Madras Agric.J.,2025; https://doi.org/10.29321/MAJ.10.SE1229

RESEARCH ARTICLE

Enumeration of Different Nutrient Management Practices in the Yield of Black Gram (*Vigna mungo* L.)

S. Sanjana*, D. Jeevitha and V. Santhosh

Department of Agronomy, Nalanda College of Agriculture, Tiruchirapalli - 621104

Received: 11 Sep 2025

Revised: 21 Oct 2025

Accepted: 24 Oct 2025

ABSTRACT

A field experiment was conducted at Nalanda College of Agriculture, Trichy, during (June - August, 2025) to study different nutrient management practices on black gram. The treatments comprised Control (T_1), 100 % Recommended Dosage of Fertiliser (T_2), 100% Farm Yard Manure at 5 t ha^{-1} (T_3), 100% Vermicompost at 3 t ha^{-1} (T_4), 50% Recommended Dosage of Fertiliser + 50% Vermicompost (T_5), 50% Recommended Dosage of Fertiliser + 50% Farm Yard Manure (T_6) and 50% Recommended Dosage of Fertiliser + 25% Farm Yard Manure + 25% Vermicompost (T_7). The experiment was laid out in a randomised block design with three replications. Farmyard manure, Vermicompost, and Recommended Dose of fertiliser were basally used in the treatments. The result revealed that among the different treatments imposed, application of 50% Recommended Dosage of Fertiliser + 25% Farm Yard Manure + 25% Vermicompost recorded the highest growth attributes like plant height (29.85 cm), leaf area index (4.41), dry matter production (2129.93 kg ha^{-1}), number of branches $plant^{-1}$ (7.06), number of leaves $plant^{-1}$ (36.06) and yield attributes like number of pods $plant^{-1}$ (27.96) pod length (5.83 cm), number of grains pod^{-1} (5.53), grain yield (910 kg ha^{-1}), haulm yield (2287 kg ha^{-1}), Net return (₹54559 ha^{-1}) and BCR (2.63). The lowest values were obtained under control conditions.

Keywords: *Black gram, Farm Yard Manure, Vermicompost, Growth and yield parameters, Economics.*

INTRODUCTION

Pulses are the most important food crops after cereals, referred to as “grain legumes” and are one of the important ingredients in global vegetarian diet, commonly known as “poor man’s protein source,” as they contain 20-25% protein (Ray *et al*., 2023). Pulse crops contribute to soil health by fixing nitrogen, reducing the need for synthetic fertilisers. Their ability to thrive in diverse climates and conditions makes them resilient to climate change, ensuring food availability in challenging environments. Furthermore, pulse crops support biodiversity and can enhance crop rotation systems, thereby improving overall agricultural productivity, (Sunil Kumar *et al*., 2025). Black gram [*Vigna mungo* (L.)] is a widely grown pulse crop, assuming considerable importance for food and nutritional security in India (Banerjee *et al.,* 2021). It is a crucial short-duration pulse crop, typically grown in rainy (kharif) season in the country. Endowed with a unique capability of symbiotic nitrogen fixation, the crop has an excellent capacity to maintain soil fertility (Saleem *et al*., 2016). Black gram seeds are exceptional source of protein, carbohydrates, fat, fibre, vitamins,

*Corresponding author mail: sanjusrknth@gmail.com

and minerals (Jadhav *et al*., 2019). India is now the world's leading producer of black gram, accounting for more than 70 per cent of worldwide output. Myanmar and Pakistan come in second and third, respectively. India has an area of 45.33 lakh hectares under black gram cultivation; its production and productivity account for 20.84 lakh tonnes and 459 kg ha^{-1}, respectively. The total area under black gram cultivation in Tamil Nadu is 4.05 lakh hectares. In Tamil Nadu, black gram production and productivity are 3.17 lakh tonnes and 783 kg ha^{-1}, respectively. Pudukkottai district has an area of 4649 ha under black gram cultivation, and its production and productivity are 2353 tonnes and 506 kg ha^{-1}, respectively (Muthulakshmi and Premavathi, 2021). INM includes the intelligent use of organic, inorganic and biological resources to sustain optimum yield, improve or maintain the soil physical and chemical properties and provide crop nutrition packages which are technically sound, economically attractive, practically feasible and environmentally safe (Desai *et al*., 2020). Biofertilisers have shown promising results in sustaining crop productivity and improving soil fertility (Tomar *et al*., 2013).

