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Effect Of Different Organic Manures, Inorganic Fertilizers And Growth Regulators On Growth And Yield Of Greengram (*Vigna Radiata* L.)

Parvathi Gadi[1], Joy Dawson[1] and Shankar M[2]
[1]Department of Agronomy, Allahabad School of Agriculture, SHIATS, Allahabad, Uttar Pradesh -211007.
[2]Krishi Vigyan Kendra, Kampasagar, PJTSAU, Nalgonda, Telangana -508207.

ABSTRACT
The experiment was conducted during Kharif 2014-15 at Crop Research Farm, Department of Agronomy, SHAITS, Allahabad to study the effect of organic manures (farm yard manure, vermicompost and polutry manure), inorganic fertilizers (Nitrogen, Phosphorus and Potash) and growth regulator (Gibberellic acid) on growth attributes and yield in green gram, Vigna radiata (L.). The experiment was laid out in Randomized Block Design with thirteen treatments in three replications. Among all the treatments, application of 10-40-20 NPK kg/ha + 10 kg/ha N through poultry manure + GA3 75+75 ppm was recorded maximum plant height, root length, more numbers of branches per plant, highest number of leaves per plant, maximum numbers of nodules, maximum dry weight per plant and maximum grain yield at 30, 45, 60 and 75 days after sowing. Poultry manure with organic form of nitrogen enabled a faster and better growth of crop. The application of organic manures, inorganic fertilizers and growth regulators could be ascribed to their direct influence on dry matter production at successive stages by virtue of increased photosynthetic efficiency.
Keywords: *Green gram, Inorganic fertilizers, Farm yard manure, Vermicompost, Poultry manure, Gibberellic acid and yield.*
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INTRODUCTION

Green gram [*Vigna radiata* (L.)] is an important pulse crop and an excellent source of high quality protein. It consists of about 25% protein which is almost 2.5 - 3.0 times more than the cereals. Green gram also known as mung bean is consumed as whole grain and as well as dal. Sprouted green gram whole seed is used in South India for preparing curry or a savory dish. India is the largest producer and consumer of pulses in the world. India primarily produces Bengal gram (chickpea), red gram (tur), lentil (masur), green gram (mung bean) and black gram (urad). Pulses are the major source of protein for vegetarians and the crop residues are a major source of high quality livestock feed.

Per capita consumption of pulses in India has decreased from 60g in 1960-61 to 40g in 1997-98 as against 80g recommended by World Health Organization (WHO) and Food and Agricultural Organization (FAO). Mung bean is cultivated in an area of 3.38 M ha, with a production of 1.61 m tonnes, average productivity is 474 kg/ha (1) in India. Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh and Karnataka are the major pulses producing states in India. In Uttar Pradesh cultivation of green gram is 0.78 M ha with a production of 0.39 m tonnes and average productivity is 500 kg/ha (1). Average yields of pulses are very low in India compared to other countries due to poor spread of improved varieties and technologies, abrupt climatic changes, substandard methods of cultivation, poor crop stand, imbalanced nutrition and vulnerability to pests and diseases.

The integrated plant nutrient system helps in improving and maintenance of soil fertility for sustaining crop productivity. Cultivation of pulses benefit the succeeding crop to the extent of 40 kg N/ha (2). Organic manures contain both macro and micronutrients whose application into soil, results in improved soil condition by significantly increasing the level of N fixation.

Use of organic manures alone, as a substitute to chemical fertilizers is not profitable and will not be enough to maintain the present levels of crop productivity of high yielding varieties. Use of organic manures along with inorganic fertilizers leads to increase in productivity and also sustain the soil health for a longer period (3). Organic manures although not useful as sole sources of nutrients, however, act as good complementary nutrient sources with inorganic fertilizers (4), which have carry-over effect on succeeding crops. About less than 30% of N and small fraction of P and K in organic manures may become available to immediate crop and rest to subsequent crops (5). Use of organic manures alone or in combination with chemical fertilizers will help to improve physico-chemical properties of the soil, efficient utilization of applied fertilizers for improving seed quality and quantity. Organic manures provide a good substrate for the growth of microorganisms and maintain a favourable nutritional balance and soil physical properties. It is recognized that combined source of organic matter and chemical fertilizers play a key role in increasing the productivity of soil. Mung bean yield and quality can be improved by the balanced use of fertilizers and also by managing the organic manures properly.

Farmyard manure is known to play an important role in improving the fertility and productivity of soil through its positive effects on physical, chemical and biological properties and balanced plant nutrition (6). Fertilizers play vital role in maintaining/improving soil fertility as the source of readily available nutrients to plants. The increasing cost of chemical fertilizers, growing environmental concern and energy crisis have created considerable interest for search of alternative cheap sources of plant nutrients.

