Effect of organic nutrient management on growth and yield of green gram (Vignaradiata L.,) under semi-arid region

Abstract:A field experiment was carried out during the *kharif* season of the year 2021-2022 at Organic Agriculture Research Farm,Karguaji, Institute of Agricultural Sciences, Bundelkhand University, Jhansi, Uttar Pradeshto study the “Effect of nutrient management through organic sources on growth and yield of green gram (*Vignaradiata* L.,). The experiment was laid out in randomized block design with nine treatments and three replications. The results revealed that growth and yield parameters influenced by the nutrient management through organic sources. The values of different attributeswere higher with application 1/3 Farm yard manure, 1/3 Poultry manure and 1/3 Vermicompost treated with rhizobium and PSB as compared with control.As a result,the improvement in growth and yield parameters viz., plant height, biomass production, number of nodules and yield attributes viz., pod length (cm), number of grains/pods, test weight, and seed yield (q/ha) was recorded and identified as best treatment. Thus, the combined use of different organic sources played a significant role in increasing seed yield of Green gram.

Key word: Organic nutrient management, Green gram, Farm yard manure, poultry manure, vermicompost, growth and yield attributes

Introduction: Green gram (*Vignaradiata* L.,) is a member of the Leguminosae/Fabaceae family and has -chromosome number 2n=22. Pollination of the green gram crop happens naturally, but there is also a very little amount of cross pollination. Green gram plays a special function in diversifying Indian agriculture and reducing malnutrition among the nation's vegetarian population. After chickpea and pigeon pea, green gram is the third most important pulse crop in India. It covers 3.09 million hectares and produces 2.01 million tons during the *kharif* season, (2020 Anonymous). Major producing state of green gramareRajasthan, Maharashtra, Andhra Pradesh, Odisha, Tamil Nadu, Madhya Pradesh andUttar Pradesh. Rajasthan is largest producing state of green gram in terms of area and production.

It is a valuable crop that is high in protein. Green gram (Mung bean) seeds and flour are all excellent sources of protein. When compared to other pulses, mung bean is far more appealing, easily digestive, and delicious. Ascorbic acid (vitamin C), riboflavin, and thiamine are abundant in the sprouted seeds of the Mung bean as reported byChoudhary et al.,[1].Its, seed is used to make soup, together with seasoned rice. It can also be grown as a green manure crop in the summer. Being a legume crop, it has the capacity to fix atmospheric nitrogen. After the ripe pods are removed, its green plants are used as fodder. Application of nutrient elements, organic manures, and biofertilizers has a significant impact on the yield

and nutritional quality of pulses as per Kumawat et al.,[2]. The combination of Rhizobium and pulse plants enhances soil fertility and is an economical way to fertilizer legumes with nitrogen as described byMeena et al.,[3]. The Rhizobium strain, the type of plant, and the climate all affect how much nitrogen is fixed. Legumes are self-sufficient in terms of their N needs due to nitrogen fixation, and they also contribute significantly to maintaining the soil's nitrogen balance. They also enhance the soil's biological qualities as well as its physical ones, including bulk density and soil aggregate stability as per Bahadur and Tiwari[4].Due to the dual benefits of N fixation and P solubilization in green gram, combined inoculation of Rhizobium and PSB not only significantly improved the growth characteristics and yield attributes, but also resulted in significantly higher yield as compared to Rhizobium and PSB inoculation alone reported by Singh et al. [5]. Numerous crops use organic sources of nourishment like vermicompost, farmyard manure, and chicken manure. The development of advantageous organisms in the soil can be encouraged by using these organic additions. To improve crop growth, production, and quality of mung bean,Meena et al., [6].Mujahid and Gupta[7].employed organic.Biofertilizer effectiveness is also increased by organic amendments. In recent years, the use of such bio-fertilizers, which are less expensive, environmentally beneficial, and based on renewable energy sources, has increased to complement chemical fertilizer'sas per Meena et al. [8].According to Choudhary et al.[1]mung bean sprouted seeds are a good source of ascorbic acid (vitamin C), riboflavinand thiamine.