MATERIALS AND METHODS

The study aimed to investigate various nutrient management practices and their impact on the yield of Black gram (*Vigna mungo* L.) during the Kharif season. The experiment was conducted at Nalanda College of Agriculture, M. R. Palayam, Trichy, from June to August 2025. The site was located at 10.08° N latitude and 77.64° E longitude, with an altitude of 296 m above MSL. The climate was characterised as a tropical zone, with a maximum temperature ranging from 33.1 °C to 38.9 °C, a minimum temperature of 25.2 °C to 27.4 °C, and a mean annual rainfall of 800 mm to 1000 mm. The soil characteristics of the experimental field included clay loam soil type, with a fertility status of 213.59 kg ha^{-1} in available nitrogen, 3.94 kg ha^{-1} in available phosphorus, and 502.14 kg ha^{-1} in available potassium. The physicochemical characteristics of the soil sample were also studied.

The study focuses on the Black gram variety VBN 11, which has high-yielding capacity resistance to Yellow Mosaic Virus, leaf crinkle, and moderate resistance to powdery mildew diseases. The experiment was conducted in a Randomised Block Design with three replications, with each treatment plot having dimensions of 5 m x 4 m. The treatments included the application of recommended doses of NPK (20:40:20 kg ha^{-1}), Vermicompost, and FYM in different combinations, except the control plot.

The field preparation involved ploughing, harrowing, and providing irrigation channels. Good viable seeds of VBN 11 were used at 20 kg ha^{-1}, and irrigation was done regularly. Nutrients were applied in the form of DAP (46% P, 18% N) and MOP (60% K) as soil application. Gap filling and thinning were done on 14 DAS, and hand weeding was done on 25 and 35 DAS. Plant protection was implemented as per the recommendations whenever the pest and disease incidence exceeded the economic threshold level. Harvesting was done by hand-picking the mature pods three times at weekly intervals.

Five samples were tagged randomly in each net plot for recording biometric observations like Plant height (cm), Number of branches $plant^{-1}$, Number of leaves $plant^{-1}$, Leaf Area Index, Dry Matter Production (kg ha^{-1}), Number of pods $plant^{-1}$, Pod length (cm), Number of seeds pod^{-1}, Grain yield (kg ha^{-1}), Haulm yield (kg ha^{-1}), Harvest Index and Benefit Cost Ratio.

These experimental data were recorded and statistically analysed with the methods given by Gomez and Gomez (1984). The data showed high variation hence, the data were subjected to a square root transformation $\sqrt{x+0.5}$ and analysed statistically. Wherever the results were found to be significant, the critical difference (CD) was calculated at a 5% probability level for a significant result. Non-significant comparison was indicated as 'NS'.

RESULTS AND DISCUSSION

The field experiment on black gram demonstrated that integrated nutrient management practices had a significant influence on growth characteristics. The application of 50% Recommended Dosage of fertiliser, 25% farmyard manure, and 25% Vermicompost resulted in maximum values of plant height, leaf area index, and dry matter production. The combined use of organic manures and inorganic fertilisers improved the availability of nutrients to the crops, leading to increased growth attributes and higher dry matter production. Similar findings were reported by Mishra *et al.,* (2024)

Yield attributing characters like the number of pods $plant^{-1}$ and number of grains pod^{-1} were higher in the application of 50% Recommended Dosage of Fertiliser

+ 25% Farm Yard Manure + 25% Vermicompost. Similar research findings were reported by Krishnaprabu (2018). This was due to the supply of plant nutrients to the crop through the combined application of organic manures with inorganic fertilisers. The combination of organic manures with inorganic fertilisers improved the soil's physical and chemical properties, providing favourable soil conditions and enhancing soil health to improve nutrient use efficiency.

Among the various treatments, the application of 50% Recommended Dosage of Fertiliser + 25% Farm Yard Manure + 25% Vermicompost registered a higher seed yield (910 kg ha^{-1}) and haulm yield (2287 kg ha^{-1}). Sridhar *et al.,* (2020) also reported similar results. The application of FYM and Vermicompost enhanced productivity and increased nutrient absorption in black gram, resulting in improved plant growth and superior yield attributes.