The use of vermicompost as a source of organic manure increases crop growth, yield and soil nutrient status (7) and nutrient uptake (8). Vermicompost is not only rich in plant nutrients but also improves the physical, chemical properties of the soil and enhances the microbial activity in soil. Vermicompost is rich in microbial populations and diversity, particularly fungi, bacteria and actinomycetes (9; 10). Generally, after vermicomposting the organic material is ground up to a more uniform size which gives the final substrate a characteristic earthy and more heterogeneous appearance (11; 12) and increases the dry weight (13).

Plant growth regulators are known to play a positive role in enhancing yield potential in plants. Foliar application of plant growth regulators influences the plant architecture and yield potential. The application of Naphthalene Acetic Acid (NAA) at 50 ppm significantly increased the grain yield in green gram (14). However, information on integration of organic manures, inorganic fertilizers and growth regulators is lacking. Hence, the present study was carried out to optimize the use of available resources of organic manures, growth regulators and inorganic fertilizers and their integrated approach to boost the green gram yields.

MATERIALS AND METHODS

The experiment was conducted during *Kharif,* 2014-15, at the Crop Research Farm, Department of Agronomy, Allahabad School of Agriculture, Sam Higginbottom Institute of Agriculture Technology and Sciences, Allahabad, Uttar Pradesh, India. The Crop Research Farm is situated at 25° 57′ N latitude, 87° 19′ E longitude and at an altitude of 98 m from the sea level. The soil was sandy loam in texture, low in organic carbon (0.28%) and medium in available nitrogen (225 kg ha^{-1}), phosphorus (21.5 kg ha^{-1}), low in potassium (87 kg ha^{-1}), and pH of 7.4. The experiment was laid out in randomized block design with thirteen treatments in three replications. The treatments comprised of T1: 20-40-20 NPK/kg/ha (Recommended Dose of Fertilizer), T2: 10-40-20 NPK/kg/ha + 10 kg N through FYM, T3: 10-40-20 NPK/kg/ha + 10 kg N through FYM + GA3 25+25 ppm (25 ppm at two leaf stage and 25 ppm at 20 days after first spraying), T4: 10-40-20 NPK/kg/ha + 10 kg N through FYM + GA3 50+50 ppm, T5: 10-40-20 NPK/kg/ha + 10 kg N through FYM + GA3 75+75 ppm, T6: 10-40-20 NPK/kg/ha + 10 kg N through vermicompost, T7: 10-40-20 NPK/kg/ha + 10 kg N through vermicompost + GA3 25+25 ppm, T8: 10-40-20 NPK/kg/ha + 10 kg N through vermicompost + GA3 50+50 ppm, T9: 10-40-20 NPK/kg/ha + 10 kg N through vermicompost + GA3 75+75 ppm, T10: 10-40-20 NPK/kg/ha + 10 kg N through poultry manure, T11: 10-40-20 NPK/kg/ha + 10 kg N through poultry manure + GA3 25+25 ppm, T12: 10-40-20 NPK/kg/ha + 10 kg N through poultry manure + GA3 50+50 ppm and T13: 10-40-20 NPK/kg/ha + 10 kg N through poultry manure + GA3 75+75 ppm was replicated thrice in each treatment. Recommended dose of fertilizer (RDF) for green gram is 20-40-20 kg/ha of nitrogen, phosphorus and potash. Nitrogen and potash were applied in all the plots as per the recommended dosages of SHAITS, Allahabad for green gram. Farm yard manure, vermicompost, poultry manure and phosphorus were applied as basal dose.. The growth regulator, gibberellic acid was sprayed two times, at two leaf stage and at an interval of 20 days after first spraying. The green gram variety, *Vigna radiata* (L.) Var. *Samrat*8 was selected for sowing with a maturity period of around 70-75 days. Seeds were soaked in normal water for half an hour before sowing and were sown manually in a line on 23rd July, 2014 at a depth of 3-4 cm. The size of the plot was 3×3 m with a spacing of 15 cm in between the plants and 45 cm in between the rows. All the recommended agronomic and plant protection practices were followed in the experimental plots. Data were recorded on five randomly selected plants from each plot which were tagged for observations on plant height (cm), root length (cm), number of leaves per plant, number of branches per plant, number of root nodules per plant, dry weight per plant at 15, 30, 45, 60 and 75 days after sowing and grain yield.

Data were analyzed using GenStat14 software. Significant difference between treatments mean were tested through 'F' test, against the critical difference at 5% level of significance.

RESULTS AND DISCUSSION

Plant height: The data on plant height of greengram at 30, 45, 60 and 75 days after sowing was influenced by different treatments. There were no significant differences between the treatments and plant height at 30 DAS. Numerically maximum plant height was recorded on T13 (19.3 cm) as compared to all other treatments. The lowest plant height was observed on T1 (18.3 cm) at 30 DAS. There were significant differences between treatments and plant height at 45, 60 and 75 DAS. At 45 DAS, significantly highest plant height was recorded on T9 (10-40-20 NPK/kg/ha + 10 kg N through vermicompost + GA3 75+75 ppm) (38.1 cm) followed by T13 (37.9 cm) and T5 (37.4 cm) which were on par each other at 45 DAS as compared to all the treatments. The minimum plant height was observed on T3 (29.8 cm) and T1 (30.2 cm).

