www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(6): 141-144

www.thepharmajournal.com
Received: 09-02-2022
Accepted: 16-05-2022

Varsha H Perli
M.Sc. Scholar, Department of Agronomy, ITM University, Gwalior, Madhya Pradesh, India

Tomar SS
Professor, Department of Agronomy, ITM University, Gwalior, Madhya Pradesh, India

Kasi R Gummadala
M.Sc. Scholar, Department of Agronomy, ITM University, Gwalior, Madhya Pradesh, India

Deepsikha
M.Sc. Scholar, Department of Agronomy, ITM University, Gwalior, Madhya Pradesh, India

Madhav Kaushik
M.Sc. Scholar, Department of Soil Science, Gwalior, Madhya Pradesh, India

Corresponding Author:
Varsha H Perli
M.Sc. Scholar, Department of Agronomy, ITM University, Gwalior, Madhya Pradesh, India

Influence of Organic manures and Bio-fertilizers on the growth and yield of green gram (*Vigna radiata* L.)

Varsha H Perli, Tomar SS, Kasi R Gummadala, Deepsikha and Madhav Kaushik

Abstract
In the year 2021, a field experiment was conducted at the School of Agriculture, ITM University, Gwalior, (M.P.) to determine the agronomical performance of green gram in the presence of organic manures and bio fertilizers. The experimental field's soil had a sandy clay loam texture, was low in organic carbon and accessible nitrogen, and was medium in available phosphorus and potash. With a pH of 7.35, it is slightly alkaline in reaction and has a moderate cation exchange capacity. There were three replications of each treatment, which included three types of organic manures and three types of bio fertilizers. There are ten different treatments available (t1 to t10). The treatment of 3 t/ha poultry manure + 2.5l/ha rhizobium (T6) resulted in positive plant growth and yield.

Keywords: Bio fertilizers, green gram, growth, Organic manures, and yield

Introduction
One of the most important pulse crops, green gram (*Vigna radiata* L.), often known as mung bean, is an excellent source of high-quality protein (Patel *et al*., 2016; Mahalingam *et al*., 2018). It's also used in salads, vegetables, and Indian recipes such as curry, sevpuri, panipuri, and Indian chat sprout salad. Green gram has been cultivated in India since ancient times and is native to the Indian subcontinent and Central Asia, where it has been grown for over a decade. India is the world's leading producer of green gram, which is grown in nearly every state, including Orissa, Madhya Pradesh, Rajasthan, Maharashtra, Gujarat, and Bihar. It is planted on around 4.5 million hectares, yielding 2.5 million tonnes with a productivity of 548 kg/ha, accounting for 10% of total pulse production. Green gram production is expected to reach 2.64 million tonnes in 2020-21, according to the government of India's third advance projections (India state 2021). For the past 100 years, chemical fertilizers have been used to grow green grams all over India.

Fertilizers alone cannot sustain land productivity in modern farming. The long-term and excessive use of chemical fertilizers has resulted in soil health deterioration and decreased productivity (Yadav and Lourd raj, 2005). Maintaining environmental safety and agricultural sustainability is critical in today's agricultural production system without reducing productivity. Excessive use of the chemical is not only harmful to crop plants over time, but it also makes soil ecologically fragile, reducing productivity and having an economic impact. Long-term use of inorganic fertilizers such as ammonium sulfide and sulfur-coated urea has resulted in soil acidification, decreased soil aggregate stability, decreased soil respiration, pollution of underground water, and a decrease in earthworm population. Soil properties have deteriorated as a result of the widespread use of inorganic fertilizers and pesticides to increase yield and protect crop varieties. The use of chemical fertilizers has had a negative impact on humans, soil organisms, and the environment. Modern agriculture is becoming increasingly reliant on a steady supply of synthetic inputs, such as chemical fertilizers.

Efficient plant nutrition management practices must be identified in order to ensure improved and sustainable agricultural production while also conserving natural resources. The role of organic manures and biofertilizers in sustainable agriculture is especially important in this context. Phosphorus solubilizing bacteria, potassium solubilizing bacteria, and rhizobium are important components of organic fertilizers such as vermicompost, poultry manure, farm yard manure, and bio-fertilizers.

Vermicomposting is an efficient method of converting organic waste materials such as plant litter, manure, and other solid wastes into useful organic fertilizers via earthworms.