The effect of integrated nutrient management practices on black gram was recorded, showing higher nitrogen, phosphorus, and potassium uptake at the crop's harvest stage. The application of NPK as chemical fertilisers supplied the initial nutrients required for black gram growth, resulting in higher growth and yield characteristics. Usman *et al.,* (2015) and Lakshmi *et al.,* (2015) also obtained similar results.

In terms of economics, the maximum gross income, net income, and BCR of ₹87943 ha^{-1}, ₹54559 ha^{-1}, and 2.63 respectively were registered in the application of 50% Recommended Dosage of Fertiliser + 25% Farm Yard Manure + 25% Vermicompost. The integration of organic manures with inorganic fertilisers improved nutrient availability, increasing growth, yield attributes, yield, gross return, and profit.

SUMMARY

The study found that integrated nutrient management practices had a significant influence on the growth characteristics of black gram plants. The application of 50% Recommended Dosage of Fertiliser + 25% Farm Yard Manure + 25% Vermicompost (T_7) resulted in higher plant height, leaf area index, dry matter production, number of branches $plant^{-1}$, and number of leaves $plant^{-1}$. The control treatment (T_1) recorded the least growth characteristics.

Integrated nutrient management practices also significantly influenced the pod length, number of pods $plant^{-1}$, and number of seeds pod^{-1} of black gram. The application of 50% Recommended Dosage of Fertiliser + 25% Farm Yard Manure + 25% Vermicompost (T_7) registered maximum pod length, number of pods $plant^{-1}$, and number of seeds pod^{-1}. The control treatment (T_1) significantly reduced yield characters.

In terms of grain and haulm yield, the application of 50% Recommended Dosage of Fertiliser + 25% Farm Yard Manure + 25% Vermicompost (T_7) recorded maximum yield. The application of 50% Recommended Dosage of Fertiliser + 25% Farm Yard Manure + 25% Vermicompost (T_7) resulted in the maximum gross income, net income, and BCR invested of

Table 1. Effect of various nutrient management practices on growth parameters of Black gram

Treatment Schedule	Plant height (cm)	No. of branches $plant^{-1}$	No. of leaves $plant^{-1}$	Leaf Area Index	Dry Matter Production (kg ha^{-1})
T_1 - Control	17.6	4.25	09.26	1.99	1061.6
T_2 - 100% RDF	26.26	6.06	28.4	2.78	1714.2
T_3 - 100% Farmyard manure at 5 t ha^{-1}	18.66	4.82	18.4	2.13	1311.07
T_4 - 100% Vermicompost at 3 t ha^{-1}	19.67	5.13	24.4	2.20	1393.47
T_5 - 50% RDF + 50% Vermicompost	29.79	6.94	29.13	3.52	1916.33
T_6 - 50% RDF + 50% Farmyard manure	20.62	5.33	26.26	2.65	1433.8
T_7 - 50% RDF + 25% Farmyard Manure + 25% Vermicompost	29.85	7.06	36.06	4.41	2129.93
S. Ed	0.32	0.78	3.24	0.19	96.668
C.D (P=0.05)	0.70	1.70	7.15	0.43	212.954

Fig 1. Effect of various nutrient management practices on growth parameters of Black gram

