E-ISSN: 2618-0618
P-ISSN: 2618-060X
© Agronomy
NAAS Rating (2025): 5.20
www.agronomyjournals.com
2025; 8(11): 716-719
Received: 17-09-2025
Accepted: 19-10-2025

Khushi
Faculty of Agricultural Sciences, DAV University, Jalandhar, Punjab, India

Shivani Chand
Faculty of Agricultural Sciences, DAV University, Jalandhar, Punjab, India

Sukhpreet Singh
Faculty of Agricultural Sciences, DAV University, Jalandhar, Punjab, India

Corresponding Author:
Khushi
Faculty of Agricultural Sciences, DAV University, Jalandhar, Punjab, India

Effect of integrated nutrient management on growth and relative economics of green gram (*Vigna radiata* L.)

Khushi, Shivani Chand and Sukhpreet Singh

DOI: https://www.doi.org/10.33545/2618060X.2025.v8.i11j.4286

Abstract
A field experiment entitled "Effect of Integrated Nutrient Management on Growth and Relative Economics of Green Gram (*Vigna radiata* L.)" was conducted during the Kharif season of 2023-2024 at the Experimental Farm, Faculty of Agricultural Sciences, DAV University, Jalandhar. The experiment was laid out in a Randomized Complete Block Design with seven treatments combining inorganic and organic nutrient sources. The treatments included 100% RDF, various proportions of RDF with Farm Yard Manure (FYM), and control. The growth parameters—plant height, number of branches, number of leaves, leaf area index, and dry matter accumulation—were significantly influenced by the treatments. The highest values were recorded under 100% RDF + FYM @ 10 t ha^{-1}, which also provided the maximum gross and net returns with a benefit-cost ratio of 1.15. Integrated use of organic and inorganic fertilizers improved plant growth, soil fertility, and profitability, indicating its potential for sustainable green gram production.

Keywords: Green gram, integrated nutrient management, growth parameters, farm yard manure, economics

Introduction
Green gram (*Vigna radiata* L.) is one of the most important pulse crops in India, valued for its high protein content, short growth duration, and ability to fix atmospheric nitrogen, thereby improving soil fertility and sustainability in cropping systems. It is widely cultivated across arid and semi-arid regions, where it serves as both a nutritional and economic staple for smallholder farmers. However, despite its potential, the productivity of green gram remains low in many areas due to poor soil fertility, nutrient deficiencies, and imbalanced or inadequate use of fertilizers (Singh *et al*., 2013) [6]. To address these challenges, the concept of Integrated Nutrient Management (INM) has gained prominence as a sustainable approach to maintaining soil health while achieving higher yields. INM involves the judicious combination of organic manures and inorganic fertilizers to ensure a balanced nutrient supply throughout the crop growth period (Hazra, 2016) [1]. The use of organic sources such as Farm Yard Manure (FYM) not only adds essential nutrients but also improves soil structure, increases microbial activity, and enhances nutrient-use efficiency. In contrast, chemical fertilizers provide readily available nutrients that meet the immediate needs of the crop. When applied together, these sources create a synergistic effect that sustains soil fertility, promotes better plant growth, and contributes to higher yields and profitability (Ramesh *et al*., 2011; Meena *et al*., 2015) [4, 3]. Therefore, the present study aims to evaluate the influence of Integrated Nutrient Management practices on the growth, yield, and economic performance of green gram, with the goal of developing a nutrient management strategy that balances productivity and environmental sustainability.

Materials and Methods
The field experiment was conducted at the Agronomy Farm of DAV University, Jalandhar (31°25'N, 75°37'E, 238 m above MSL) during the *Kharif* season of 2023-24. The soil was sandy loam with pH 6.21, EC 0.22 dS m^{-1}, OC 0.42%, available N 147.25 kg ha^{-1}, P 10.20 kg ha^{-1}, and K 70.19 kg ha^{-1}. The experiment was laid out in a Randomized Complete Block Design (RCBD) with seven treatments and three replications. Treatments included T_1-Control, T_2-100% Recommended dose of fertilizer, T_3-100% Recommended dose of nitrogen through Farm Yard

Manure @ 10 t ha^{-1}, T_4-100% Recommended dose of fertilizer + Farm Yard Manure @ 10 t ha^{-1}, T_5-75% Recommended dose of fertilizer +25% Recommended dose of nitrogen through Farm Yard Manure, T_6-50% Recommended dose of fertilizer +50% Recommended dose of nitrogen through Farm Yard Manure, T_7-25% Recommended dose of fertilizer +75% Recommended dose of nitrogen through Farm Yard Manure. The green gram variety ML 2056 was used. Growth parameters were recorded at 30, 45 DAS, and at harvest. Economic analysis included cost of cultivation, gross return, net return, and benefit-cost ratio.