Significantly higher plant height (67.9 cm) was observed on T13 application of (10-40-20 NPK kg/ha + 10 kg N through poultry manure + GA3 75+75 ppm) as compared to the all other treatments. But treatment T12 (67.7 cm) and T11 (63.9 cm) which was on par each other. The lowest plant height was recorded on T1 and T2 (55.1 cm), respectively, at 60 DAS. At 75 DAS, significantly higher plant height was recorded on T13 (72.5 cm) as compared to the all other treatments. However, treatments T9 and T10 (69.5 cm), respectively which were on par other. The minimum plant height was obtained T2 (60.5 cm) (Table 1). Among all the organic sources of nitrogen, poultry manure was found to be most effective for increasing the plant height followed by vermicompost and farm yard manure. Significant increase in plant height by application of vermicompost (15). In the present study, application of 10+40+20 NPK kg/ha + 10 kg N through poultry manure+GA3 75+75 ppm was recorded maximum plant height all the crop growth periods of greengram. However, the plant height increased with increasing levels of growth regulator GA3 concentration. The increasing in plant height on T13 and T9 might be due to foliar application growth regulator and it promotes the apical dominance elongation of cells and increases of cell division. Increase in plant growth with the basal application of RDF as a basal dose and 10 kg of N through organic sources and foliar application of GA3 promotes apical dominance, cell elongation and shoots development. Application of NAA and kinetin @ 10, 20 and 30 ppm increased the plant height, number of branches per plant and yield in chickpea (23).

Root length: There were significant differences between the treatments and root length at 30, 45, 60 and 75 DAS. Significantly maximum root length was observed from application of T13 (10-40-20 NPK/kg/ha + 10 kg N through poultry manure + GA3 75+75 ppm) (14.2 cm), followed by T8 (14.1 cm) and T9 (14.0 cm) as compared to the all other treatments. The minimum root length was noticed on T10 (12.7 cm) at 30 DAS. At 45 DAS, significantly maximum root length was observed on T13 (10-40-20 NPK/kg/ha + 10 kg N through poultry manure + GA3 75+75 ppm) and T8 10-40-20 NPK/kg/ha + 10 kg N through vermicompost + GA3 50+50 ppm (14.7 cm), but it was on par with T9 (14.6 cm). However, lowest root length was recorded on T10 (12.7cm).

At 60 DAS, T13 (10-40-20 NPK/kg/ha + 10 kg N through poultry manure + GA3 75+75 ppm) and T9 (10-40-20 NPK/kg/ha + 10 kg N through vermicompost + GA3 75+75 ppm) (15.6 cm, respectively) were observed significantly maximum root length, but it was statistically similar with T8 (15.5 cm). The minimum root length was obtained on T10 (13.7 cm). Significantly highest root length was noticed on T13 (15.8 cm) as compared to all other treatments, followed by T8 and T9 (15.6 cm) which was on par with each other. The lowest root length was noticed on T10 (14.0 cm) at 75 DAS (Table 2). The results showed that the combination of organic, inorganic fertilizers and growth regulators significantly increased the root length than the individual application of organic and inorganic fertilizers. The treatment T13 followed by T9 and T8 was recorded maximum root length at 30, 45, 60 and 75 DAS.

Number of branches per plant: At 30 DAS, significantly highest number of branches per plant were produced on T13 (10-40-20 NPK/kg/ha + 10 kg N through poultry manure + GA3 75+75 ppm) (3.7) over the rest of the treatments, but it was on par with T9, T10, T12 (3.5) and T5 (3.4). The lowest number of branches was observed on T1 (20-40-20 NPK kg/ha) (2.2). There were no significant differences between among treatments and number of branches at 45, 60 and 75 DAS (Table 3). Foliar application with NAA @ 40 ppm in green gram increased number of branches per plant (16). The results showed that combination of organic manures (poultry manure), inorganic fertilizers and growth regulators significantly increased number of branches per plant. The organic manures (poultry manure) help to increase the organic matter content in soil. Growth regulator (GA3) promotes the elongation and apical dominance (17).

