

Influence of organic nutrients on growth and yield of summer Greengram (*Vignaradiata*)

Abstract

Greengram (*Vignaradiata*), commonly called as mungbean is an important pulse crop grown mainly in *Zaid* and *Kharif* season in India. Organic farming is one of the sustainable farming practices that can overcome the harmful effects of chemical farming and provides quality production. A field experiment was conducted during *Zaid*, 2023 to study the “Effects of organic nutrients on growth and yield of Greengram” at SHUATS Model Organic Farm, Department of Agronomy, SHUATS, Prayagraj (U.P.). The experiment was laid out in a randomized block design with nine treatments replicated thrice. The treatment consisted of 3 different solid manures i.e. Farmyard manure, Vermicompost, Goat manure and 3 different liquid manures i.e. Fish amino acid, Panchagavya and Seaweed (*Kappaphycus alvarezii*) sap. The experimental field soil was sandy loam in texture, moderately basic in reaction (pH 7.8), available medium Organic Carbon (0.662%) low in available N (249.5 kg/ha), and very high accessible phosphorus (38.7 kg/ha) and available potassium (240.8 kg/ha). The results showed that significantly higher growth parameters viz. plant height (42.09 cm), number of nodules (22.22/plant), dry weight (19.35 g/plant) and yield attributes i.e. effective pod/plant (11.05), seed/pod (9.68), test weight (37.17 g), seed yield (1633.54 kg/ha) and stover yield (3323.55 kg/ha) were observed with application 5 t/ha FYM and foliar spray of 7.5% K sap (T9). Highest net return (Rs. 100032.30/ha) and benefit:cost ratio (1.83) was also recorded in the same treatment. This concludes that application of 5 t/ha FYM along with foliar spray of 7.5% K sap at 15 and 30 DAS performed better in terms of yield and economic returns.

Keywords: Fish Amino Acid, Goat manure, Greengram, Panchagavya, Seaweed sap, Vermicompost.

INTRODUCTION

“Greengram (*Vignaradiata*) is one of the important legume plants of the pulse family (Fabaceae). It is commonly known as mungbean, mungo, oregon pea, or simply mung and is also cultivated as a green manure crop. It is grown as a catch crop in between the *Zaid* and *kharif* seasons and is one of India's major *Zaid* pulse crops. Its seed is more palatable, nutritive, digestible, and non-flatulent than other pulses grown in the world. The seed of Greengram contains an average of 20-24% protein, 62.5% carbohydrates, 1.4% fat, 4.2% fiber, vitamins, and minerals” (Sehrawat *et al.* 2013). It provides enough fibers and iron hence becomes easily digestible. Because of its short growing time, which allows it to fit into intercropping systems with diverse crops, high tonnage capacity, and exceptional nutritional properties for food, feed, and forage, it has a wider range of adaptations. In second generation world, pulses are frequently referred to as "poor man's meat" since they are less expensive than meat (Patel *et al.*, 2020). “India is the major producer of green gram in the world, and is grown in almost all the states. It covers an area of 40.38 lakh hectares with a total production of 31.5 lakh tonnes with a productivity of 783 kg/ha and contributes 11 % to the total pulse production in the year 2021-22. Some of the states like Rajasthan (20.89 lakh/ ha), Madhya Pradesh (1.57 lakh/ ha) and Uttar Pradesh (0.30 lakh/ha) are the major producers of Greengram in India” (GOI, 2021).

Any considerable improvement to the agricultural system that raises output needs to be environmentally benign and strengthen the system's sustainability. The indiscriminate use of chemical fertilizers and pesticides damages soil flora and fauna and raises important issues. Due to these reasons, the farmers need more sustainable farming practices. Organic farming can be one of them that comprises of various options like organic manures, bio-stimulants, growth regulators, etc., to enhance the fertility of the soil and yield of the crops.

