



International Journal of Research in Agronomy

E-ISSN: 2618-0618
P-ISSN: 2618-060X
© Agronomy
NAAS Rating: 5.20
www.agronomyjournals.com
2025; SP-8(6): 23-26
Received: 23-03-2025
Accepted: 26-04-2025

Vivek Durugkar
M.Sc. Scholar, Department of
Agronomy, School of Agriculture
Science, Technology & Research,
Sardar Patel Agriculture
University, Balaghat, Madhya
Pradesh, India

JS Bisen
Associate Professor, Department of
Agronomy, School of Agriculture
Science, Technology & Research,
Sardar Patel Agriculture
University, Balaghat, Madhya
Pradesh, India

Devendra Turkar
Assistant Professor, Department of
Agronomy, School of Agriculture
Science, Technology & Research,
Sardar Patel Agriculture
University, Balaghat, Madhya
Pradesh, India

Navneet Satankar
Director, School of Agriculture
Science, Technology & Research,
Sardar Patel Agriculture
University, Balaghat, Madhya
Pradesh, India

Corresponding Author:
Vivek Durugkar
M.Sc. Scholar, Department of
Agronomy, School of Agriculture
Science, Technology & Research,
Sardar Patel Agriculture
University, Balaghat, Madhya
Pradesh, India

Influence of integrated nutrient management on growth and yield of Black gram (*Vigna mungo* L.)

Vivek Durugkar and JS Bisen, Devendra Turkar and Navneet Satankar

DOI: <https://www.doi.org/10.33545/2618060X.2025.v8.i6Sa.3026>

Abstract

A field experiment was carried out during Rabi (*Rabi*) season of 2023-24 at the Research farm of the Department of Agronomy, School of Agriculture Science, Technology & Research, Sardar Patel University, Balaghat (M.P.) to assess the "Influence of integrated nutrient management on growth and yield of Black gram (*Vigna mungo* L.)". The experiment consisted of eleven different treatment combinations; the organic and inorganic sources of nutrients were applied as per specified treatments. The Leaf mould was applied through the leaf as per mentioned doses. The crop was grown as per the recommended practice package. Grown parameters like plant height number of leaves, number of internodes, number of branches, fresh weight of plant (g) dry weight of plant (g), number of pods/plant, and length of pod (cm) were found maximum in T₁₁ treatment (50% RDF + Leaf mould @ 5.0t/ ha). Yield attributing characters like number of pods/plant, length of pod (cm) seed yield (q/ha) were found maximum in T₁₁ treatment (50% RDF + Leaf mould @ 5.0t/ ha) highest protein content (23.94%) was noted T₁₁ treatment (50% RDF + Leaf mould @ 5.0t/ ha). Maximum net income (Rs.61580/ha) in T₁₁ treatment (50% RDF + Leaf mould @ 5.0t/ ha). B:C ratio was found maximum (3.03) with same treatment.

Keywords: Black gram, branches, grains, internodes, pod, seed index, straw yield

Introduction

The common name for black grams, or *Vigna mungo* L., is "Urad bean." It is one of the most significant pulse crops farmed nationwide. It is a member of the Leguminosae family. One of the most highly valued pulse crops, black gram is grown throughout practically all of India. The primary source of its introduction to other tropical regions is Indian immigration. Black grams are the ideal source of every nutrient, including fat (1.5%), carbohydrates (60%), protein (25-26%), minerals, and vitamins. It is used as nutritive fodder, especially for milch cattle. It is also used as a green manuring crop. In India, black gram is very popularly grown in Andhra Pradesh, Madhya Pradesh, Maharashtra, Bihar, Uttar Pradesh, West Bengal, Punjab, Haryana and Karnataka.

In India, the total area under black gram is 4.50 M ha. with a production of 2.83 Mt and productivity of 628 kg/ha during 2020-21. In Madhya Pradesh, the total area under black gram is 4.72 lakh ha with a production of up to 1.66 lakh tons and productivity of 351.69 kg/ha during 2020-21.

