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

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Abstract

The present investigation entitled "Effect of Integrated Nutrient Management on Growth, Yield and quality of Green Gram (*Vigna radiata* L.)" was carried out at Crop Research Farm of National Post Graduate College, Barhalganj, Gorakhpur, (U.P.) during zaid season on 2021 with the objective to study the effect of Integrated Nutrient Management on growth, yield and quality of Green Gram (*Vigna radiata* L.). The soil of the experimental field was silty loam in texture with low, medium and high in N, P and K, respectively. The experimental site is situated in subtropical zone in indo gangatic plains. The experiment was laid out in Randomized Block Design with 7 treatment combinations and 3 replications. Green gram was sown on 28th March 2021 with treatment combinations viz. T1 – R D F, T2 - 50% F Y M + 50% D A P, T3 - 50% Vermicompost + 50% D A P, T4 - 50% Poultry manure + 50% D A P, T5 - 75% F Y M + 25% D A P, T6 - 75% Vermicompost + 25% D A P and T7 - 75% Poultry Manure + 25% D A P, respectively. The crop was harvested on 2nd April 2021. The result indicated that the treatment combination T7 - Poultry Manure 75% + D A P 25% was at par with T6 - Vermicompost 75% + D A P 25% and registered significantly superior in terms of plant height, number of branches per plant, dry weight, number of nodules per plant, number of grain per pod, number of pod per plant, grain yield, straw yield, gross return (Rs/ha) and net return (Rs/ha.), respectively over rest of the treatments. Integrated use of organic manures along with optimum doses of chemical fertilizers increased the growth parameters and yield of Green gram.

Keywords: Green gram, inorganic fertilizer, organic fertilizer, FYM, vermicompost, poultry manure, yield attributing parameters, yield, stover yield, protein content

Introduction

Green gram (*Vigna radiata* Wilczek) is one of the most ancient and extensively grown short duration and drought tolerant leguminous crop of India for its multi- purpose uses as vegetable, pulse, fodder and green manure crop. its seed contains 24.7% protein, 0.6% fat, 0.9% fibre and 3.7% ash (Potter and Hotchkiss 1977) [3] as well as sufficient quantity of Calcium, Phosphorus and important vitamins. The productivity of the crop is very low because of its cultivation on marginal and sub-marginal lands of low soil fertility, where little attention is paying to adequate fertilization. (Saravanan, *et al.* 2013) [6]. In summer Green gram, a high reduction in yield has been reported to occur due to non- use of fertilizer. (Singh and Sekhan, 2000) [8]. In India, it is the third important pulse crop after Chickpea and Pigeonpea. Mung bean is cultivated in the state of Rajasthan, M.P., Punjab, Haryana, U. P., Maharashtra, Karnataka and Tamil Nadu. The yield of pulse crop is low due to lack of awareness in adopting of improved technology (Kumar, 2013) [2]. The use and development of improved technology particularly integrated nutrient management will help in bridging gap between demand and supply of pulses. The basic concept of integrated nutrient management is the supply of the required plant nutrient for sustaining the desired crop productivity with minimum deleterious effect on soil health environment. Integrated nutrient management intended for four major goals to be achieved. They are to maintain soil productivity, to ensure sustainable productivity, to prevent degradation of the environment and to reduce expenditure on the cost of chemical fertilizer. (Sharma *et al.* 2004) [7]. Nutrient balance is the key component to increase crop yield. Excess and imbalanced use of nutrients has caused mining from the soil, deteriorated crop productivity and ultimately soil health. Replenishment of these nutrients through organic and combination with organic and inorganic has a direct effect on soil health and crop productivity. Because of escalating energy cost, chemical fertilizers are not available at affordable price to the farmers. Reliance on the increased use of chemical fertilizer and associated hazards put back, then attention on organic sources which are effective in

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promoting soil health and productivity of the crop with quality produce. (Bairwa *et al.* 2009) ^[1]. On the other hand, use of organic manure alone does not result in spectacular increase in crop yields, due to their low nutrient strategies. Therefore, integrated management of chemical fertilizer and organic manure may be an important strategy for sustainable production of Green gram crops. This may not only improve the efficiency of chemical fertilizers along with their minimal use in crop production, besides providing stability in crop production with higher crop yield and improving available major and minor nutrients. (Rautaray *et al.* 2003) ^[5]. Therefore, a field experiment has been conducted to study the effect of integration on inorganic fertilizer and organic manure on yield and quality of Green gram.

