultry manure 1 t/ha, T9: Foliar spray of Panchagavya 6% + Vermicompost 1 t/ha used. The results showed that application of Panchagavya 4% foliar spray + Poultry manure 1 t/ha was recorded significantly higher plant height (43.10 cm), Plant dry weight (6.41 g/plant), No. of Nodules/plant (9.17), No. of Branches/plant (6.70), Pods/plant (62.67), Seeds/pod (7.67), Test weight (36.79 g), Seed yield (716.12 kg/ha), Gross returns (Rs. 57,289.60/ha), Net return (Rs. 35,389.60/ha) and Benefit cost ratio (1.61) as compared to other treatments.

Keywords: Panchagavya, F.Y.M, poultry manure, vermicompost and yield

Introduction

Black gram (*Vigna mungo* L.) is a self-pollinated crop which grows up to 35 to 50 cm in height having yellow flowers with an auxiliary inflorescence, belongs to the family Fabaceae sub family Papilionaceae. It is distributed from different parts of Asia and it contains three times high percentage of quality protein than cereals, also rich in carbohydrate, fat, amino acids, vitamins and minerals. It is broadly used in various cuisine preparations. It is a soil nourishing crop which fixes nitrogen from the atmosphere through symbiotic nitrogen fixation. After the removal of pods, the green plants can be used as fodder. It is an oldest and well known principle pulse crop of Asia (Kokani *et al.*, 2014) [5], the crop is originated from India and secondary origin was Central Asia (Vavilov 1951) [15] extended from India to Myanmar which later spreads throughout the Asia during trading spreads to other parts of the world as staple food grain legumes.

Pulses are important components of organic farming systems in the country. In recent years, the use of fermented cow dung, cow urine, cow ghee, cow curd and cow milk with the name of panchagavya is getting adaptive popularity in Indian agriculture largely through the efforts of small groups of farmers. Panchagavya has got reference in the scripts of Vedas (divine scripts of Indian wisdom) and Vrikshayurveda (Natarajan 2002). Panchagavya, an organic product has potential to play the role in promoting growth and providing immunity in plant system. The use of panchagavya results in higher growth, yield, and quality of crops (Choudhary *et al.*, 2014). [2]

FYM, Poultry manure, Vermicompost have high levels of nitrogen, phosphorous and potassium and micro Nutrients, Microbial and Enzyme activities and Growth Regulators and continuous and adequate use with proper management can increase soil organic Carbon, soil water retention and transmission and improvement in other physical properties of soil like Bulk Density, resistance and aggregation as well as beneficial effect on growth of variety of plants (Singh *et al.*, 2017) [13].

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Poultry manure contains considerable amount of plant nutrients which has to be used as manure after composting. Enrichment of poultry wastes with phosphatic fertilizers and bio fertilizers can increase its nutrient content and availability. Disposal of agro industrial wastes are a major problem and dumping it in the vicinity of industrial areas initiate environmental hazards. Recycling of industrial wastes is one way of disposal mechanism and another way of resource management. One among the industrial wastes is coir pith from coir industries. It has a greater potential in supplying higher quantity of nitrogen, phosphorus and potassium besides secondary and micronutrients and can be used as best organic manure (Reghuvaran and Ravindranath 2012) [9].

Materials and Methods

This experimental trial was carried out during *Kharif* 2021 at SMOF (SHIATS Model Organic Farm), Department of Agronomy, Sam Higginbottom University of Agriculture, Technology & Sciences (SHUATS), Prayagraj (U. P) located 25° 30' 42''N latitude, 81° 60' 56'' E longitude and 98 m altitude above the mean sea level (MSL). The experiment laid was out in Randomized Block Design consisting of nine treatments which are T1: Foliar spray of Panchagavya 2% + FYM 4 t/ha, T2: Foliar spray of Panchagavya 2% + Poultry manure 1 t/ha, T3: Foliar spray of Panchagavya 2% + Vermicompost 1 t/ha, T4: Foliar spray of Panchagavya 4% + FYM 4 t/ha, T5: Foliar spray of Panchagavya 4% + Poultry manure 1 t/ha, T6: Foliar spray of Panchagavya 4% + Vermicompost 1 t/ha, T7: Foliar spray of Panchagavya 6% + FYM 4 t/ha, T8: Foliar spray of Panchagavya 6% + Poultry manure 1 t/ha, T9: Foliar spray of Panchagavya 6% + Vermicompost 1 t/ha replicated thrice to determine the Effect of Panchagavya and Organic Manures on Growth and Yield of Blackgram (*Vigna mungo* L.). The experimental site was uniform in topography and sandy loam in texture nearly neutral in soil reaction (pH 7.1), low in organic carbon (0.36%), available N (171.48 kg/ha), medium in available P and K (15.2 kg/ha and 232.5 kg/ha respectively). Between the period of germination to harvest several plant growth parameters were recorded at equal intervals and after harvest several yield parameters were recorded. In growth parameters plant height (cm), dry weight (g/plant), number of nodules/plant, and number of branches/plant were recorded and yield parameters like pods/plant, seeds/pod, test weight (g), and seed yield (kg/ha) were recorded and statistically analyzed using analysis of variance (ANOVA) as applicable to Randomized Block Design (Gomez, K. A. and Gomez, A. A. 1984).