The soil application of organic manures and foliar sprays of liquid manure during crop growth period significantly enhances the seed yield and seed quality parameters of Greengram. Use of organic manures alone or in combination with liquid organic manures will help to improve soil physico-chemical properties and the effective utilization of applied organic manures for improved seed yield and seed quality. Sharma *et al.* (2012) reported that “FYM will decompose in moist soil to improve the soil structure and release the nutrients contained in its insoluble form for the growth of the crop”. “Vermicompost is a mixture of organic waste and Vermicast that is produced by utilizing different species of worms, primarily red wigglers, white worms, and earthworms. It improves the soil structure and increases its water-holding capacity” (Singh *et al.* 2022). “Goat manure is a great soil conditioner because of its high nitrogen, phosphorus and potassium content which adds nutrients to the soil and also makes a positive change in the physical properties of the soil. Enhancing the texture of the soil allows more oxygen to reach the roots and nodules, promoting efficient water consumption and plant growth” (Kumar *et al.* 2003).

“Foliar application of liquid fertilizer supply plant nutrients more rapidly than methods involving uptake by root due to seed/root treatment. Fish protein dramatically increases the amount of organic matter in the soil, may quickly encourage the spawning of soil microorganisms, greatly activates soil nutrients, and increases soil fertility. Fish amino acid topically boosts Greengram’s yield and growth” (Setia *et al.* 2023). “An organic compound called Panchagavya can strengthen plant systems by fostering development and immunity. The application of Panchagavya as foliar spray considerably enhances the quantity of pods on each Greengram plant, hence directly contributing to larger crop production” (Singh *et al.* 2022).

“Seaweed liquid fertilizers are useful for achieving higher agricultural production, because the extract contains growth promoting hormones, IAA, IBA, Cytokinin’s, Gibberellins, trace elements, vitamins, amino acids, antibiotics, and micronutrients” (Zodape *et al.* 2008).

“Seaweed extracts from *Kappaphycus alvarezii* have been found to increase the yield of *Vigna sinensis* and *Vigna radiate*” (Sivasankari *et al.* 2006, Zodape *et al.* 2010)

MATERIALS AND METHOD

A field experiment was carried out in alluvial soil at the Crop Research Farm of the Department of Agronomy, SHUATS, Prayagraj, U.P., during the Zaid season of 2023. There were nine treatment combinations replicated thrice and conducted in randomized block design. The sandy loam soil of the experimental plot had a virtually neutral soil response (pH 7.8), 0.618 ds/m electrical conductivity, medium organic carbon (0.662 %), low available nitrogen (249.5 kg/ha), medium potassium (240.8 kg/ha) and very high accessible phosphorus (38.7 kg/ha). On 19th April 2023, Greengram seeds (Virat IPM 205-7) were sown at 25 cm x 10 cm spacing. The treatment combinations consisted of three different solid manure i.e. Vermicompost 2.5 t/ha, Goat manure 1 t/ha, FYM 5 t/ha and foliar applications of liquid manure i.e. 3% Fish Amino acid, 5% Panchagavya and 7.5% K sap (seaweed sap) at 15 and 30 DAS after sowing. To apply organic manure as broadcasting method, 4-5 cm deep furrows were dug along the seed rows using a hand hoeing. Ten days after sowing, the gap filling was done whereas to maintain the recommended spacing, thinning was done by removing excess plants. In order to reduce crop density,

weed competition, intercultural operations were carried out twice at 15 and 30 DAS. At regular intervals from germination to harvest, plant growth parameters such as plant height (cm) and dry weight (g/plant) were assessed at 15 days interval till harvest whereas at harvest, yield metrics such as pods/plant, seeds/pod, test weight (g), seed yield (kg/ha), stover yield (kg/ha), and harvest index (%) were recorded and statistically analyzed using analysis of variance (ANOVA) for randomized block design (Gomez and Gomez, 1984).