The profitable production of black gram crops may be affected by many factors, among these soil fertility to produce good seeds, is of practical significance. The poor yield of this crop in our country is mainly ascribed to low fertility of the soil, inadequate manuring and cultural practices. Our soils are exhausted in respect of major and minor elements hampering the yield of crops. The new varieties of the crop require higher amounts of nutrients to realize their inherent yield potential. Proper and optimum application of fertilizers not only increases the yield but also favorably affects the quality of the produce. To curb this trend of declining yield, there is need to adopt the concept of integrated nutrient management (INM). Organic manure is an important component of integrated nutrient management and may help to recover soil health. Besides, organic manures also supply the traces of micronutrients, which are not supplied by chemical fertilizers. Therefore, needed to compare various organic manures with chemical fertilizers to find out the effective combination. Integrated system approach is not only a reliable

way of obtaining high productivity with substantial fertilizer economy, but also a concept of ecological soundness leading to sustainable agriculture. The basic concept of integrated plant nutrient system is the maintenance and improvement of soil fertility for sustaining crop productivity on long-term basis. Application of different organic-cum-inorganic sources was found very effective in realizing high yield, better economy (Singh *et al.*, 2013 a and Saket *et al.*, 2014) ^[13, 8] and improved residual fertility of the soil.

A key component of sustainable agriculture is integrated nutrient management (INM), which calls for resource management that meets evolving human requirements without compromising environmental quality or depleting essential natural resources. To maximize crop yields without degrading the health of the soil, it entails applying green manures, organic manures, blue-green algae, biofertilizers, crop rotation with legumes, and the least amount of chemical fertilizers. Organic nutrient management is proving as a remedy to cure the ills of modern chemical agriculture. Therefore, the application of organic manure has received great attention. Among organic sources as supplemental fertilizer, seaweed extracts have been used. More than 15 million tonnes (MT) of seaweed products are used annually as nutrient supplements and bio-stimulants in agriculture and horticultural crop production (anonymous 2010). Under the current farming system, chemical fertilizers are insufficient to maintain the productivity of the soil. Similarly, a crop's needs for nutrients cannot really be met by organic manures or biofertilizers. The best option turned out to be applying organic manure in an integrated manner with inorganic fertilizers. It has been discovered that combining chemical fertilizer with organic manures holds significant promise for both preserving higher productivity and enhancing crop production stability. Farmyard manure or vermicompost when integrated with reduced doses of inorganic fertilizers resulted in improved soil fertility, growth and yield of crops. On the other hand, chemical fertilizers have a deleterious effect on soil fertility leading to unsustainable yields; while integration of chemical fertilizers with organic manures and bio-fertilizers would be able to maintain soil fertility and sustain crop productivity. Nutrient supply plays an important role in crop production but under intensive cultivation, use of chemical fertilizers alone for a longer period would result in deterioration of soil fertility and quality of produce.

Materials and Methods

The experiment was carried out at the Research farm of the Department of Agronomy, School of Agriculture Science, Technology & Research, Sardar Patel University, Balaghat (M.P.). The experiment was conducted in a randomized complete block design with three replications. Different rates treatment comprised of eleven organic-cum- inorganic sources of nutrients allocated to the plots as per treatments. The seed rate used as 20 kg/ha for sowing with 30.0 x 10.0 cm row-to-row and plant-to-plant distance. The gross and net plot size was 5.0 m x 3.5 m and 4.0 m x 3.0 m, respectively. The fertilizer grades were applied as per treatments. A whole dose of N, P, and K was applied as a basal dose at the time of sowing. Full recommended dose of nitrogen and potassium at the rate of 25 kg N /ha and 25 Kg K₂O /ha, respectively. All the other agronomic practices were applied uniformly to all the treatments. The experiment will be consisting of the following factors along with their respective levels.

Results and Discussion

Growth parameters

Amongst the INM treatments, T₁₁ (50% RDF + Leaf mould @ 5.0t/ ha) having resulted in significantly higher plant height, branches and leaves/plant at 20, 40, 60 DAS and harvest stages. At the harvest stage, the maximum height was 37.00 cm, and at 60 DAS branches were 7.86/plant and leaves 46.38/ plant. The length and number of root nodules and fresh and dry weight of the plant were also found highest. This was followed by T₈ (75% RDF + Vermicompost (VC) @ 1.25t/ ha) and T₂ (100% RDF), the differences among the values were non-significant. The fourth best INM treatment was T₉ having 50% RDF + Vermicompost (VC) @ 2.5t/ ha.

In the present research, it is apparent that the 100% RDF (N₂₀P₄₀K₂₀) as in T₂ or 50% RDF + Leaf mould @ 5.0t/ ha as in T₁₁ or T₈ (75% RDF + Vermicompost (VC) @ 1.25t/ ha) combined impact of FYM + vermicompost proved most beneficial as compared to their separate or combined applications in different proportions. The beneficial effect of the combined influence of NPK + FYM or vermicompost in different amounts on growth parameters may be because there was great variation in their nutrient contents, decomposition of organic residue, C: N ratio, nutrient release pattern, climate and soil characteristics Sanwal *et al.*, 2007) ^[9]. These treatments also enhanced the number and length of root nodules/plant as well as the fresh and dry weight of the plant.