Results and Discussion

Growth parameters

Plant height

Significantly Highest plant height (43.10 cm) was observed in the treatment with Foliar spray of Panchagavya 4% + Poultry manure 1 t/ha over all the other treatments. However, the treatments with application of Foliar spray of Panchagavya 4% + FYM 4 t/ha (42.30 cm), Foliar spray of Panchagavya 4% + Vermicompost 1 t/ha (42.67 cm) and Foliar spray of Panchagavya 6% + Poultry manure 1 t/ha (42.20 cm) which were found to be at par with the treatment Foliar spray of Panchagavya 4% + Poultry manure 1 t/ha as compared to all the treatments. It is established fact that application of panchagavya supplies almost all the essential plant nutrients

for the growth and development of plants. The balanced nutrition might have resulted in higher plant height in blackgram plant. The results were in accordance to Nileema *et al.*, (2011) [7]. The application of Poultry manure might have favored better root proliferation, more solubility of phosphorous which consequently favored higher biological nitrogen fixation and uptake of nutrients and availability of all plant nutrients during the crop growth period. Which resulted in the higher plant height. These results are in close in close conformity with the findings of Jat *et al.*, (2012)

Dry weight

The treatment with Foliar spray of Panchagavya 4% + Poultry manure 1 t/ha was recorded with significantly maximum dry weight (6.41 g/plant) over all the treatments. However, the treatments with Foliar spray of Panchagavya 4% + Vermicompost 1 t/ha (6.24 g/plant) which was found to be statistically at par with the treatment Foliar spray of Panchagavya 4% + Poultry manure 1 t/ha. 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 help in the higher dry matter production in plants. The results were also found to be similar with Saranraj *et al.*, (2011) [11]. The increase in the total dry matter production may be due to better source and sink capacity developed due to better dry matter production and its accumulation in assimilatory surface area and increase in the photosynthetic efficiency and thus increased the production of photosynthates reflected in better growth and ultimately in higher dry accumulation. The results were found to be similar with Nehra *et al.*, (2001) [6].

Number of nodules/plant

The highest nodules per plant (9.17) was observed in the treatment with application of Foliar spray of Panchagavya 4% + Poultry manure 1 t/ha, which was significantly higher over rest of the treatments. However, the treatments with Foliar spray of Panchagavya 4% + FYM 4 t/ha (8.43) and Foliar spray of Panchagavya 4% + Vermicompost 1 t/ha (8.70) which were found to be statistically at par with the treatment Foliar spray of Panchagavya 4% + Poultry manure 1 t/ha. The increase in number of nodules per plant might be due to direct addition and slow release of nutrients from poultry manure. 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 Singh *et al.*, (2017) [13].

Number of branches/plant

The highest number of Branches per plant (6.70) was observed in the treatment with application of foliar spray of Panchagavya 4% + Poultry manure 1 t/ha, which was significantly superior over rest of the treatments. However, the treatments with Foliar spray of Panchagavya 4% + FYM 4 t/ha (6.47), Foliar spray of Panchagavya 4% + Vermicompost 1 t/ha (6.60) and Foliar spray of Panchagavya 6% + Poultry manure 1 t/ha (6.43) which were found to be statistically at par with the treatment Foliar spray of Panchagavya 4% + Poultry manure 1 t/ha. Panchagavya contains NPK, some micronutrients and besides this growth regulatory substances such as IAA, Gibberellic acid, cytokinins and essential plant nutrient have also been reported in panchagavya. All these nutrients and PGR's have helped in increase number of

branches in blackgram. Similar results were found by Sanjutha *et al.*, (2008) ^[10]. The higher number of branches due to the application of poultry manure might be due to the availability of desired and required quantity of nutrients for

longer period in root zone of growing plants which helped plant cells to divide. The results were found to in correspondence with Pandey *et al.*, (2019) ^[8].