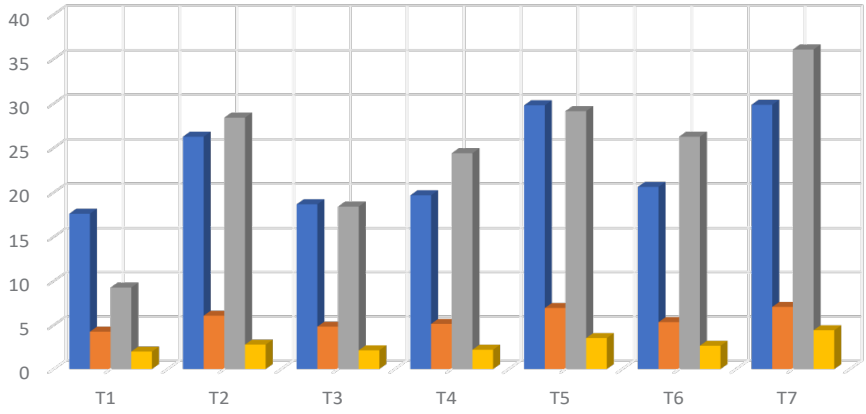
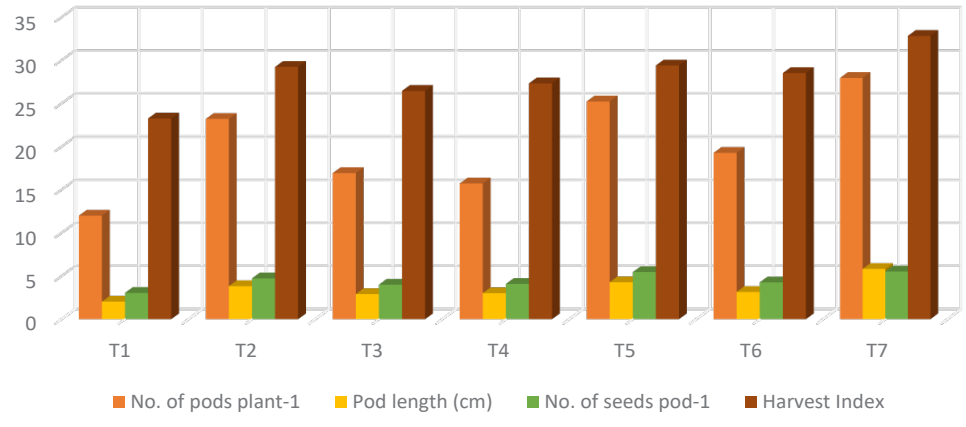


Table 2. Effect of various nutrient management practices on yield parameters of Black gram

Treatment Schedule	No. of pods plant^{-1}	Pod length (cm)	No. of seeds pod^{-1}	Grain yield (kg ha^{-1})	Haulm yield (kg ha^{-1})	Harvest Index	Benefit Cost Ratio
T_1 - Control	12	2.04	3.05	412	996	23.26	1.23
T_2 - 100% RDF	23.21	3.83	4.73	775	1875	29.24	2.47
T_3 - 100% Farmyard manure at 5 t ha^{-1}	16.93	2.91	4	502	1027	26.46	1.94
T_4 - 100% Vermicompost at 3 t ha^{-1}	15.73	3.02	4.09	518	1135	27.33	2.16
T_5 - 50% RDF + 50% Vermicompost	25.23	4.29	5.46	897	2154	29.40	2.61
T_6 - 50% RDF + 50% Farmyard manure	19.28	3.16	4.27	694	1579	28.53	2.45
T_7 - 50% RDF + 25% Farmyard Manure + 25% Vermicompost	27.96	5.83	5.53	910	2287	32.83	2.63
S. Ed	3.672	0.29	0.13	4.025	0.365	0.029	NS
C.D (P=0.05)	8.088	0.64	0.28	29.425	25.855	0.067	NS

Fig 2. Effect of various nutrient management practices on yield parameters of Black gram



₹ 87943 ha^{-1}, ₹ 54559 ha^{-1}, and 2.63 respectively while the minimum gross income, net income, and BCR were registered under the control treatment (T_1).

CONCLUSION

Based on the result of the field experiment, it can be concluded that the Integrated application of 50% Recommended Dosage of Fertiliser +25% Farm Yard Manure + 25% Vermicompost (T_7) treatment performed very well in enhancing the grain yield of black gram. The application of FYM and Vermicompost with inorganic fertiliser supplies the nutrients, making it an economically viable method that can be recommended to black gram farmers for achieving good yields and profit.

ACKNOWLEDGMENT

I express my sincere gratitude to my guide, Mr V. Santosh, Assistant Professor, and my advisor, Mrs M. Arthy, Assistant Professor. I am thankful to all the teaching and non-teaching staff of Nalanda College of Agriculture. Additionally, I am grateful to my friends, Ms R. Rabitha Shri, Ms M. Thilagavathi, Ms A. Vigneshwari, and Ms C. Yogeshwari, for the enormous help they provided throughout the experiment.