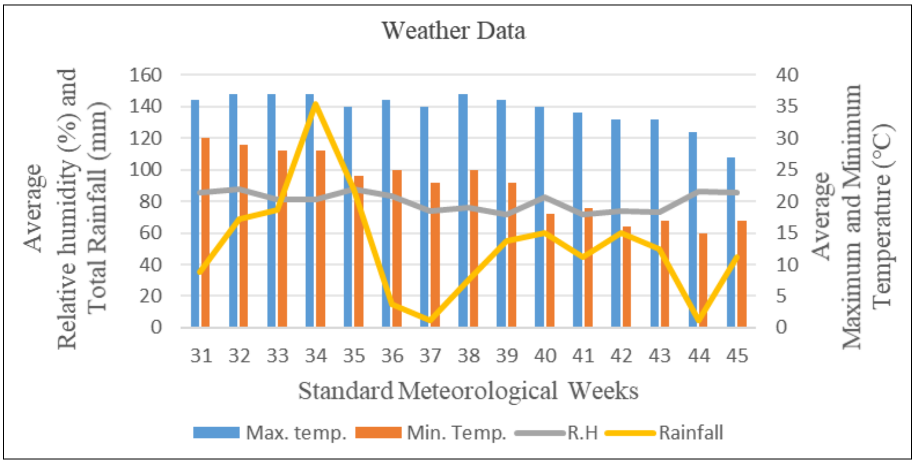

Fig 1: Graphical representation of weekly data during crop growth period (*kharif* 2023-2024)

Collection of data on growth and Relative Economics

Five plants were randomly selected from each plot and tagged. All observations were recorded from these plants. A methodology of individual aspect is briefly described in the following paragraphs.

Growth Parameters

Plant height (cm)

Plant height of five randomly selected plants (tagged) from the net plot area of each treatment was recorded with the help of steel marked scale. The height of the plants was measured from the ground level to the tip of the top most leaf at 30 DAS, 45 DAS and at the time of harvest.

Number of branches per plant

The branches arising from main shoots were counted from five plants selected randomly in each plot. Average value of each plot was calculated and recorded at 30 DAS, 45 DAS and at the time of harvest.

Number of leaves per plant

The number of leaves per plant were counted from each selected plants. Data was recorded as the average of five plants selected at random of each plot at 30 DAS, 45 DAS and at harvest.

Leaf area index

The leaf area was also determined at 30 DAS, 45 DAS and at harvest. The length and maximum width of these leaves were measured with the meter scale. Leaf area index was calculated using following formula (Dwyer and Stewart, 1986).

$$\text{Leaf area index} = \frac{\text{Leaf area}}{\text{Ground area}}$$

Dry matter accumulation (g per plant)

Five plants were randomly taken from each plot. Fresh weight was measured and plants were dried in shade for 48 hours and in hot air oven at 65 °C temperature till constant weight was attained. The dry weight of plant (including vegetative parts and pods) was recorded and expressed in g per plant.

Economics

Cost of cultivation (Rs. ha^{-1})

The total cost of cultivation (Rs. ha^{-1}) was calculated on per hectare basis. The wages of labour, amount spent on mechanical power for different operations and cost of inputs such as seed, fertilizers, farmyard manure and pesticides etc. were calculated on the basis of current market prices of different operation/input.

Gross returns (Rs. ha^{-1})

Gross returns was worked out by multiplying the saleable products (grains and Stover of green gram) with their respective sale prices and then presented as Rs. ha$^{-1.}$

Net returns (Rs. ha^{-1})

The net returns (Rs.ha^{-1}) was calculated by deducting the cost of cultivation from the gross return (Rs.ha^{-1}).

Net returns (Rs. ha^{-1}) = Gross returns (Rs. ha^{-1}) - Cost of cultivation (Rs. ha^{-1}).

Benefit cost ratio

It was calculated by dividing net return with cost of cultivation.

Results and Discussion

INM treatments significantly influenced the growth attributes of green gram. The combined application of 100% RDF + FYM @ 10 t ha^{-1} (T_4) produced the tallest plants, maximum branches, leaves, leaf area index (LAI), and dry matter accumulation compared to control. The FYM contributed to better soil structure, higher microbial activity, and increased nutrient mineralization, providing a sustained supply of nutrients throughout the crop growth period. In contrast, the chemical fertilizers supplied readily available nutrients during the early and critical growth stages, supporting rapid vegetative development. Together, these effects created a favorable rhizosphere environment, leading to better nutrient uptake, vigorous plant growth, and efficient photosynthetic activity.

These findings are consistent with the observations of Makwana *et al.*, (2020) [2] and Sharma *et al.*, (2016) [5], who also reported that the integration of organic manures with inorganic fertilizers significantly improved growth parameters and overall productivity in legume crops. The increase can be attributed to improved nutrient availability and soil biological activity.