Number of leaves per plant: The results revealed that, there were significant differences between the treatments and number of leaves at 30, 45, 60 and 75. At 30 DAS, significantly more number of leaves per plant (39.3) was noticed on T13 and T9, followed by T10 (37.7), T12 (36.1) as compared to all the other treatments. However, lower number of leaves per plant was recorded on T1 (28.9). Significantly highest number of leaves were recorded on T13 (10-40-20 NPK/kg/ha + 10kg N through poultry manure + GA3 75+75 ppm) (42.9), followed by T9 (42.8) and T8 (41.7) over the rest of treatments. The minimum number of leaves per plant (33.3) was observed on T1 (20-40-20 NPK kg/ha) at 45 DAS. At 60 DAS, the highest numbers of leaves were recorded on T13 (10-40-20 NPK kg/ha + 10 kg N through polutry manure + GA3 75+75 ppm) (54.5), followed T9 (54.1) as compared to all the other treatments. The lowest numbers were recorded on T1 (20-40-20 NPK kg/ha) (49.5). The highest numbers of leaves were observed at 75 DAS on T13 (10-40-20 NPK/kg/ha + 10 kg N through poultry manure + GA3 75+75 ppm) and T9 (10-40-20 NPK/kg/ha + 10 kg N through vermicompost+GA3 75+75 ppm) (59.9, respectively) as compared to all the other treatments. The minimum numbers of leaves (53.7) were recorded on T1 (20-40-20 NPK kg/ha) (Table 4). Application of organic manures, inorganic fertilizers and growth regulator GA3 enhanced the nutrient uptake. The combination of organic and inorganic fertilizers significantly increased the number of leaves per plant at 30 DAS and harvest stage (18). Organic fertilizers will help to improve the soil condition and inorganic fertilizers assure quick availability of essential nutrients and growth regulator increases cell elongation.

Number of nodules per plant: There were statistical significant differences between the treatments and number of nodules at 30 DAS. Significantly more number of nodules (37.9) were produced on T13 (10-40-20 NPK/kg/ha + 10 kg N through poultry manure + GA3 75+75 ppm), followed by T9 (35.4) as compared to all other treatments. However, lower number of nodules was recorded on T1 (20-40-20 NPK kg/ha) (23.7) at 30 DAS. Significantly maximum numbers of nodules per plant were observed on T13 (10-40-20 NPK/kg/ha + 10kg N through poultry manure + GA3 75+75 ppm) (39.1) followed by T9 (36.2) as compared to the all other treatments at 45 DAS. The number of nodules per plant was minimum on T1 (27.1). At 60 DAS, T13 (10-40-20 NPK/kg/ha + 10 kg N through poultry manure + GA3 75+75 ppm) recorded significantly higher numbers of nodules per plant (41.7) over rest of the treatments. However, it was on par with T9 (38.6) and T10 (38.4), respectively (Table 5). Lowest number of nodules per plant was noticed on T1 (32.0). Application of poultry manure, vermicompost, inorganic fertilizers and growth regulators increased the number of nodules due to direct addition and slow release of nutrients from organic manures and application of growth regulator GA3 increased the vegetative growth. There was no significant difference between the treatments and number of nodules per plant at 75 DAS.

Dry weight: The statistical analysis of the data for plant dry weight was found to be significant throughout the crop growth period at 30, 45, 60 and 75 DAS. Significantly highest average of plant dry weight was recorded on T13 (10-40-20 NPK kg/ha +10 kg N through poultry manure + GA3 75+75 ppm) (2.78, 6.31, 9.18 and 9.85 mg per plant, respectively) over the rest of the treatments at 30, 45, 60 and 75 DAS (Table 6). The lower dry weight was accumulation in leaves on T1 (20-40-20 NPK kg/ha) (2.29, 5.85, 8.16 and 8.22, respectively) all the crop growth periods. Das *et al*. (1990) observed significant increase in dry weight with increasing levels of phosphorus in green gram. Significantly increased total dry matter production was observed with foliar application of NAA @ 40 ppm (19). From the present study, application rate of NPK (10-40-20 NPK kg/ha + 10 kg N through poultry manure + GA3 75+75 ppm might be recommended for increasing green gram dry weight. This study found that the effect of NPK, poultry manure and GA3 on various growth parameters account for enrichment of soil with these nutrients on plant parts that resulted in better availability of nutrient for growth and development of plant right from early stage, as nutrients are mostly translocated from vegetative to reproductive parts of the plants.

Grain yield: The statistical analysis of data showed that there were significant differences between treatments. The significantly highest grain yield was recorded on T13 (10-40-20 NPK kg/ha + 10 kg N through poultry manure + GA3 75+75 ppm) (1704 kg/ha) as compared to the other treatments (Table 7). The minimum grain yield (1194.0 kg/ha) was recorded on T1 (20-40-20 NPK kg/ha). The grain yield increased with the application of growth regulator which can be attributed to the beneficial effect of the combination of organic manures and inorganic fertilizers at proper stage and time which resulted in higher yields (20). Significant increase in grain yield due to use of organic manures, inorganic fertilizers and growth regulator (GA3) could be ascribed to their direct influence on dry matter production at successive stages by virtue of increased photosynthetic efficiency. While indirect influence seems to be due to the increase in plant height and crop growth rate (CGR). The profound influence of nutrient application on biological yield seems to be an account of its influence on vegetative (straw) and reproductive growth (grain). The application of 120 kg N/ha and 100 kg P_2O_5/ha significantly increased plant growth attributes (21). Grain yield and straw yield mean increase was with application of 120 kg N/ha. Phosphorus application increased the grain yield of green gram (22). Nitrogen being ann essential plant nutrient has a direct effect on the final green gram yield. Nitrogen and phosphorus are very essential for good vegetative growth and grain development in green gram production. Adequate nitrogen from organic sources coupled with phosphorus leads to a better crop growth and yield in green gram (24).