The nutrient quality of vermicompost varies and is dependent on the substrates used. Moisture percent- 60 to 70, aeration-50%, temperature- 18 to 35 °C, pH- 6.5 to 7.5, nitrogen 0.8–3.0 percent, phosphate 0.5–1.7 percent, and potassium 0.5–1.6 percent Vermicompost contains micronutrients, microbes from various groups such as bacteria, fungi, and actinomycetes, phytohormones, soil enzymes, and humic acids, and it is free of pests and diseases. It improves soil and increases plant growth productivity.

Farmyard manure is a diverse mixture of animal manure, urine, bedding material, fodder residues, and other components that contribute significantly to soil fertility and capacity through positive effects on soil physical, volatile, and biological properties, as well as plant nutrition. On average, well-composted farmyard manure contains 0.5 percent nitrogen, 0.2 percent phosphorus, and.0.5 percent potassium. Poultry manure is the rapidly fermented excreta of a bird. If left exposed for 30 days, it will lose half of its nitrogen. When compared to other organic manures, poultry manure contains more nitrogen and phosphorus. 3.03 percent N, 2.63 percent P2O5, and 1.4 percent K2O is the average nutrient contents.

Biofertilizers are organic fertilizers. Rhizobium inoculation is the most cost-effective, simple, and secure method of supplying nitrogen to green grams via a well-known symbiotic nitrogen fixation process. Phosphate Solubilizing Bacteria (PSB) consistently increase phosphate availability to plants by mineralizing organic phosphorus compounds (Beg and Singh 2009). Potash Solubilizing Bacteria contains potash mobilizing Bacteria strains that help mobilize and convert insoluble potash to soluble potash, making it available to plants.

In terms of soil structure and nutrient management, the use of organic manure and biofertilizers is critical. They increase the solubility of a fixed form of nutrient into a soluble form, improve nutrient availability, and maintain soil health due to the build-up of soil organic matter and beneficial microbes, which helps to improve physical, chemical, and biological conditions of the soil, soil microbial activities, soil structure, water-holding capacity, and thus increase soil fertility and productivity, which helps to improve plant growth, metabolic activity, and soil fertility.

Materials and Methods

The study, entitled "Effects of Organic manures and Biofertilizers on Growth and Yield of Mung Bean (*Vigna radiata* L)," was conducted in 2021 at the Agricultural Research Farm (M.P.), School of Agriculture, ITM University. Details of the test site, climatic conditions, materials used, procedures, and techniques that were followed during the course. The research farm is located at latitude 26 ° 14ˈN, longitude 78 ° 14ˈE, and at an altitude of 206 m above sea level. Field of Agricultural Research Farm, School of Agriculture, ITM University, Gwalior (M.P.). The soil at the test site was a sandy loam structure. Several soil samples from topsoil to a depth of 15 cm were randomly taken before sowing and the mixed samples prepared after mixing were analyzed in the laboratory for mechanical and chemical composition. This study adopted a randomized block design with 9 treatments repeated 3 times. The length of each plot for each process is 5m. When shown in combination. (T1) VC – 2 t / ha + PSB – 2.5 l / ha (T2) VC – 2 t / ha + SB – 2.5 l / ha (T3) VC – 2 t / ha + RHIZOBIUM – 2, 5 l / ha (T4) PM – 3 t / ha + PSB – 2.5 l / ha (T5) PM – 3 t / ha + KSB – 2.5 l / ha (T6) PM – 3 t / ha + RHIZOBIUM – 2.5 l / ha (T7) FYM – 2 t / ha + PSB – 2.5 l / ha (T8) FYM – 2 t / ha + KSB – 2.5 l / ha (T9) FYM – 2 t / ha + RHIZOBIUM – 2.5 l / ha (T10) Absolute Control. Mung beans were carefully harvested when the harvest season was reached. Plant height (cm) and plant dry matter accumulation (g) were manually measured with four companion plants randomly selected from each replicating plot, seeds were separated and dried in the sun 3 days after harvest. The foliage production from each plot was measured and expressed in tonnage per hectare. Statistics were calculated and analyzed using Gomez and Gomez's statistical approach.

Results and Discussions

Effect of Organic manures and bio fertilizers on growth attributes

Plant height

At harvest, the highest plant height of 55.50 cm was recorded in the treatment (T6) poultry manure – 3 t/ha + rhizobium – 2.5L/ ha which is on par with the poultry manure -3t/ha + phosphorus solubilizing bacteria - 2.5L/ha (T4) (54.20 cm) and vermicompost - 2t/ha +rhizobium – 2.5L/ha (T3) (53.85). The lowest plant height 42.50 cm was recorded in the treatment (T10) which is inferior to other treatments.