In Agriculture manures such asvermicompost, Farm yard manure, poultry manure, bio fertilizer's, etc. are used as source of nutrients. These manures assist in maximizing crop output and desired quality while also ensuring balanced nutrient proportions, closing the current large gap between nutrient removal and supply, and improving response efficiency.

Material and method:A field experiment was conduct during the *kharif* season 2021-22 at Organic Agriculture Research Farm, Karguaji, Institute of Agricultural Sciences, Bundelkhand University, Jhansi, Uttar Pradeshwhich is situated at 25^0.27" N latitude and 78^0.35" E longitude at an altitude of 271 meters above mean sea level in a semi-arid region of central India. The climatological scenario of Jhansi is depicted in fig.1The soil had a sandy loam texture, a pH of 7.4 that was neutral, low levels of available phosphorus (14.10 kg P_2O_5/ha), medium levels of potassium (229.0 kg K_2O/ha), low levels of available nitrogen (186.0 kg/ha), and low levels of organic carbon (0.48%). The was experiment laid out in randomized block design included three replications.Nine treatments combination: T_0 with 100% RDF (25: 40: 30); T_1,100% nutrients though farm yard manure (50 q/ha FYM) + rhizobium; T_2,100% nutrients through vermicompost (25 q/ha VC) + rhizobium; T_3,100% nutrients through poultry manure (8.33 q/ha PM) + rhizobium; T_4, 50% nutrients through farm yard manure (25 q/ha FYM) + 50% nutrients through vermicompost (12.5 q/ha VC) + rhizobium; T_5, 50% nutrients through farm yard manure (25 q/ha FYM) + 50% nutrients through poultry manure (4.16 q/ha PM) + rhizobium; T_6, 50% nutrients through poultry manure (4.16 q/ha PM) + 50% nutrients through vermicompost (12.5 q/ha VC) + rhizobium; T_7, 1/3 nutrients through farm yard manure (16.66 q/ha FYM) + 1/3 nutrients through poultry manure (2.77 q/ha PM) + 1/3 nutrients through vermicompost (8.33 q/ha VC) + rhizobium; T_8,1/3 nutrients through farm yard

manure (16.66 q/ha FYM) + 1/3 nutrients through poultry manure (4.16 q/ha PM) + 1/3 nutrients through vermicompost (8.33 q/ha VC) + rhizobium + PSB (100% Phosphate solubilizing bacteria) were evaluated.

The field was plough once using a cultivator on 12th July, 2021, and then let too dry in the sun for three days. One pre-sowing irrigation was administered on 15th July, 2021. The soil was levelled and farmed using a cultivator after two days of watering. The green gram cultivated variety 'Shikha (410-3) was sown on 18th July 2021 by manual, using seed rate 15 kg/ha. The experimental plot was of size 2x3 m^2 with a row spacing of 30 cm and 10 cm plant to plant and seed treated with thiram at a rate of 2.5 g/kg seed, rhizobium 10g/kg seed and with PSB @ 20g/ kg seeds as per treatments. The treated seeds were kept in shade approximately for 2 hours for drying. FYM Vermicompost and poultry manure were incorporated 12 days before to sowing of green gram.Thinning operation done after having complete germination in the plot at 12 to 15 days after sowing. Weeding was done as per the treatment requirement by khurpi, two weeding's were done manually at 25 and 40 days after sowing to keep weed free plots and There was least infestation/infection of insect-pest and disease so plant protection measures not needed, but one spray of neem oil. The crop was finally harvested after the 78 days sowing. Observation to be occupied on vegetative parameters of growth;plant height, primary branch, secondary branch, fresh and dry weight of plant, root length, root nodules and total biomass productionand the yield parameters; pod length, number of pods per plant, number of grains per pod, weight of pod per plant, seed yield per plant, thousand seed weightand protein content in grains through micro Kjeldahl digestion and distillation method. As part of the root nodule recording process, uprooted plants were put in a basin of water and the roots washed. After thorough root cleaning, nodules were counted separately for each plant's root. OPSTAT software was used for analysis of the datausing procedure suggested byPanse and Sukhatme [9]

Results and discussion: The analysis of the experiment's data revealed a range of responses from the crop's application of plant nutrients from organic sources, showing that the management of nutrient levels in green gram growth and yield attributes such as plant height, number of branches, dry and fresh weight of plant, number of leaves/plants, root nodule, number of pod $plants^{-1}$, number of grains pod^{-1}, pod length (cm), weight of pod $plant^{-1}$, test weight of grains, straw yield and seed yield.