All the growth parameters and yield components due to combined use of inorganic fertilizers, organic manure and growth regulators increased the grain yield. The combined use of organic manures, inorganic fertilizers and growth regulator (GA3) might have enhanced the nutrients uptake. Significant increase in the yield of green gram was due to application of organic manures and growth regulator (GA3) and the application of vermicompost and FYM.

The present study clearly indicated that, the application of 10-40-20 kg/ha NPK + 10 kg/ha N through poultry manure + GA3 75+75 ppm resulted in increased growth attributes i.e., plant height, root length, number of branches, number of leaves, number of nodules and dry weight and grain yield in green gram due to basal application organic manures, inorganic fertilizers and foliar application of growth regulator GA3.

Table 1. Effect of organic manures, inorganic fertilizers and growth regulators on plant height (cm) in green gram

Treatments	Plant height (cm)			
	30 DAS	45 days	60 days	75 days
T1-20-40-20 NPK kg/ha (RDF)	19.0	30.2^{a}	55.1^{a}	62.3^{ab}
T2-10-40-20 NPK kg/ha+10 kg N through FYM	18.7	31.3^{ab}	55.1^{a}	60.5^{a}
T3-10-40-20 NPK kg/ha+10 kg N through FYM+GA3 25 ppm+25 ppm	19.3	29.8^{a}	59.4^{ab}	66.2^{abc}
T4-10-40-20 NPK kg/ha+10 kg N through FYM+GA3 50 ppm+50 ppm	18.6	36.7^{de}	61.3^{abc}	63.3^{ab}
T5-10-40-20 NPK kg/ha+10 kg N through FYM+GA3 75 ppm+75 ppm	18.8	37.4^{e}	61.6^{abc}	64.9^{abc}
T6-10-40-20 NPK kg/ha+10 kg N through Vermicompost	18.3	32.7^{abcd}	62.7^{abc}	67.2^{abc}
T7-10-40-20 NPK kg/ha+10 kg N through Vermicompost+GA3 25 ppm+25 ppm	19.1	32.9^{abcd}	62.9^{abc}	67.1^{abc}
T8-10-40-20 NPK kg/ha+10 kg N through Vermicompost+GA3 50ppm+50 ppm	18.9	35.7^{cde}	62.9^{abc}	65.1^{abc}
T9-10-40-20 NPK kg/ha+10 kg N through Vermicompost+GA3 75 ppm+75 ppm	18.4	38.1^{e}	63.1^{abc}	69.5^{bc}
T10-10-40-20 NPK kg/ha+10 kg N through poultry manure	18.8	32.2^{abc}	63.1^{abc}	69.5^{bc}
T11-10-40-20 NPK kg/ha+10 kg N through poultry manure+GA3 25 ppm+25 ppm	18.9	34.7^{bcde}	63.9^{bc}	67.5^{abc}
T12-10-40-20 NPK kg/ha+10 kg N through poultry manure+GA3 50 ppm+50 ppm	18.5	36.0^{cde}	67.7^{bc}	69.1^{abc}
T13-10-40-20 NPK kg/ha+10 kg N through poultry manure+GA3 75 ppm+75 ppm	19.0	37.9^{e}	67.9^{c}	72.5^{c}
Fpr	0.7	<0.001	<0.001	0.002
Vr (12, 24)	7.7	0.4	3.8	22.4
SEm±	0.3	0.8	1.6	1.7
LSD (P 0.05)	NS	2.4	4.8	4.9
CV (%)	3.1	4.2	4.5	4.4

NS=Non significant; Figures followed by the same letter within column are not significantly different at P≤ 0.05

Table 2. Effect of organic manures, inorganic fertilizers and growth regulators on root length (cm) in green gram

Treatments	Root length (cm)			
	30 days	45 days	60 days	75 days
T1-20-40-20 NPK kg/ha (RDF)	12.4^{abc}	13.2^{ab}	14.4^{ab}	15.0^{ab}
T2-10-40-20 NPK kg/ha+10 kg N through FYM	13.8^{abc}	14.4^{ab}	15.4^{ab}	15.5^{ab}
T3-10-40-20 NPK kg/ha+10 kg N through FYM+GA3 25 ppm+25 ppm	12.6^{abc}	13.3^{ab}	14.3^{ab}	14.5^{ab}
T4-10-40-20 NPK kg/ha+10 kg N through FYM+GA3 50 ppm+50 ppm	12.8^{abc}	13.7^{ab}	14.6^{ab}	15.0^{ab}
T5-10-40-20 NPK kg/ha+10 kg N through FYM+GA3 75 ppm+75 ppm	13.3^{abc}	14.0^{ab}	14.8^{ab}	15.0^{ab}
T6-10-40-20 NPK kg/ha+10 kg N through Vermicompost	12.7^{abc}	13.4^{ab}	14.3^{ab}	14.8^{ab}
T7-10-40-20 NPK kg/ha+10 kg N through Vermicompost+GA3 25 ppm+25 ppm	12.2^{ab}	13.1^{ab}	13.9^{ab}	14.3^{ab}
T8-10-40-20 NPK kg/ha+10 kg N through Vermicompost+GA3 50ppm+50 ppm	14.2^{c}	14.7^{b}	15.5^{b}	15.6^{ab}