Table 1: Effect of panchagavya and organic manures on growth parameters of blackgram at harvest

S. No	Treatment	Plant height (cm)	Plant dry Weight (gm)	No. of Nodules/plant	No. of branches/plant
1.	Foliar spray of Panchagavya 2% + FYM 4 t/ha	40.83	5.03	6.53	5.73
2.	Foliar spray of Panchagavya 2% + Poultry manure 1 t/ha	41.60	5.33	7.10	5.97
3.	Foliar spray of Panchagavya 2% + Vermicompost 1 t/ha	41.36	5.24	6.80	5.87
4.	Foliar spray of Panchagavya 4% + FYM 4 t/ha	42.30	5.89	8.43	6.47
5.	Foliar spray of Panchagavya 4% + Poultry manure 1 t/ha	43.10	6.41	9.17	6.70
6.	Foliar spray of Panchagavya 4% + Vermicompost 1 t/ha	42.67	6.42	8.70	6.60
7.	Foliar spray of Panchagavya 6% + FYM 4 t/ha	41.87	5.46	7.43	6.20
8.	Foliar spray of Panchagavya 6% + Poultry manure 1 t/ha	42.20	5.74	8.00	6.43
9.	Foliar spray of Panchagavya 6% + Vermicompost 1 t/ha	42.06	5.60	7.77	6.24
	F test	S	S	S	S
	S.Em (\pm)	0.33	0.08	0.29	0.14
	CD (p=0.05)	0.99	0.23	0.89	0.42

Yield Attributes

Pod per plant

Maximum Pods/plant (62.67) was recorded with the treatment of application of Foliar spray of Panchagavya 4% + Poultry manure 1 t/ha over all the treatments. However, the treatments Foliar spray of Panchagavya 4% + FYM 4 t/ha (61.33) and Foliar spray of Panchagavya 4% + Vermicompost 1 t/ha (61.66) which were found to be statistically at par with the treatment Foliar spray of Panchagavya 4% + Poultry manure 1 t/ha.

Seeds per pod

Significantly Highest Seeds/Pod (7.67) was recorded with the treatment of application of Foliar spray of Panchagavya 4% + Poultry manure 1 t/ha over all the treatments. However, the treatments Foliar spray of Panchagavya 6% + Poultry manure 1 t/ha (6.67), Foliar spray of Panchagavya 4% + FYM 4 t/ha (7.00) and Foliar spray of Panchagavya 4% + Vermicompost 1 t/ha (7.33) which were found to be statistically at par with the treatment Foliar spray of Panchagavya 4% + Poultry manure 1 t/ha. The beneficial response of poultry manure to yield attributes might also be attributed to the availability of sufficient amounts of easily utilizable form of plant nutrients throughout the growth period and especially at critical growth periods of crop resulting in better uptake, plant vigour and superior yield attributes. The results were found to be similar with Saravanan *et al.*, (2013) ^[12].

Test weight

The highest Test weight (36.79 g) was recorded with the treatment application of Foliar spray of Panchagavya 4% + Poultry manure 1 t/ha over all the treatments. However, the treatments with Foliar spray of Panchagavya 4% + FYM 4 t/ha (35.84 g) and Foliar spray of Panchagavya 4% + Vermicompost 1 t/ha (36.46 g) which were found to be

statistically at par with the treatment Foliar spray of Panchagavya 4% + Poultry manure 1 t/ha. The easy transfer of nutrients and growth stimulants to plants through foliar spray of higher dose of panchagavya might be the reason for enhancement in yield attributes. The smaller quantities of IAA and GA present in panchagavya also helped increase the yield attributes in blackgram. The findings were in accordance with Birendra and Christopher (2007) ^[11].

Seed yield

The highest Seed yield (716.12 kg/ha) was recorded with the treatment application of Foliar spray of Panchagavya 4% + Poultry manure 1 t/ha over all the treatments. However, the treatments with Foliar spray of Panchagavya 4% + FYM 4 t/ha (672.06 kg/ha) and Foliar spray of Panchagavya 4% + Vermicompost 1 t/ha (685.96 kg/ha) which were found to be statistically at par with the treatment Foliar spray of Panchagavya 4% foliar spray + Poultry manure 1 t/ha. The seed yield increased due to the application of panchagavya 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. The results were found to be similar with Somasundaram *et al.*, (2003) ^[14]. The higher increase in the yield has been reported to be associated with the release of macro and micro nutrients during the course of microbial decomposition. Organic matter also functions as source of energy for soil micro flora which brings about the transformation of other nutrients held in soil or applied through other means, in a form that is readily utilized by growing plants which helped in increase of seed yield. The results were in accordance with Kannan *et al.*, (2014).