Plant dry weight

At harvest the highest plant dry weight with 9.01gm was recorded in the treatment (T6) poultry manure – 3 t/ha + rhizobium – 2.5L/ ha which is on par with the poultry manure -3t/ha + phosphorus solubilizing bacteria - 2.5L/ha (T4) (8.22gm) and vermicompost - 2t/ha +rhizobium – 2.5L/ha (T3) (53.85). The lowest plant height 4.02 was recorded in the treatment (T10) which is inferior to other treatments.

Number of leaves per plant

At harvest, the application of poultry manure – 3 t/ha + rhizobium – 2.5L/ ha (T6) recorded the higher number of leaves 19.65 and the lowest number of leaves was registered under Absolute control (T10) with 15.25 leaves and was significantly inferior over the rest of the treatments.

Number of primary branches per plant

The treatment involving poultry manure – 3 t/ha + rhizobium – 2.5L/ ha (T6) recorded a maximum of 7.62 branches at harvest and was comparable with poultry manure -3t/ha + phosphorus solubilizing bacteria - 2.5L/ha (T4) (7.52), vermicompost - 2t/ha +rhizobium – 2.5L/ha (T3) (7.47). The least number of branches was recorded in absolute control (T10) with 5.71 which was inferior to the rest of the treatments. Mohbe *et al.* (2018) proved that application of poultry manure showed, best performance in initial plant Number of primary branches at 60 DAS.

Number of root nodules per plant

At harvest a higher number of root nodules was recorded under the application of poultry manure – 3 t/ha + rhizobium – 2.5L/ ha (T6) by registering 18.78 which is on par with the application of poultry manure -3t/ha + phosphorus solubilizing bacteria - 2.5L/ha (T4) (18.30). The lowest was recorded in the absolute control (T10) with 11.23 and was significantly inferior to the rest of the treatments. Poultry manure with organic form of nitrogen may have enabled a faster and better growth of the crop, this with better

Rhizobium establishment in the nodules due to a conducive atmosphere provided by the organic manure with adequate phosphorus for supportive growth of roots and nodules may have resulted in a higher yield attributes in greengram. The results are similar to findings of Abraham *et al*., 2007.

Number of pods per plant

The number of pods per plant the results show that the number of pods per plant was influenced significantly due to different levels of organic fertilizer and bio fertilizer. The number of pods per plant ranged from 13.2 to 9.8. The maximum number of pods per plant (13.2) was observed under the application of poultry manure – 3 t/ha + rhizobium – 2.5L/ ha (T6) which is on par with the application of poultry manure -3t/ha + phosphorus solubilizing bacteria - 2.5L/ha (T4) (13.0) and vermicompost - 2t/ha +rhizobium – 2.5L/ha (T3) (13.0). The lower number of pods was recorded in the absolute control (T10) with 9.8 and was significantly inferior to the rest of the treatments.

Number of seeds per pod

The highest number of seeds (9.5) was registered in the application of poultry manure – 3 t/ha + rhizobium – 2.5L/ ha (T6) which is on par with the application of poultry manure - 3t/ha + phosphorus solubilizing bacteria - 2.5L/ha (T4) (9.2). The lower seeds per pod were recorded in the absolute control (T10) with 6.5 and were significantly inferior to the rest of the treatments.

1000 grain weight

The highest number of 1000 grain weight (33.4 gm) was registered in the application of poultry manure – 3 t/ha + rhizobium – 2.5L/ ha (T6) and the lower 1000 grain weight was recorded in the absolute control (T10) with 31.2 gm and were significantly inferior over the rest of the treatments.

Effect of organic manures and bio fertilizers on yield attributes

Grain yield

The highest grain weight (1496.12 kg) was registered in the application of poultry manure – 3 t/ha + rhizobium – 2.5L/ ha (T6) and was significantly superior to the rest of the treatments. The lower grain weight was recorded in the absolute control (T10) with 662.48 kg and was significantly inferior to the rest of the treatments.

Stover yield

The highest stover yield was recorded under the application of poultry manure – 3 t/ha + rhizobium – 2.5L/ ha (T6) by registering 3286.12 kg which is on par with the application of poultry manure -3t/ha + phosphorus solubilizing bacteria - 2.5L/ha (T4) (3222.57 kg) and vermicompost - 2t/ha +rhizobium – 2.5L/ha (T3) (3203.13 kg). The least stover yield was recorded in the absolute control (T10) with 2552.48 kg and was significantly inferior to the rest of the treatments.