T9-10-40-20 NPK kg/ha+10 kg N through Vermicompost+GA3 75 ppm+75 ppm	14.0[bc]	14.6[b]	15.6[b]	15.6[ab]
T10-10-40-20 NPK kg/ha+10 kg N through poultry manure	11.9[a]	12.7[a]	13.7[a]	14.0[a]
T11-10-40-20 NPK kg/ha+10 kg N through poultry manure+GA3 25 ppm+25 ppm	12.3[abc]	12.9[ab]	13.9[ab]	14.2[ab]
T12-10-40-20 NPK kg/ha+10 kg N through poultry manure+GA3 50 ppm+50 ppm	12.6[abc]	13.6[ab]	14.5[ab]	14.7[ab]
T13-10-40-20 NPK kg/ha+10 kg N through poultry manure+GA3 75 ppm+75 ppm	14.1[bc]	14.7[b]	15.6[b]	15.8[b]
Fpr	0.001	0.004	0.002	0.01
Vr (12, 24)	6.7	6.1	4.6	4.5
SEm±	0.4	0.4	0.4	0.4
LSD (P 0.05)	1.1	1.1	1.0	1.0
CV (%)	5.1	4.7	4.1	4.0

NS=Non significant; Figures followed by the same letter within column are not significantly different at P≤ 0.05

Table 3. Effect of organic manures, inorganic fertilizers and growth regulators on number of branches per plant in greengram

Treatments	Number of branches per plant			
	30 days	45 days	60 days	75 days
T1-20-40-20 NPK kg/ha (RDF)	2.2[a]	4.9	10.2	8.7
T2-10-40-20 NPK kg/ha+10 kg N through FYM	2.7[ab]	5.0	6.6	8.7
T3-10-40-20 NPK kg/ha+10 kg N through FYM+GA3 25 ppm+25 ppm	2.7[ab]	8.3	7.1	9.6
T4-10-40-20 NPK kg/ha+10 kg N through FYM+GA3 50 ppm+50 ppm	2.7[ab]	7.6	9.5	10.8
T5-10-40-20 NPK kg/ha+10 kg N through FYM+GA3 75 ppm+75 ppm	3.4[b]	5.5	9.6	10.0
T6-10-40-20 NPK kg/ha+10 kg N through Vermicompost	2.7[ab]	5.1	7.6	10.5
T7-10-40-20 NPK kg/ha+10 kg N through Vermicompost+GA3 25 ppm+25 ppm	3.0[ab]	5.4	8.2	10.2
T8-10-40-20 NPK kg/ha+10 kg N through Vermicompost+GA3 50ppm+50 ppm	2.9[ab]	5.2	9.1	9.1
T9-10-40-20 NPK kg/ha+10 kg N through Vermicompost+GA3 75 ppm+75 ppm	3.5[b]	8.8	11.7	10.6
T10-10-40-20 NPK kg/ha+10 kg N through poultry manure	3.5[b]	5.5	7.1	9.9
T11-10-40-20 NPK kg/ha+10 kg N through poultry manure+GA3 25 ppm+25 ppm	3.2[ab]	5.3	7.7	10.7
T12-10-40-20 NPK kg/ha+10 kg N through poultry manure+GA3 50 ppm+50 ppm	3.5[b]	5.7	9.2	10.1
T13-10-40-20 NPK kg/ha+10 kg N through poultry manure+GA3 75 ppm+75 ppm	3.7[b]	5.8	11.6	9.1
Fpr	<0.001	0.6	0.06	0.9
Vr (12, 24)	1.03	3.3	0.8	1.1
SEm±	0.2	1.4	1.2	1.1
LSD (P 0.05)	0.6	NS	NS	NS
CV (%)	11.2	41.1	22.5	19.5

NS=Non significant; Figures followed by the same letter within column are not significantly different at P≤ 0.05

Table 4. Effect of organic manures, inorganic fertilizers and growth regulators on number of leaves per plant in greengram