Yield-attributes

The factors which are directly responsible for ultimate grain production viz. number of pods, length of the pod, number of seeds/pod, test weight and grain yield/plant were augmented up to a significant extent due to INM treatment T₁₁ (50% RDF + Leaf mould @ 5.0t/ ha). Accordingly, the maximum pods were 18.03/plant, pod length 7.95 cm, number of seeds 8.26/pod, 1000-seed weight 45.53 g and seed yield 8.60 g/plant. The second and third-best treatments were T₈ and T₂, respectively. The maximum yield attributes from the highest 100% NPK level with or without FYM or VC may be owing to the maximum increase in dry matter production and its effective partitioning to the economic sink. The increased supply of multi-nutrients might have increased multi-role activities in plants and soil which, in turn, resulted in a greater accumulation of carbohydrates, protein and their translocation to the reproductive organs i.e. yield-attributes. The results corroborate the findings of Singh *et al.* (2008 & 2013) ^[12, 13], Shah and Namdeo (2009) ^[10], Kumawat *et al.* (2009, 2010 and 2013) ^[4, 6, 5], Shete *et al.* (2010) ^[11], Ghulam *et al.* (2011) ^[3].

Economical gain

The ultimate aim of any black gram grower is to secure maximum income out of the applied resources and production technology. It is a general understanding that the application of various organic manures not only produces the highest and most sustainable yields but also maintains soil fertility as well as productivity and improves the quality of produce in comparison to inorganic chemical fertilizers.

Amongst the INM treatments, T₁₁ (50% RDF + Leaf mould @ 5.0t/ ha) gave the maximum net income of up to Rs.61580/ha with a 3.03 B: C ratio. This income was higher by Rs.52324/ha over the control treatment. This was followed by T₂, T₈ and T₉ treatments having the highest dose of NPK with or without FYM and vermicompost (Rs.53704, Rs.51114 and Rs.48911/ha,

respectively). The net income under different INM treatments was exactly by the increased grain yield which fetched higher market values. Similar results have been reported by Singh *et al.* (2013)^[13], Saket *et al.* (2014)^[8].

Nutritional quality of grain

Evaluation of nutritional modifications in black gram seed, in addition to quantitative parameters (grain yield and yield components), is necessary for relevance to the present investigation. Black gram is known to contain seed protein in the range of about 22 to 25 per cent.

The protein content in grain was found to increase almost significantly with the increasing levels of multi-nutrients as in T₁₁ thus the highest value being 23.94% as against 20.43% under control. This was followed by T₈ (23.32%), T₂ (22.80%) and T₉ (22.69%). The response of multi-nutrients in improving seed quality may be attributed to its significant role in regulating photosynthesis, root enlargement and better microbial activities (Marko *et al.*, 2013)^[7] and more synthesis of protein through amino acids as a result of N-metabolism (Dwivedi and Bapat, 1998)^[2]. The present findings are also in cognizance with those of Zeidan (2007)^[14].

Table 1: Influence of integrated nutrient management on yield potential of Black gram (*Vigna mungo* L.)

Treatment	Plant height (cm)	Number of branches/plant	Number of leaves/plant	Number of pods/plant	Length of pod (cm)	Test weight (g)	Grain yield/hectare (q/ha)	Straw yield/hectare (q/ha)	B: C ratio	Harvest index (%)
Control	30.60	2.35	30.66	9.87	3.70	40.40	4.88	15.66	1.43	23.76
100% RDF	35.58	5.43	44.65	17.41	7.60	44.73	12.41	32.34	3.25	28.37
FYM @ 10t/ha	31.23	3.20	32.06	11.01	4.48	42.20	7.99	20.62	1.88	27.93
Vermicompost (VC) @ 5t/ha	34.12	4.30	37.66	13.11	5.49	42.36	9.41	24.84	2.22	27.47
Leaf mould (LM) @ 10t/ha	30.60	2.69	31.43	10.83	4.27	40.76	6.30	16.48	1.48	28.93
75% RDF + FYM @ 2.5t/ha	35.31	4.74	44.06	16.28	7.30	44.13	11.99	31.83	2.65	27.36
50% RDF + FYM @ 5t/ha	34.96	4.73	43.83	16.06	7.15	43.77	9.49	28.95	2.16	24.69
75% RDF + Vermicompost (VC) @ 1.25t/ha	36.27	7.23	45.67	17.60	7.86	45.36	12.74	29.89	2.81	29.89
50% RDF + Vermicompost (VC) @ 2.5t/ha	35.48	5.06	44.53	16.32	7.38	44.30	12.24	32.11	2.76	27.60
75% RDF + Leaf mould @ 2.5t/ha	34.23	4.73	43.76	15.41	6.93	43.23	9.16	25.67	2.03	26.30
50% RDF + Leaf mould @ 5.0t/ha	37.00	7.86	46.38	18.03	7.95	45.53	14.82	30.50	3.03	32.71
S.Em±	0.236	0.063	0.178	0.238	0.103	0.278	0.308	0.321		0.476
C.D. (P=0.05)	0.681	0.183	0.516	0.687	0.297	0.804	0.892	0.928		1.376

