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Integrated nutrient management on economics of green gram (*Vigna radiata* L.)

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Abstract
An experiment was conducted at Research Farm, Department of Agronomy, Faculty of Agriculture, AKS University, Sherganj, Satna (M.P.) during *Kharif* season of 2021-22. The experiment consisted of randomize block design three replications. In this experiment, 12 treatment combinations *viz*., RDF (NPK @ 20: 60: 20 kg/ha) – T_1, 100% nitrogen through FYM – T_2, 100% nitrogen through vermicompost –T_3, 100% nitrogen through poultry manure - T_4, 75% nitrogen through FYM + 25% nitrogen through vermicompost – T_5, 75% nitrogen through vermicompost + 25% nitrogen through poultry manure – T_6, 75% nitrogen through poultry manure + 25% nitrogen through FYM – T_7, 50% nitrogen through FYM + 50% nitrogen through poultry manure – T_8, 50% nitrogen through vermicompost + 50% nitrogen through poultry manure – T_9, 50% nitrogen through FYM + 50% nitrogen through vermicompost – T_{10}, 33% nitrogen through FYM + 33% nitrogen through vermicompost + 33% nitrogen through poultry manure – T_{11} & 25% nitrogen through FYM + 25% nitrogen through poultry manure + 50% nitrogen through vermicompost – T_{12}. Concluded that application of 100% RDF prove best treatment. Among the INM treatment, application of 100% nitrogen through poultry manure recorded the maximum and significantly higher grain yield (12.19q/ha), gross returns (₹ 100083.00/ha), net returns (₹ 79320.00/ ha) and highest B: C ratio of 3.8:1 followed by T_4 than T_3.

Keywords: Green gram, PSB, FYM, vermicompost, plant, grains/pod, grain weight, stover yield

Introduction
Green gram (*Vigna radiata* L.) is an important pulse crop believed to be originated from India. Green gram commonly known as mung, is also known as "golden gram" and it contains 20-25% protein. It is cultivated in variety of soils from red lateritic to black cotton soil. More than 70% of world's green gram production comes from India. It is also used as green manuring crop, being a leguminous crop, it has the capacity to fix atmospheric nitrogen. It also helps in preventing soil erosion. Being a short duration crop and adaptability to off season, it fits well in many intensive crop rotations. It is a good source of protein (20-24%), carbohydrates (60-62%), water (10%), fat (1.0%), fiber (4.0%) and ash (3.0%). Green gram protein is deficient in methionin and cystein but rich in lysine making it an excellent complement to rice. It is a good source of mineral, pro-vitamin A, B complex and ascorbic acid.
Integrated plant nutrient management enhances the crop productivity and improves the soil physical, chemical as well as biological properties. The physical properties *viz*., water stable aggregates, mean weight diameter, available water holding capacity and hydraulic conductivity increase with the application of crop residues along with fertilizers whereas bulk density decreases. The chemical properties namely organic carbon content and available nutrients enhance with the application of crop residues supplemented with chemical fertilizers.
The economic assessment (*viz*., cost of cultivation, GMR, NMR and benefit per rupee investment) is essential to evaluate the effect of a particular treatment for its practical utility by the farmers. The farmers are mainly interested in earning more profit from a unit area, time and investment. Thus, the economic analysis of the treatment gives valuable information to farmers.
The application of graded levels of fertilizer also influenced the economic returns of green gram during the experimental year. The application of 100% nitrogen through PM, fetched maximum gross returns and net returns. The significantly maximum B: C ratio during the experimental

year, was obtained under the same treatment. The cost involved under these treatments was comparatively lower than additional income, which led to more returns under these treatments as compared to others. It also indicated that additional dose of manures would yield no profit reported by Singh *et al*. (2013) [3].

Materials and Methods

Experiment was carried out at the Research Farm, Faculty of Agriculture, AKS University, Sherganj, Satna (M.P.) during *Kharif* season 2021-22. The experiment was conducted in randomize block design with three replications. different Fertility levels *viz*., RDF (NPK @ 20: 60: 20 kg/ha) – T_1, 100% nitrogen through FYM – T_2, 100% nitrogen through vermicompost – T_3, 100% nitrogen through poultry manure - T_4, 75% nitrogen through FYM + 25% nitrogen through vermicompost – T_5, 75% nitrogen through vermicompost + 25% nitrogen through poultry manure – T_6, 75% nitrogen through poultry manure + 25% nitrogen through FYM – T_7, 50% nitrogen through FYM + 50% nitrogen through poultry manure – T_8, 50% nitrogen through vermicompost + 50% nitrogen through poultry manure – T_9, 50% nitrogen through FYM + 50% nitrogen through vermicompost – T_{10}, 33% nitrogen through FYM + 33% nitrogen through vermicompost + 33% nitrogen through poultry manure – T_{11} & 25% nitrogen through FYM + 25% nitrogen through poultry manure + 50% nitrogen through vermicompost – T_{12}. The gross and net plot size was 5 m x 3 m, respectively. The experimental plots were fertilizers as per recommended dose.

Results and Discussion

The result shows that cost of cultivation, GMR, NMR and benefit per rupee investment was influenced significantly due to INM.

The highest cost of cultivation of green gram was recorded with the application of 75% nitrogen through vermicompost + 25% nitrogen through PM (T_6) with the respective values of ₹ 22230.00 Rs/ha and highest gross monetary return of green gram was recorded with the application of NPK @ 20: 50: 20 kg/ha (T_1) with the respective values of ₹ 101882.00 Rs/ha. While, among the integrated nutrient management treatment, application of 100% nitrogen through poultry manure observed highest gross monetary return with the respective value of ₹ 100083.00 Rs/ha which was proved significantly superior to rest of the treatments.

The significantly highest net monetary return of green gram was recorded with the application of NPK @ 20: 50: 20 kg/ha (T_1) with the respective values of ₹ 81212.00 Rs/ha. While, among the integrated nutrient management treatment, application of 100% nitrogen through poultry manure observed highest net monetary return with the respective value of ₹ 79320.00 Rs/ha which was proved significantly superior to rest of the treatments and highest B: C ratio of green gram was recorded with the application of NPK @ 20: 50: 20 kg/ha (T_1) with the respective values of 3.93:1. While, among the integrated nutrient management treatment, application of 100% nitrogen through poultry manure observed highest B: C ratio with the respective value of 3.82:1 which was proved significantly superior to rest of the treatments.

The economic evaluation of green gram production in terms of gross monetary returns, net monetary returns and B: C ratio varied due to application of nutrient levels during the experimental year. Fertilization at 100% nitrogen through PM was found the most remunerative fertility level in green gram. As net return is calculated by multiplying grain and straw yields by their sale prices and subtracting the total cost of cultivation including treatment wise cost. These variations in the NMR were owing to differences in produce (grain and straw yields) of crop. Among the integrated nutrient management, the highest B: C ratio at 100% nitrogen through PM (3.82:1) was due to comparatively lower additional cost and maximum grain and stover yield in comparison to other treatments. Highest B: C ratio was owing to reduction in cost of treatment as compared to the highest concentration of other nutrient levels. Similar results were also reported by Bhadu *et al*. (2018) [1].

Summary and Conclusion

Based upon this experiment it is concluded that application of 100% RDF prove best treatment. Among the INM treatment, application of 100% nitrogen through poultry manure recorded the maximum and significantly higher grain yield (12.19q/ha), gross returns (₹ 100083.00/ ha), net returns (₹ 79320.00/ ha) and highest B: C ratio of 3.82:1.

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