Table 1: Effect of INM on growth parameters of green gram

Treatment	Plant height (cm)	Branches per plant	Leaf area index	Dry matter accumulation (g m^2)	Leaves per plant
Control	53.25	8.25	0.21	17.63	19.38
100% RDF	61.96	10.07	0.25	20.06	21.16
100% RDN through FYM	56.39	9.06	0.23	18.75	20.05
100% RDF + FYM	62.69	10.53	0.26	20.58	21.52
75% RDF + 25% RDN FYM	60.52	9.89	0.24	19.67	20.78
50% RDF + 50% RDN through FYM	58.79	9.45	0.24	19.25	20.39
25% RDF + 75% through FYM	54.68	8.78	0.22	18.34	19.68
S.Em(±)	2.08	0.42	0.01	0.57	0.45
CD (5%)	6.48	1.28	0.04	1.74	1.38

The treatment 100% RDF + FYM @ 10 t ha^{-1} (T_4) recorded the highest plant height (62.69 cm), branches (10.53), and LAI (0.26). Control plots had the lowest values. for these parameters, indicating that the absence of a balanced nutrient supply limited plant growth and development. The superior performance of the T_4 treatment can be attributed to the combined effect of organic and inorganic nutrient sources, which ensured an adequate and continuous supply of essential nutrients throughout the crop growth period. The organic manure (FYM) improved soil structure, water retention, and microbial activity, leading to better nutrient availability and uptake by the plants. Simultaneously, the application of chemical fertilizers provided readily available nutrients during the early growth stages, supporting rapid vegetative growth. This balanced nutrient availability enhanced photosynthetic activity, canopy expansion, and dry matter accumulation, ultimately contributing to stronger and more productive plants. The findings by Tyagi *et al.*, (2014) highlight the importance of integrating organic and inorganic nutrient sources to achieve optimal plant growth and sustainable crop productivity. The balanced nutrient supply from both sources promoted photosynthesis, canopy development, and dry matter production.

Table 2: Effect of INM on economics of green gram

Treatment	Gross return (Rs ha^{-1})	Net return (Rs ha^{-1})	B:C ratio
Control	39958	16004	0.67
100% RDF	55585	28386	1.04
100% RDN through FYM	45363.50	18909.50	0.71
100% RDF + FYM	63795	34096	1.15
75% RDF + 25% RDN FYM	50768.70	23754.10	0.88
50% RDF + 50% RDN through FYM	46178.70	19350.95	0.72
25% RDF + 75% through FYM	44604.00	10589.97	0.67
S.Em(±)	1006.18	-	-
CD (5%)	3355.25	-	-

Economic analysis of the different nutrient management treatments revealed that the integrated application of 100% RDF along with FYM at 10 t ha^{-1} resulted in the highest net returns and a benefit-cost (B:C) ratio of 1.15, followed closely by the treatment receiving 100% RDF alone. In contrast, the control plot recorded the lowest returns, highlighting the economic disadvantage of nutrient deficiency and poor soil fertility management. The superior profitability under the integrated treatment can be attributed to the significant improvement in yield and yield attributes due to the combined and balanced supply of nutrients from both organic and inorganic sources. The inclusion of FYM not only enhanced soil health and nutrient availability but also improved water retention and microbial activity, leading to better crop growth and higher productivity. Additionally, the efficient utilization of nutrients under the integrated system helped reduce input costs and improved overall nutrient-use efficiency, resulting in greater economic returns. These findings are consistent with those of Tripathi *et al.*, (2022) [7] and Verma *et al.*, (2024), who also reported that integrated nutrient management practices significantly increase profitability and sustainability in pulse cultivation by improving both crop yield and soil fertility over time.

Conclusion

Integrated nutrient management significantly enhanced growth and profitability of green gram. The combination of 100% RDF + FYM @ 10 t ha^{-1} provided the best results in terms of growth and economic returns. This integrated approach ensures sustainable productivity and improved soil health.

Acknowledgements

Authors are thankful to the administration of DAV University, Jalandhar for providing all the necessary infrastructure to carry out the present work.

Conflict of Interest

All authors declared that there is no conflict of interest.

References

1. Hazra G. Different types of eco-friendly fertilizers: an overview. Sustain Environ. 2016;1(1):54-70.
2. Makwana SN, Patel GG, Patel HK, Shiyal VN, Patel BK. Effect of inorganic and organic nutrients on growth and yield of summer green gram (*Vigna radiata* L. Wilczek). Int J Curr Microbiol Appl Sci. 2020;11:730-738.

3. Meena RS, Dhakal Y, Bohra JS, Singh SP, Singh MK, Sanodiya P, *et al*. Influence of bio-inorganic combinations on yield, quality and economics of mung bean. Am J Exp Agric. 2015;8(3):159-166.
4. Ramesh P, Singh M, Subba Rao A. Organic farming: its relevance to the Indian context. Curr Sci. 2011;90(9):1190-1194.
5. Sharma AR, *et al*. Integrated nutrient management for sustainable crop production in pulses. Indian J Agron. 2016;61(3):345-350.
6. Singh B, Singh JP, Singh P. Role of pulses in improving soil health and sustaining productivity. Indian J Agron. 2013;58(4):518-526.
7. Tripathi A, Lilhare S, Tiwari AS. Integrated nutrient management on economics of green gram (*Vigna radiata* L.). Int J Res Agron. 2022;5(2):197-198.