Results and

Discussions Growth parameter

The data of growth parameter are presented in Table 1. Significantly highest plant height (42.09 cm), number of nodules (22.22), dry weight (19.35 g) were recorded with the application of FYM 5 t/ha + 7.5% K sap (T9). However, plant height was found statistically at par (39.79 cm) in FYM

5 t/ha + Panchagavya 5 % (T8), while number of nodules were found statistically at par (20.45 and 21.09) in FYM 5 t/ha + FAA 3 % (T7) and T8 with the highest. Although dry weight was found statistically at par (18.12 g) in T8 with the highest treatment. These results might be due to influence of the growth promoting hormones such as IAA, IBA, Cytokinin's, Gibberellins, trace elements, vitamins, amino acids, antibiotics, and micronutrients present in organic manures (Patele *et al.* 2008 and Chaudhary *et al.* 2008). Significant increase in nodule number was observed at flowering stage due to increased soil microbes' activity due to FYM 5 t/ha and foliar spray of 7.5 % K sap. This might be due to FYM application which increases the porosity and bulk density of the soil leading in increased microbial activity of rhizobium that solubilizes phosphorus hence increases nodulation in plants. These results are in conformity with Pramanick *et al.* (2013). Foliar application of seaweed saps had significantly influenced the dry weight of the plant. This might be due to presence of growth promoting hormone in seaweed extract attributed to the activation of cell division and cell elongation in the axillary bud hence resulted in increased dry weight. These results are in close vicinity with the findings of Patel *et al.* (2008) and Akhila *et al.* (2017). Interaction effect of organic manures and bioenhancers on dry weight of plant was found to be significant for Greengram.

Yield attributes

The data pertaining to yield-attributing characters are represented in Table 2. The maximum number of pods/plant (11.05) was recorded with the application of FYM 5 t/ha + 7.5 % K sap (T9) which was found statistically at par with treatment 5, 6, 7 and 8 (10.08, 10.44, 10.78, 10.96). Significantly higher number of seeds/pod (9.68) were recorded with application of FYM 5 t/ha + 7.5 % K sap in (T9) Whereas T8 (8.89) was found statistically at par with T9. Whereas significantly highest test weight (34.17g) was found with application of FYM 5 t/ha and 7.5 % K sap (T9) among all treatments. Foliar application of seaweed saps had significantly influenced on the growth and yield of Greengram such as number of pods per plant, number of seeds per pod, test weight. Results reveal that maximum plant growth and yield attributes were obtained in T9 (Zodapeet *et al.* 2010, Patele *et al.* 2013 and Choudhary *et al.* 2017).

Grain yield

The statistical data in Table 2 showed that significantly highest grain yield (1633.5 kg/ha) was recorded due to FYM 5 t/ha + 7.5 % K sap (T9), which was statistically at par (1483.10 kg/ha) with FYM 5 t/ha + Panchagavya 5% (T8). Seaweed sap contains several microelements such as B, Fe, Mn, etc., along with other macronutrients. The increase in seed yield might be due to presence of boron leading in enhancement of cell wall, tissue difference, sugar transport, maintenance of conducting tissue with regulatory effect also promoting flower production, pollen tube elongation and seed and fruit development. Highest seed yield was also obtained due to availability of iron during the crop growth period (Pramanick *et al.* 2013).

Stover yield

The data in Table 2 showed that a significantly maximum stover yield (9.82 kg/ha) was recorded with the application FYM 5 t/ha + 7.5 % K sap (T9) whereas, all treatments were respectively found statistically at par with the highest. This might be due to greater photosynthetic accumulation in vegetative components leading to superior vegetative development such as plant height, dry matter accumulation hence the stover yield increases. Similar results reported by Patel *et al.* (2008), Akhila *et al.* (2017), Chaudhary *et al.* (2008).

Harvest index

Data presented in table 2 showed that the highest harvest index (34.39 %) was recorded with the application of FYM 5 t/ha + 7.5 % K sap (T9) which was statistically at par to all treatments.

Economics

The data on the economics of different treatments presented in Table 2 showed that the significantly maximum net return (₹ 1,00,032.30/ha) and benefit-cost ratio (1.83) were recorded with the application of FYM 5 t/ha + 7.5 % K sap and the minimum net return (₹ 53,303.73/ha) and benefit-cost ratio (1.20) was recorded in Vermicompost 2.5 t/ha + Fish amino acid 3 % (T1). These results might be due to higher grain and stover yields in the same treatment because of enhanced availability of nutrients by the FYM and better utilization of micronutrients supplied by K sap, the result was significantly highest (Yadka *et al.* 2004 and Yadav *et al.* 2014).