Table 2: Effect of panchagavya and organic manures on yield attributes of blackgram.

S. No.	Treatment	Pods/plant	Seeds/pod	Test weight (g)	Seed yield (kg/ha)
1.	Foliar spray of Panchagavya 2% + FYM 4 t/ha	54.66	5.00	33.38	554.13
2.	Foliar spray of Panchagavya 2% + Poultry manure 1 t/ha	56.33	5.67	34.17	590.27
3.	Foliar spray of Panchagavya 2% + Vermicompost 1 t/ha	55.67	5.33	33.85	572.81
4.	Foliar spray of Panchagavya 4% + FYM 4 t/ha	61.33	7.00	35.84	672.06

5.	Foliar spray of Panchagavya 4% + Poultry manure 1 t/ha	62.67	7.67	36.79	7.16.12
6.	Foliar spray of Panchagavya 4% + Vermicompost 1 t/ha	61.66	7.33	36.46	685.96
7.	Foliar spray of Panchagavya 6% + FYM 4 t/ha	57.33	6.00	34.69	611.78
8.	Foliar spray of Panchagavya 6% + Poultry manure 1 t/ha	59.00	6.66	35.46	642.85
9.	Foliar spray of Panchagavya 6% + Vermicompost 1 t/ha	58.00	6.33	35.21	926.45
F-test		S	S	S	S
S.Em+		0.4	0.44	0.36	15.67
CD (p=0.05)		1.41	1.32	1.09	46.97

Economics

Gross return

Higher Gross returns have been recorded with the Foliar spray of Panchagavya 4% + Poultry manure 1 t/ha (Rs. 57,289.60/ha) over rest of the treatments followed by Foliar spray of Panchagavya 4% + Vermicompost 1 t/ha (Rs. 54,876.80/ha) whereas minimum gross return was recorded with Foliar spray of Panchagavya 2% + FYM 4 t/ha (Rs. 44,330.40/ha).

Net return

Higher Net returns have been recorded with the treatment Foliar spray of Panchagavya 4% + Poultry manure 1 t/ha (Rs.

35,389.60/ha) over rest of the treatments followed by Foliar spray of Panchagavya 4% + Vermicompost 1 t/ha (Rs. 32,476.80/ha) whereas minimum Net returns was recorded with Foliar spray of Panchagavya 2% + FYM 4 t/ha (Rs. 18,630.00/ha).

Benefit cost ratio

Higher Benefit cost ratio have been recorded with the treatment Foliar spray of Panchagavya 4% + Poultry manure 1 t/ha (1.61) over rest of the treatments followed by Foliar spray of Panchagavya 4% + Vermicompost 1 t/ha (1.44) whereas lower Benefit cost ratio was recorded with Foliar spray of Panchagavya 2% + FYM 4 t/ha (0.72).

Table 3: Effect of panchagavya and organic manures on economics of blackgram.

S. No.	Treatments	Cost of cultivation (INR/ha)	Gross returns (INR/ha)	Net returns (INR/ha)	B:C Ratio
1.	Foliar spray of Panchagavya 2% + FYM 4 t/ha	25,700.00	44,330.40	18,630.00	0.72
2.	Foliar spray of Panchagavya 2% + Poultry manure 1 t/ha	21,700.00	47,221.60	25,521.60	1.17
3.	Foliar spray of Panchagavya 2% + Vermicompost 1 t/ha	22,200.00	45,824.80	23,624.80	1.06
4.	Foliar spray of Panchagavya 4% + FYM 4 t/ha	25,800.00	53,764.80	27,864.80	1.07
5.	Foliar spray of Panchagavya 4% + Poultry manure 1 t/ha	21,800.00	57,289.60	35,389.60	1.61
6.	Foliar spray of Panchagavya 4% + Vermicompost 1 t/ha	22,300.00	54,876.80	32,476.80	1.44
7.	Foliar spray of Panchagavya 6% + FYM 4 t/ha	25,900.00	48,942.40	23,142.40	0.89
8.	Foliar spray of Panchagavya 6% + Poultry manure 1 t/ha	21,900.00	51,428.00	29,628.00	1.35
9.	Foliar spray of Panchagavya 6% + Vermicompost 1 t/ha	22,400.00	50,356.00	28,056.00	1.25

Conclusion

Based on the findings of the investigation it may be concluded that the treatment with Foliar spray of Panchagavya 4% + Poultry manure 1 t/ha performed exceptionally in all growth, yield parameters and in obtaining higher seed yield of blackgram. Since, the findings based on the research done in one season

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