Treatments	Number of leaves per plant			
	30 days	45 days	60 days	75 days
T1-20-40-20 NPK kg/ha (RDF)	28.9[a]	33.3[a]	49.5[a]	53.7[a]
T2-10-40-20 NPK kg/ha+10 kg N through FYM	29.2[a]	34.3[abc]	51.9[ab]	56.9[ab]
T3-10-40-20 NPK kg/ha+10 kg N through FYM+GA3 25 ppm+25 ppm	29.2[a]	34.4[abc]	49.8[ab]	57.1[ab]
T4-10-40-20 NPK kg/ha+10 kg N through FYM+GA3 50 ppm+50 ppm	29.8[ab]	33.7[ab]	52.1[ab]	57.8[ab]
T5-10-40-20 NPK kg/ha+10 kg N through FYM+GA3 75 ppm+75 ppm	31.1[abc]	34.4[abc]	53.6[ab]	57.6[ab]
T6-10-40-20 NPK kg/ha+10 kg N through Vermicompost	32.8[abcd]	35.7[abc]	54.1[ab]	58.6[ab]
T7-10-40-20 NPK kg/ha+10 kg N through Vermicompost+GA3 25 ppm+25 ppm	33.5[bcd]	36.7[abcd]	53.6[ab]	58.5[ab]

T8-10-40-20 NPK kg/ha+10 kg N through Vermicompost+GA3 50ppm+50 ppm	35.6^{def}	41.7^{ef}	52.5^{ab}	57.1^{ab}
T9-10-40-20 NPK kg/ha+10 kg N through Vermicompost+GA3 75 ppm+75 ppm	39.3^{f}	42.8^{ef}	54.1^{ab}	59.9^{b}
T10-10-40-20 NPK kg/ha+10 kg N through poultry manure	37.7^{ef}	38.2^{bcde}	52.7^{ab}	57.8^{ab}
T11-10-40-20 NPK kg/ha+10 kg N through poultry manure+GA3 25 ppm+25 ppm	33.9^{cde}	40.8^{def}	51.6^{ab}	57.7^{ab}
T12-10-40-20 NPK kg/ha+10 kg N through poultry manure+GA3 50 ppm+50 ppm	36.1^{def}	38.5^{cdef}	53.1^{ab}	57.7^{ab}
T13-10-40-20 NPK kg/ha+10 kg N through poultry manure+GA3 75 ppm+75 ppm	39.3^{f}	42.9^{f}	54.5^{b}	59.9^{b}
Fpr	<0.001	<0.001	0.01	0.1
Vr (12, 24)	1.6	4.4	10.1	10.4
SEm±	0.8	0.9	0.9	1.1
LSD (P 0.05)	2.3	2.6	2.7	3.3
CV (%)	4.0	4.2	3.1	3.4

NS=Non significant; Figures followed by the same letter within column are not significantly different at P≤ 0.05

Table 5. Effect of organic manures, inorganic fertilizers and growth regulators on number of nodules per plant in greengram

Treatments	Number of nodules per plant			
	30 days	45 days	60 days	75 days
T1-20-40-20 NPK kg/ha (RDF)	23.7^{a}	27.1^{a}	32.0^{a}	36.8
T2-10-40-20 NPK kg/ha+10 kg N through FYM	27.0^{ab}	28.5^{ab}	32.9^{ab}	40.4
T3-10-40-20 NPK kg/ha+10 kg N through FYM+GA3 25 ppm+25 ppm	26.0^{ab}	27.8^{a}	34.3^{ab}	38.7
T4-10-40-20 NPK kg/ha+10 kg N through FYM+GA3 50 ppm+50 ppm	28.3^{abc}	31.3^{abc}	34.7^{ab}	39.1
T5-10-40-20 NPK kg/ha+10 kg N through FYM+GA3 75 ppm+75 ppm	26.3^{ab}	27.9^{a}	35.7^{abc}	42.3
T6-10-40-20 NPK kg/ha+10 kg N through Vermicompost	27.5^{ab}	31.4^{abc}	36.0^{abc}	39.9
T7-10-40-20 NPK kg/ha+10 kg N through Vermicompost+GA3 25 ppm+25 ppm	31.4^{bcd}	33.1^{abcd}	37.4^{abc}	44.0
T8-10-40-20 NPK kg/ha+10 kg N through Vermicompost+GA3 50ppm+50 ppm	29.3^{abc}	31.3^{abc}	36.3^{abc}	41.4
T9-10-40-20 NPK kg/ha+10 kg N through Vermicompost+GA3 75 ppm+75 ppm	35.4^{cd}	36.2^{cd}	38.6^{bc}	45.0
T10-10-40-20 NPK kg/ha+10 kg N through poultry manure	33.0^{bcd}	35.3^{bcd}	38.4^{bc}	44.5
T11-10-40-20 NPK kg/ha+10 kg N through poultry manure+GA3 25 ppm+25 ppm	31.3^{bcd}	31.7^{abc}	35.6^{ab}	40.7
T12-10-40-20 NPK kg/ha+10 kg N through poultry manure+GA3 50 ppm+50 ppm	32.1^{bcd}	33.2^{abcd}	37.3^{abc}	45.9
T13-10-40-20 NPK kg/ha+10 kg N through poultry manure+GA3 75 ppm+75 ppm	37.9^{d}	39.1^{d}	41.7^{c}	67.9
Fpr	<0.001	<0.001	<0.001	0.5
Vr (12, 24)	16.2	7.8	8.8	1.4
SEm±	1.4	1.4	1.2	7.9
LSD (P 0.05)	4.1	4.0	3.4	NS
CV (%)	8.1	7.5	5.5	31.4