Biological yield: The result shows that biological yield per hectare was influenced significantly due to different levels of organic manures and bio fertilizers. The poultry manure – 3 t/ha + rhizobium – 2.5L/ ha (T6) registering 4782.24 kg which is on par with the application of poultry manure -3t/ha + phosphorus solubilizing bacteria - 2.5L/ha (T4) (4672.87 kg) and vermicompost - 2t/ha +rhizobium – 2.5L/ha (T3) (4474.03 kg). The least biological yield was recorded in the absolute control (T10) with 3214.96 kg and was significantly inferior to the rest of the treatments.

Harvest Index

The highest harvest index was noticed in the treatment with the application of poultry manure – 3 t/ha + rhizobium – 2.5L/ ha (T6) by registered 31.28. The least harvest index was recorded in the absolute control (T10) with 20.61 and was significantly inferior to the rest of the treatments. These results are similar with the findings of (Yadav *et al*., 2018).

Table 1: Influence of Organic manures and Bio fertilizers on the growth of green gram. (*Vigna radiata* L.)

Treatments	Plant height	Plant dry weight	Number of leaves per plant	Number of primary branches per plant	Number of root nodules
T1	52.90	7.43	18.10	7.25	17.30
T2	48.75	5.23	16.35	6.63	13.32
T3	53.85	7.89	18.45	7.47	17.57
T4	54.20	8.22	19.20	7.52	18.30
T5	50.20	6.22	16.95	6.57	15.57
T6	55.50	9.01	19.65	7.62	18.78
T7	51.40	6.96	17.00	6.92	16.72
T8	45.55	4.96	15.80	6.42	12.38
T9	52.00	7.01	17.34	7.16	16.80
T10	42.50	4.02	15.24	5.17	11.23
S.Ed	1.13	0.13	0.35	0.16	0.24
C.D	2.37	0.28	0.73	0.34	0.73

Table 2: Influence of 0rganic manures and Bio fertilizers on the yield of green gram (*Vigna radiata* L.)

Treatments	Pod per plant	Seeds per pod	1000 grain weight
T_1	12.5	8.6	33.1
T_2	10.4	7.3	32.0
T_3	13.0	9.1	33.3
T_4	13.0	9.2	33.4
T_5	10.4	7.8	32.2
T_6	13.2	9.5	33.4
T_7	11.8	8.0	32.6
T_8	10.1	6.9	31.9
T_9	12.2	8.2	32.8
T_{10}	9.8	6.5	31.2
S.Ed	0.23	0.14	0.72
CD (p= 0.05)	0.50	0.31	1.51

Table 3: Influence of Organic manures and Bio fertilizers on the yield of green gram.

Treatments	Grain Yield	Stover Yield	Biological Yield	Harvest Index
T_1	1186.08	3076.08	4262.16	27.83
T_2	809.81	2699.81	3509.63	23.07
T_3	1270.90	3203.13	4474.03	28.41
T_4	1450.30	3222.57	4672.87	31.04
T_5	890.00	2760.69	3650.69	24.38
T_6	1496.12	3286.12	4782.24	31.28
T_7	1025.81	2915.81	3941.62	26.03
T_8	741.04	2631.04	3372.07	21.98
T_9	1030.00	2983.77	4013.77	25.66
T_{10}	662.48	2552.48	3214.96	20.61
S.Ed	22.76	53.24	93.89	0.54
CD (p= 0.05)	47.82	111.87	197.26	1.14

Conclusion

The result of this study indicates that combination of Poultry manure and Rhizobium has given the highest yield when compared to the other treatments. Therefore it is recommended to the farmers that the combination of Poultry manure and Rhizobium can be used instead of chemical fertilizers. It is also observed that treatments like T_4 and T_3 also gave similar yield of green gram when compared to treatment T_6.As Poultry manure and Rhizobium are obtained at lower price and are in abundance, it also has notable effect on the yield of green gram.