A. Effect on growth attributes:

Plant height: An analysis of the data revealed (Table 1) that the pattern of plant height at 30 DAS was constant across all organic nutrient management regimens. At 45 and 60 days after sowing maximum plant height (31.64 and 36.44 cm) was recorded with the treatment $T_{8;}$ (16.66 q/ha FYM + 2.77 q/ha poultry manure + 8.33 q/ha vermicompost + rhizobium + PSB 100%),might be due to organic manure like farm yard manure, poultry and vermicompost manure or organic fertilizers increases the production of new cells, fosters plant vigour and speeds up leaf growth, all of which contribute to better plant height. Similar results also reported by the Sangeetha et al. [10]

Number of branches: The results of the statistical study related to the number of branches plant-1 are provided table 1. The maximum number of branches per plant-1 were recorded treatment T_8 (16.66 q/ha FYM + 2.77 q/ha poultry manure + 8.33 q/ha vermicompost + rhizobium + PSB 100%)which it was significantly higher 12.21 at 60 DASSimilar findingsreported of Kamble et al. [11]

Number of leaves: The information table2 showed that at 30 DAS, treatment T_1 (100% nutrients through farm yard manure (FYM) + rhizobium) produced the maximum branches (14.33), and at 45 and 60 DAS, treatment T_8; (16.66 q/ha FYM + 2.77 q/ha poultry manure + 8.33 q/ha vermicompost + rhizobium + PSB 100%), produced the higher number of leaves which were statistically significant has compared to other treatments (21.68 and 34.77). Similar findingsreported byChannaveerswami et al. [12]

Fresh shoot weight: According to the data analysis, all of the organic nutrition management treatments for fresh shoot weight showed(Table2) a similar trend at 30 DAS and were deemed to be statistically irrelevant. The treatment T_8; (16.66 q/ha FYM + 2.77 q/ha poultry manure + 8.33 q/ha vermicompost + rhizobium + PSB 100%), was associated with the highest fresh shoot weights (20.22 and 29.44 g) at 45 and 60 DAS, whereas the treatment T_0; (control) was associated with the lowest fresh shot weight (15.11 g). The findings from this study supportedthe findings ofVerma et al. [13]

Dry shoot weight: The data analysis revealed a same trend (Table3) for dry shoot weight for all organic nutrition management treatments at 30 DAS, and these results were judged statistically non-significant. The treatments T_0 and T_5 had the lowest dry shoot weights, but the treatments T_8;(16.66 q/ha FYM + 2.77 q/ha poultry manure + 8.33 q/ha vermicompost + rhizobium + PSB 100%) were linked to the highest dry shoot weights (4.50 and 8.81g) at 45 or 60 DAS. These findings agree with those from Verma et al. [13]

Fresh root weight: The treatment $T_{8;}$(16.66 q/ha FYM + 2.77 q/ha poultry manure + 8.33 q/ha vermicompost + rhizobium + PSB 100%)had the highest fresh root weight(Table3) at 45 and 60 DAS (0.90 and 2.28 g), but the treatment T_4 and T_0 had the lowest (0.53 and 1.30 g). The T_8 recorded higher fresh root weight than the other treatments, according to the data for this character. The findings are only partially consistent with the studyaccording toDivyavani et al. [14],Kalal et al.; [15] and Kamble et al.,[11].