REFERENCES

Banerjee, P., V. K. Venugopalan, R. Nath, Y. S. Althobaiti, A. Gaber, H. Al-Yasi, and A. Hossain. 2021. Physiology, growth, and productivity of spring–summer black gram (*Vigna mungo* L. Hepper) as influenced by heat and moisture stresses in different dates of sowing and nutrient management conditions. *Agronomy*, 11 (11) :2329. https://doi.org/10.3390/agronomy11112329

Desai, N. B., R. L. Leva, M. B. Khadadiya and U. J. Patel. 2020. Integrated nutrient management in Rabi Indian bean (*Dolichos lablab* L.). *Journal of Pharmacognosy and Phytochemistry*, *9*(4):457-459. https://dx.doi.org/10.22271/phyto

Jadhav, S., S. Chand, P. Patted and K. Vishwanath. 2019. Influence of plant growth regulators and micronutrients on seed quality of black gram (*Vigna mungo* L.) cv. LBG-625 (Rashmi). *Indian Journal of Pure and Applied Bioscience*, *7*(3):115-121. http://dx.doi.org/10.18782/2320-7051.7478

Krishnaprabu. S 2018. Response of green gram to pre-sowing seed priming chemicals. *International Journal of Pure and Applied Biosciences*, *6*(6), 455-458. http://dx.doi.org/10.18782/2320-7051.7158

Lakshmi, C. S. R., P. C. Rao, T. Sreelatha, G. Padmaja and P. V. Rao. 2015. Effect of Integrated Nutrient Management on Soil Properties, Yield and Nutrient Uptake in Rice-Green gram Cropping System in an Inceptisol of Andhra Pradesh. *Journal of the Indian Society of Soil science*, *63*(4), 400-405. https://doi.org/10.5958/0974-0228.2015.00053.5

Mishra, A., S. K. Pidurkar, T. Rathore and G. Rai. 2024. Response of integrated nutrient management on growth and yield of black gram (*Vigna mungo* L.). *Egyptian Journal of Agricultural Research*, *102* (3): 345-353. https://doi.org/10.21608/ejar.2024.238426.1440

Muthulakshmi, M. and R. Premavathi. 2021. A Study on Adoption Level of Black Gram VBN 8 among Farmers of Pudukkottai District, Tamil Nadu. *Asian Journal of Agricultural Extension, Economics & Sociology*, *39* (11):123-127. https://doi.org/10.9734/ajaees/2021/v39i1130732

Ray L. I., P. K. Parida, K. Sirisha, V. Ram, A. K. Singh and N. J. Singh. 2023. Performance of Black gram (*Vigna mungo*) cultivars grown during the pre-monsoon season in Meghalaya. *Indian Journal of Hill Farming*, *36* (01):219-226. https://doi.org/10.56678/

Saleem, R., Z. I. Ahmad, M. Ashraf, M. A. Anees, and H. I. Javed. 2016. Impact of different fertility sources and intercropping on productivity of black gram. *International Journal of Biology and Biotechnology*, *13*:89-99. https://ijbbku.com/assets/custom/journals/2016/1/Impact%20of%20different%20fertility%20sources%20and%20intercropping%20on%20productivity%20of%20black%20gram.pdf

Sridhar, S. M., C. Supriya and S. A. Krishnaveni. 2020. Productivity enhancement through foliar nutrition in green gram (*Vigna radiata*). *International Journal of Current Microbiology and Applied Sciences*, *9*(4):807-811. https://doi.org/10.20546/ijcmas.2020.904.096

Sunil Kumar, T., H. M. Virdia, K. G. Patel, M. Chowdhury, M. S. S. C. Satya, S. F. Mahmoud and D. M. El-Shinawy. 2025. Residual effect of summer legumes incorporation on soil nutrient status and nutrient use efficiency of kharif rice. *Frontiers in Sustainable Food Systems*, *9*: 153 - 162. https://doi.org/10.3389/fsufs.2025.1535162

Tomar, T. S., S. Kumar and S. Tomar. 2013. Effects of plant density, nitrogen and phosphorus on black gram

(*Vigna mungo* L. Hepper). *Annals of Agricultural Research*, *34* (4). https://epubs.icar.org.in/index.php/AAR/article/view/37896

Usman, M., M. G. Nangere and I. Musa. 2015. Effect of three levels of NPK fertiliser on growth parameters and yield of maize-soybean intercrop. *International Journal of Scientific and Research Publications*, *5*(9):710-712. https://www.researchgate.net/publication/331987618_Effect_of_Three_Levels_of_NPK_Fertilizer_on_Growth_Parameters_and_Yield_of_Maize-Soybean_Inter_crop