References

1. Appavu K, Saravanan A. Effect of organic manures and tillage practices on soil physical properties and crop yields under sorghum – soybean cropping sequence. Madras Agriculture Journal. 1999;86(10-12):561-565.
2. Ashraf M. Influence of seed inoculation and NPK application on growth, yield, and quality of mung bean (*Vigna radiata* L.). M.Sc. (Ag.) Thesis, University of Agriculture, Faisalabad, Pakistan, 2001.
3. Bhuiyan MAH. Evaluation of introducing mung bean into cereal-based cropping patterns for sustainable soil fertility and productivity. Ph. D. Thesis, Dept. of Soil Sci., Bangladesh Agril. Univ., Mymensingh, Bangladesh. 2004, p 217.
4. Brijesh Kumar Rathi, *et al*. Response of rhizobium inoculation with sulfur and micronutrients on yield and yield attributes of green gram (*Vigna radiata* (L.) Hepper). Legume Res. 2009;32(1):62-64
5. Channaveerswami AS. Studies on integrated nutrient management and planting methods on seed yield and quality of ground, 2005.
6. Daterao SH, Vinaya B, Deshpande VL, Satiwale TR. Influence of Rhizobium plus molybdenum on nitrogen use efficiency and economy in legumes. Journal of Soil and Crops. 1994;4:144-147.
7. Dhage Shubhangi, Kachhave. Effect of biofertilizers on yield, nutrient content, and quality of soybean (Glycine max) under rain fed conditions. J Oilseeds Res. 2010;27(2):187-189.
8. Dhutraj *et al*. Efficacy of agrochemicals and Rhizobium on different biometric characters, microbial dynamics, and yield of soybean. Agric. Res. Technol. 2011;369(3):424- 426.
9. Dhyani *et al*. from Meerut (U.P) Effect of nitrogen, phosphorus, vermicompost, and biofertilizers on growth and yield of urdbean (*Vigna mungo*). Pantnagar Journal of Research. 2011;9:72-74.
10. Dusica Delica *et al*. Effect of Brady rhizobium inoculation on growth and seed yield of mung beans. African J Microbial. Res. 2011;5923:3946-3957.
11. Gaur AC, Neelakanthan S, Daragan KS. Organic manures. Indian Council of Agriculture Research, New Delhi. 1992, p159.
12. Gaur AC. Bulky organic manure and crop residues. In: Fertilizers organic matter recyclable wastes and biofertilizers. Tondon HLS, Fertilizer Development, and Consultation Organization, New Delhi, 1991.
13. Govindan K, Thirumurugan V. Synergistic association of Rhizobium with phosphate solubilizing bacteria under different sources of nutrient supply on productivity and soil fertility in soybean (*Glycine max*). Indian Journal of Agronomy. 2005;50(3):214-217.
14. Gratt JD. Earthworm Ecology. Cultural Soils. 1970;10:107-123.
15. Jat *et al*. Effect of organic manuring on productivity and economics of summer mung beans. Annals Agril. Res. (New Series). 2012 a;33(1&2):17-20.
16. Jat *et al*. effect of FYM and mineral nutrients on physic-chemical properties of soil under mustard in the western arid zone of India. Annals of Plant and Soil Research. 2012 b;14(2):167-166.
17. Javed S, Panwar A. Effect of biofertilizer, vermicompost, and chemical fertilizer on different biochemical parameters of Glycine max and Vigna mungo, Recent Research in Science and Technology. 2013;5(1):40-44.
18. Kathireshan G, Manickam G, Gnanmurthy P. Effect of enriched farm yard manure and time of gypsum application on growth and yield of soybean (Glycine max). Journal of Oilseed Research. 1999;6(2):348-349.
19. Kondappa D, Radder BM, Patil PL, Hebsur NS, Alagundagi SC. Effect of integrated nutrient management on growth, yield, and economics of chili (cv. Byadgi Dabbi) in a vertisol. Karnataka Journal of Agricultural Sciences. 2009;22:438-440.
20. Kumari SMS, Usha Kumari K. Effect of vermicompost enriched with rock phosphate on the yield and uptake of nutrients in cowpea (*Vigna unguiculata* L. Walp). Journal of Tropical Agriculture. 2002;40:27-30.
21. Kumawat *et al*. Response of organic manures, PSB and phosphorus fertilization on growth and yield of mung beans. Environ Ecol. 2009;27(4B):2024-2027.
22. Mahetele, Kushwaha. Productivity and profitability of pigeon pea as influenced by FYM, PSB, and phosphorus fertilization under rainfed conditions. J Food Legumes. 2011;24(1):72-74.
23. Maskina MS, Randhawa NS. Effect of manures and zinc levels on the availability of zinc, manganese, and copper to wetland rice. Indian Journal of Agricultural Science. 1979;53:48-52.
24. Nadeem MA, Ahmad R, Ahmad MS. Effects of seed inoculation and different fertilizers levels on the growth and yield of mung beans. Journal of Agronomy. 2004;3:40-42.
25. Nagaraju, Mohan Kumar. Effect of micronutrients and bio inoculants on growth and yield of soybean (*Glycine max* L. Merrill). Mysore J Agric, Sci. 2010;44(2):148-150.