Dry root weight: The information (Table4)on effective dry root weight plant^{-1} at different growth phases. The treatment T_8; (16.66 q/ha FYM + 2.77 q/ha poultry manure + 8.33 q/ha vermicompost + rhizobium + PSB 100%)produced the highest dry root weight at 30. 45 and 60 DAS (0.17, 0.29, and.71 g), whereas the T_6, T_0, and T_5 treatments produced the lowest dry root weight. Similar results were found by Khan et al. [16]

Number of root nodules plant^{-1}: At 30 DAS, the treatment T_5 with the application of (50%through FYM + 50%through poultry manure + rhizobium) (45.88) recorded the highest number of nodules (Table4) at 45 and 60 DAS, the treatment T_8 with the application of(16.66 q/ha FYM + 2.77 q/ha poultry manure + 8.33 q/ha vermicompost + rhizobium + PSB 100%), (70.14 and 112.98) recorded the highest number of

nodules. Application of biofertilizers like rhizobium and PSB helped in increased nitrogen fixation and phosphorous solubilization, respectively, which assisted in increased root development and nodule formation. Additionally, application of farmyard manure, vermicompost and poultry manure aided in increased nutrient availability, which aided in increased nodule formation. The outcomes matched with the findings ofKumawat et al. [2]and Singh et al.[17].

Effect on yield attributes:

Number of pod plant^{-1}: Over all the treatments (Table 5), the treatment that applied T_8; (16.66 q/ha FYM + 2.77 q/ha poultry manure + 8.33 q/ha vermicompost + rhizobium + PSB 100%),had the highest number of pods per plant (17.78). However, the treatments (100% nutrients through Vermicompost (VC) + Rhizobium) (14.66) and (100% nutrients through Poultry manure (PM) + Rhizobium), (14.22) were shown to be statistically equivalent. Similar findings were found by Patel et al.[18].

Number of seeds pod^{-1}: Data presented in table 5 shows that treatment T_8; (16.66 q/ha FYM + 2.77 q/ha poultry manure + 8.33 q/ha vermicompost + rhizobium + PSB 100%), reported a considerably greater number of seeds pod (10.84) which was comparable to treatments T_4 and T_6. There may have been an increase in metabolite production as a result of seed treatment with biofertilizers like rhizobium or PSB and the application of organic manure, and their translocation to various sinks, particularly the productive structures (pods and seeds), may have helped to increase the number of seeds per pod in addition to promoting overall growth. Similar results were found byRajkhowa, et al. [29].

Pod length (cm): The maximum length of pod was registered (6.65 cm) with the treatmentT_8; (16.66 q/ha FYM + 2.77 q/ha poultry manure + 8.33 q/ha vermicompost + rhizobium + PSB 100%)but it remained statistically at par with treatments T_6 and T_2,(Table5).

Weight of pod plant^{-1}: The treatment T_8; (16.66 q/ha FYM + 2.77 q/ha poultry manure + 8.33 q/ha vermicompost + rhizobium + PSB 100%)registered the highest weight of pod per plant (6.75 g). The treatment T_0 (control) had the lowest weight of pod per plant (3.97 g). According to the values for this character, the T_8 greatly outperformed the other treatments in terms of pod weight per plant(Table 5). This result presented (Table6) outcomes support by Nadeem et al. [20].

Test weight: With the combination of treatments in T_8; (16.66 q/ha FYM + 2.77 q/ha poultry manure + 8.33 q/ha vermicompost + rhizobium + PSB 100%), a considerable increase in seed weight (36.72 g) was noted. However, statistically speaking, it stayed on par with treatments T_7 and T_3 (Table 5). It is possible that the favorable response of FYM, poultry manure, and vermicompost to yield attributes is due to the availability of sufficient amounts of readily usable plant nutrients throughout the growth period, particularly

at crucial growth periods of the crop, which leads to better uptake, plant vigour, and superior yield attributes. The results were found to be the similar resultalso reportedYadav et al. [21]

Seed yield (q/ha): The grain yield was significantly higher (10.50q/ha) in treatments T_8; (16.66 q/ha FYM + 2.77 q/ha poultry manure + 8.33 q/ha vermicompost + rhizobium + PSB 100%)compared to(T0) control where in minimal grain yield was obtained (7.36 q/ha)and other treatments (Table 6) but it was comparable to T_1 and T_7 (9.75 q/ha and 9.95 q/ha respectively). The release of macro- and micronutrients over the course of microbial decomposition is thought to be the cause of the higher increase in yield. The energy provided by organic matter also fuels the microflora of the soil, which converts additional nutrients added to the soil or treated in other ways into forms that are easily absorbed by growing plants and encourage seed development. The outcomes were consistent with findings of Sharma and Abraham [22].