NS=Non significant; Figures followed by the same letter within column are not significantly different at P≤ 0.05

Table 6. Effect of organic manures, inorganic fertilizers and growth regulators on dry weight (mg) in greengram

Treatments	Dry weight per plant (mg)			
	30 DAS	45 DAS	60 DAS	75 DAS
T1-20-40-20 NPK kg/ha (RDF)	2.29	5.85	8.16	8.22
T2-10-40-20 NPK kg/ha+10 kg N through FYM	2.61	6.17	8.87	9.34
T3-10-40-20 NPK kg/ha+10 kg N through FYM+GA3 25 ppm+25 ppm	2.39	5.95	8.60	9.05
T4-10-40-20 NPK kg/ha+10 kg N through FYM+GA3 50 ppm+50 ppm	2.52	6.10	8.75	9.21
T5-10-40-20 NPK kg/ha+10 kg N through FYM+GA3 75 ppm+75 ppm	2.48	6.05	8.69	9.13

T6-10-40-20 NPK kg/ha+10 kg N through Vermicompost	2.59	6.15	8.86	9.36
T7-10-40-20 NPK kg/ha+10 kg N through Vermicompost+GA3 25 ppm+25 ppm	2.62	6.18	8.90	9.42
T8-10-40-20 NPK kg/ha+10 kg N through Vermicompost+GA3 50ppm+50 ppm	2.68	6.25	8.95	9.44
T9-10-40-20 NPK kg/ha+10 kg N through Vermicompost+GA3 75 ppm+75 ppm	2.70	6.27	9.01	9.62
T10-10-40-20 NPK kg/ha+10 kg N through poultry manure	2.68	6.23	8.95	9.44
T11-10-40-20 NPK kg/ha+10 kg N through poultry manure+GA3 25 ppm+25 ppm	2.64	6.20	8.88	9.41
T12-10-40-20 NPK kg/ha+10 kg N through poultry manure+GA3 50 ppm+50 ppm	2.57	6.14	8.90	9.42
T13-10-40-20 NPK kg/ha+10 kg N through poultry manure+GA3 75 ppm+75 ppm	2.78	6.31	9.18	9.85
Fpr	<0.001	<0.001	0.002	0.02
SEm±	0.11	0.13	0.16	0.19
LSD (P 0.05)	0.66	0.077	0.153	0.117
CV (%)	9.3	9.6	11.5	13.2

Figures followed by the same letter within column are not significantly different at P≤ 0.05

Table 7. Effect of organic manures, inorganic fertilizers and growth regulators on grain yield in greengram

Treatments	Grain yield (kg/ha)
T1-20-40-20 NPK kg/ha (RDF)	1194.0^{a}
T2-10-40-20 NPK kg/ha+10 kg N through FYM	1222.0^{a}
T3-10-40-20 NPK kg/ha+10 kg N through FYM+GA3 25 ppm+25 ppm	1296.0^{a}
T4-10-40-20 NPK kg/ha+10 kg N through FYM+GA3 50 ppm+50 ppm	1296.0^{a}
T5-10-40-20 NPK kg/ha+10 kg N through FYM+GA3 75 ppm+75 ppm	1270.0^{a}
T6-10-40-20 NPK kg/ha+10 kg N through Vermicompost	1304.0^{a}
T7-10-40-20 NPK kg/ha+10 kg N through Vermicompost+GA3 25 ppm+25 ppm	1259.0^{a}
T8-10-40-20 NPK kg/ha+10 kg N through Vermicompost+GA3 50ppm+50 ppm	1296.0^{a}
T9-10-40-20 NPK kg/ha+10 kg N through Vermicompost+GA3 75 ppm+75 ppm	1430.0^{a}
T10-10-40-20 NPK kg/ha+10 kg N through poultry manure	1407.0^{a}
T11-10-40-20 NPK kg/ha+10 kg N through poultry manure+GA3 25 ppm+25 ppm	1370.0^{a}
T12-10-40-20 NPK kg/ha+10 kg N through poultry manure+GA3 50 ppm+50 ppm	1370.0^{a}
T13-10-40-20 NPK kg/ha+10 kg N through poultry manure+GA3 75 ppm+75 ppm	1704.0^{b}
Fpr	<0.001
Vr (12, 24)	6.3
SEm±	51.6
LSD (P 0.05)	150.5
CV (%)	6.7

` Figures followed by the same letter within column are not significantly different at P≤ 0.05

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