Conclusion

A considerable increase in growth parameters, yield attributes, seed yield, protein content, and economic gain from black gram var. T-9 was observed with the combined application of 50% RDF + Leaf mould @ 5.0t/ha among the INM treatments, according to the findings. The maximum seed yield, with a protein content of 23.94%, was 14.82 q/ha. The B: C ratio was 3.03 and the net income was up to Rs. 61580/ha. The next best treatment was 75% RDF plus 75% RDF + Vermicompost (VC) @ 1.25t/ha (T₈), followed by 100% RDF solely (N20P40K20) T₂. Therefore, it is evident that the most advantageous method for achieving sustained black gram yield and preserving soil health under the agroclimatic conditions of Balaghat (M.P.) was to apply organic manures in conjunction with a small reduction in NPK (75% RDF).

References

- Anonymous. Food and Agriculture Organization (FAO) Report 2006. Italy; 2006.
- Dwivedi AK, Bapat PN. Sulphur-phosphorus interaction on the synthesis of nitrogenous fractions and oil in soybean. J Indian Soc Soil Sci. 1998;46(2):254-7.
- Ghulam A, Zafar A, Aslam A, Malik AU, Ishaque M, Husain F. Effects of organic and inorganic fertilizers on mung bean yield under arid climate. Int Res J Plant Sci. 2011;2(4):94-8.
- Kumawat N, Singh P, Kumar R, Hari O. Effect of integrated nutrient management on the performance of sole and intercropped pigeonpea under rainfed conditions. Indian J Agron. 2013;58(3):309-15.
- Kumawat BL, Choudhary A, Kumawat A, Kumawat A. Effect of vermicompost and molybdenum on yield of greengram and fertility status of soil. Ann Plant Soil Res. 2009;11(2):92-5.
- Kumpawat BS. Integrated nutrient management in blackgram (*Vigna mungo*) and its residual effect on succeeding mustard (*Brassica juncea*) crop. Indian J Agric Sci. 2010;80(1):76-9.
- Marko G, Singh K, Kushwaha HS, Singh S, Namdeo KN, Sharma RD. Effect of sulphur and biofertilizers on growth yield and quality of black gram (*Phaseolus mungo* L.). Crop Res. 2013;45(1-3):175-8.
- Saket S, Singh SB, Namdeo KN, Parihar SS. Effect of organic and inorganic fertilizers on yield, quality and nutrients uptake of lentil. Ann Plant Soil Res. 2014;16(3):238-41.
- Sanwal SK, Laxminarayana K, Yadav RK, Rai Y, Yadav DS, Bhuyan M. Effect of organic manures on soil fertility, growth, physiology, yield and quality of turmeric. Indian J Hortic. 2007;61(1):71-3.

10. Shah M, Namdeo KN. Response of chickpeas to organic manures under dryland conditions. *Ann Plant Soil Res.* 2009;11(1):62-3.
11. Shete PG, Thanki JD, Sdhav SL, Kushare YM. Response of rabi green gram to land configuration and inorganic fertilizer with and without FYM. *Crop Res.* 2010;39(1-3):43-6.
12. Singh A, Singh VK, Rana NS, Kumar S, Panwar GS, Kumar Y. Response of urd bean to farmyard manure and phosphorus application under urd bean-wheat cropping sequence. *J Food Legumes.* 2008;21(2):119-21.
13. Singh D, Singh RP. Effect of integrated nutrient management on growth, physiological parameters and productivity of lentil. *Int J Agric Sci.* 2013;10(1):175-8.
14. Zeidan MS. Effect of organic manure and phosphorus fertilizers on growth, yield and quality of lentil plants in sandy soil. *Res J Agric Biol Sci.* 2007;3(60):748-52.