Conclusion

On the basis of one year experimentation, it concludes that with the application of FYM 5 t/ha along with foliar spray of 7.5 % K sap performed better in obtaining higher yield as well as economic returns from Greengram.

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Table1.Effectoforganicnutrient ongrowthattributesofGreengram.

S.No.	Treatments	Plant height	Dry weight(g)	No of Nodules	CGR (g/g/day)	RGR (g/g/day)
		60DAS	60DAS	45DAS	30-45DAS	30-45DAS
1	Vermicompost2.5t/ha+Fishaminoacid3%	32.14	12.65	15.96	16.489	0.1231
2	Vermicompost2.5t/ha+Panchagavya5%	32.92	13.52	16.99	16.604	0.1161
3	Vermicompost2.5t/ha+7.5% Ksap	33.40	14.11	17.19	16.427	0.1107
4	Goatmanure1t/ha+Fishaminoacid3%	33.89	15.17	17.34	16.578	0.1094
5	Goatmanure1t/ha+Panchagavya5%	35.49	16.02	18.40	17.209	0.1073
6	Goatmanure1 t/ha+7.5%Ksap	37.02	16.49	19.19	17.200	0.1019
7	FYM 5t/ha+Fishaminoacid3%	37.79	17.13	20.45	18.960	0.1068
8	FYM5t/ha+Panchagavya5%	39.79	18.12	21.09	19.689	0.1047
9	FYM5t/ha+7.5%Ksap	42.09	19.35	22.22	20.124	0.1008
SEm(±)		1.30	0.67	0.95	1.29	0.0081
CD(P= 0.05)		3.87	2.02	2.86	3.88	-

Table 2. Effect of organic nutrient on yield attributes and yield of Greengram

S. No.	Treatments	No. of Pods/plant	No. of Seeds/pod	Test weight (g)	Grain yield (kg/ha)	Stover yield (kg/ha)	Harvest index (%)	Net returns (₹/ha)	Benefit ratio (B:C)
1	Vermicompost 2.5t/ha + Fish amino acid 3%	8.63	7.35	34.6	1025.3	2076.6	33.05	53303.73	1.21
2	Vermicompost 2.5t/ha + Panchagavya 5%	8.80	7.65	34.8	1072.8	2155.8	33.14	58050.60	1.32
3	Vermicompost 2.5t/ha + 7.5% Ksap	9.27	7.91	35.3	1138.8	2239.7	34.11	58517.59	1.18
4	Goat manure 1t/ha + Fish amino acid 3%	9.94	8.16	35.5	1155.8	2357.3	33.88	68316.87	1.64
5	Goat manure 1t/ha + Panchagavya 5%	10.08	8.38	36.4	1232.4	2477.6	33.27	75743.14	1.83
6	Goat manure 1t/ha + 7.5% Ksap	10.44	8.55	36.7	1311.4	2628.8	33.38	105572.53	1.67
7	FYM 5t/ha + Fish amino acid 3%	10.78	8.72	37.9	1425.1	2862.9	33.20	86260.58	1.76
8	FYM 5t/ha + Panchagavya 5%	10.96	8.89	38.0	1483.1	3010.4	33.00	88551.86	1.81
9	FYM 5t/ha + 7.5% Ksap	11.05	9.68	38.1	1633.5	3123.5	34.39	100032.30	1.84
SEM(±)		0.48	0.33	1.14	63.23	103.33	1.50	5353.987	0.115
CD(P= 0.05)		1.45	1.06	-	189.57	310.19	-	16051.25	0.345

Note: Price of grain yield - ₹ 8510/q (MSP) and price of stover yield - ₹ 500/q and ₹ 85.10/kg grain yield and stover yield - ₹ 5/kg.