Material and Methods

The field experiment was carried out at the Crop Research Farm of National Post Graduate College, Barhalganj, Gorakhpur, U.P. during Zaid season 2021. The experimental site is situated in subtropical zone in Indo - gangetic plains and lies between 260471 North latitude, 820101 East longitude and 1130m above sea level. The soil of the experimental field was silty loam in texture and slightly alkaline in reaction with PH, 7.6, EC 0.20 ds-m, organic carbon 0.40% and available Nitrogen 196 kg ha⁻¹, Phosphorus 18.9 kg h and Potassium 260.50 kg ha⁻¹ at 0 -15 Cm soil depth. The experiment was laid out in Randomized Block Design, keeping 7 treatment combinations viz. viz. T1 - RDF, T2 - 50% F Y M + 50% D A P, T3 - 50% Vermicompost + 50% D A P, T4 - 50% Poultry manure + 50% D A P, T5 - 75% F Y M + 25% D A P, T6 - 75% Vermicompost + 25% D A P, T7 - 75% Poultry manure + 25% D A P, respectively with 3 replications. The sowing was done on the 27th February 2021. The crop was sown by using seed rate of 15 kg per ha. and Phosphorus, F. Y. M, Vermicompost and

Poultry manure were applied to the crops as per treatment of the experimental crops. The other agronomical cultural practices such as Nitrogen, Potash, irrigation, weeding and plant protection measures have been performed as per requisite and recommendation of the crop. The crop was harvested manually at the maturity dated on 29th April 2021 and grain and straw were recorded.

Result and Discussion Growth Parameters

As experiment was conducted to observe the influence of Integrated Nutrient Management on growth and yield of Green gram. The data pertaining to growth, yield and quality along with statistical interpretations are presented and discussed. The data (Table - 1) revealed that the integration of inorganic fertilizer and organic (F. Y. M, Vermicompost and Poultry manure) as a source of nutrients had a significant influence on plant growth characters viz. plant height, number of branches plant⁻¹, dry weight and number of nodules plant⁻¹ during the year of study. Results clearly indicates that the maximum plant height, number of branches plant⁻¹, dry weight and number of nodules plant⁻¹ (47.70, 6.33, 18.06 and 13.70 respectively) were recorded with the Treatment T 7 i. e. 75% Poultry manure + 25% D A P which was at par with Treatment T6 i.e. 75% Vermicompost + 25% D A P and significantly superior over rest of the treatment, while the lowest values were observed (plant height - 41.16 cm, number of branches plant⁻¹ - 4.96, dry weight - 15.13 g and number of nodules plant⁻¹ - 7.03, respectively) with the Treatment T1 i.e. R D F. It might be due to basal application of poultry manure supplied all essential nutrients, growth hormones and enzymes to plant, which favour rapid cell division and ultimately cell division into better growth of the plant. The results are in collaborated with research finding reported by Singh *et al.* 2017 ^[9].

Table 1: Growth attributes of Green gram as affected by different combinations of Integrated Nutrient Management

Treatment	Plant height (cm)	Number of branches per Plant	Dry weight (g)	Number of nodules per Plant
T1	41.16	4.96	15.13	7.03
T2	42.60	5.30	15.60	7.96
T3	44.05	5.40	15.93	9.60
T4	43.71	5.86	16.36	10.50
T5	45.16	5.96	17.03	11.53
T6	46.50	6.16	17.76	13.06
T7	47.70	6.33	18.06	13.70
SEm	0.84	0.10	0.14	0.29
CD at 5%	1.87	0.22	0.31	0.64

Yield Parameters

Number of grain pod⁻¹, number of pod plant⁻¹, test weight (g), grain yield (q ha⁻¹), stover yield (q ha⁻¹) and protein content (%) as influenced by different combinations of Integrated Nutrient Management have been presented in Table 2 and clearly indicates that number of grains pod⁻¹ (11.03), number of pod plant⁻¹ (24.00), test weight (32.80 g), grain yield (15.83 q ha⁻¹), stover yield (27.13 q ha⁻¹) and protein content (23.71%) respectively were recorded significantly highest with the Treatment T 7 i.e. 75% Poultry manure + 25% D A P, which was at par with Treatment T6 - i.e. 75% Vermicompost + 25% D A P, while the lowest values were observed (8.03, 12.33, 25.23 g, 10.10 q ha⁻¹, 17.50 q ha⁻¹ and 22.06%, respectively) with the Treatment T 1 i.e. R D F. When the new plant come out of the seed, they do not have

well root development and they need nutrients soon, which is obtained from chemical fertilizers instantly. Whereas, the organic manures are gradually decomposed, so that new plants do not have nutrients as needed. Greater availability of metabolites (photosynthates) and nutrients to developing reproductive structures seems to have resulted in increase in all the yield attributing characters which ultimately improved the yield of the crop. As a consequence of higher value of yield parameters grain and straw yield of green gram also increased significantly. Flocculation of soil and availability of all micro and macro nutrient making the soil and crop production sustainable one. (Rajkhowa *et al.* 2003) ^[4]. Benefits occurring from the integrated use of organic with inorganic fertilizers might be attributed to better supply of nutrients along with conducive physical environment, leading

to better root activity and higher nutrient absorption, which resulted into better plant growth and superior yield attributes

responsible for higher yield. (Thakur *et al.* 2011)^[10].

Table 2: Yield attributes and yield of Green gram as affected by different combinations of Integrated Nutrient Management

Treatment	Number of grains per pod	Number of pods per Plant	Test weight (g)	Grain yield (q ha ⁻¹)	Stover yield (q ha ⁻¹)	Protein content (%)
T1	8.03	12.33	25.23	10.10	17.50	22.06
T2	9.63	14.66	26.43	11.04	18.56	22.30
T3	10.10	15.00	27.15	12.73	20.86	22.32
T4	10.13	16.33	27.93	13.51	23.66	22.63
T5	9.70	17.66	28.10	12.43	21.20	22.93
T6	10.40	22.66	31.50	15.00	26.46	23.33
T7	11.03	24.00	32.80	15.83	27.13	23.71
SE m	0.27	1.76	0.98	0.41	0.24	0.21
CD at 5%	0.60	3.87	2.16	0.91	0.34	0.46

Economic Feasibility

To examine the economic feasibility and viability of different treatments under investigation, economics of Green gram

production in terms of gross return (Rs per ha), net return (Rs per ha) and B:C ratio were calculated for different treatment combinations and the outcome is presented in Table 3.

Table 3: Gross return, net return and benefit: cost ratio of Green gram as affected by different combinations of Integrated Nutrient Management

Treatment	Gross return (Rs ha ⁻¹)	Net return (Rs ha ⁻¹)	Benefit cost: ratio
T1	73477.50	39300.50	1:1.14
T2	80316.00	46116.00	1:1.34
T3	92632.57	56296.57	1:1.54
T4	98336.17	64456.17	1:1.90
T5	90450.07	56750.07	1:1.68
T6	109125.00	72025.00	1:1.94
T7	115185.07	81935.07	1:2.46

It is obvious from the above Table that the Treatment T 7 i.e. 75% Poultry manure + 25% D A P registered highest gross return (Rs - 115185.07), net return (Rs 81935.07) and benefit cost ratio (1:2.46) per ha., this might be due to higher yield in the treatment compared to other treatments.

Conclusion

Based on the experimental findings, it is described that 75% Poultry manure + 25% D A P has been proved significantly best treatment among the different treatment combinations of Integrated Nutrient Management to exploit the maximum yield. Hence, it is concluded that application of 75% poultry manure + 25% D A P registered the B:C ratio greater than 1:2.46 can be used as remunerative strategy and can be adopted in a eastern Uttar Pradesh.

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