Straw yield (g/plant): The treatment T_8; (16.66 q/ha FYM + 2.77 q/ha poultry manure + 8.33 q/ha vermicompost + rhizobium + PSB 100%)produced the highest straw yield of green gram (13.50 q/ha) while the treatment T_6(100% nutrients by Vermicompost (VC) + rhizobium) yielded the lowest straw yield of green gram (8.78 q/ha). Thevalues for this characteristic presented intable 6 revealed that the T_8, recorded substantially higher straw yield. These findings closely matched with those published by Sharma and Guled. [23]

All the growth and yield indicators, of green gram's including plant height, number of leaves per plant, number of branches per plant, pod length (cm), number of pods per plant, and dry weight of nodules, utilizing various organic management techniques has an impact on seed yield, number of seeds/pods, pod weight (gm), number of nodules/plants, test weight (gm), and number of seeds/pods. Straw yield (q/ha), seed yield q/ha etc. Maximum dry and fresh weight of plant was observed in (16.66 q/ha FYM + 2.77 q/ha poultry manure + 8.33 q/ha vermicompost + rhizobium + PSB 100%), which was superior to other combination treatments and statistically higher over control as well as the growth stages. The combination treatments of organic resources consistently showed higher values of plant height, number of branches. The findings of Priyadharshini et al., [24]Who observed comparable growth responses as a result of the simultaneous application of organic sources, given confirmation to these findings. The application (16.66 q/ha FYM + 2.77 q/ha, poultry manure + 8.33 q/ha,vermicompost + rhizobium + PSB 100%) have contributed to the increase in shoot cytokinin availability, which in turn contributed to the process of cell elongation through cell division and cell elongation, according to Beaulah et al [25] and Sanjutha et al. [26]. Nearly all of the plant nutrients for plant growth and development come from organic sources, increasing plant height as per Nileema et al., [27]. Organic sources have a favorable effect on crop growth and yield, according to Rao et al., [28]. These sources may have had high concentrations of microbial metabolites that help maintain the stomata open for longer during favorable and unfavorable crop growth circumstances.

The combination of (FYM + Poultry manure + Vermicompost + rhizobium + PSB) with organic sources boosted the yields of seeds and stover. However, for both criteria, the only treatment combination that

showed a discernible improvement over other treatments were FYM 16.66 q/ha, Vermicompost 8.33 q/ha, Poultry manure 2.77 q/ha, plus rhizobium + PSB 100%. The highest recorded seed yield (16.66 q/ha FYM plus 2.77 q/ha poultry manure plus 8.33 q/ha vermicompost plus rhizobium plus PSB 100%) was 10.50 q/ha. To combinations rhizobium and PSB with farm yard manure (33%), vermicompost (33%), and poultry manure (33%), were superior. The increased microbial activity, nutrient availability, and improved soil physico-chemical environment in the soil for plant growth are known effects of using organic sources in conjunction with bio fertilisers. The combination treatments also showed increased productivity. These findings are supported by previous of findings (Mandal et al [29] and Sable et al., [30].

Conclusion: That green gram reacted best to the combination of farm yard manure, poultry manure, vermicompost, rhizobium, and PSB in the semi-arid region of Bundelkhand.The combination of organic sources (16.66 q/ha FYM + 2.77 q/ha poultry manure + 8.33 q/ha vermicompost + rhizobium + PSB 100%)was found to be best for ensuring batter growth ultimately higher yield of organic green gram. There may have been an increase in metabolite production as a result of seed treatment with biofertilizers like rhizobium or PSB and the application of organic manure, and their translocation to various sinks, particularly the productive parts of the plants.

Acknowledgement: The Authors are thankful to the Vice Chancellor,Bundelkhand University Jhansi,Uttar Pradesh for providing the resources we required to carry out the study.

Table 1. Effect of managing nutrients from organic sources on plant height (cm) and branch count.

Treatments	Plant height (cm)			Branches/plant (number)		
	30DAS	45DAS	60DAS	30DAS	45DAS	60DAS
Control	16.03	27.33	32.68	4.33	10.11	9.44
100% nutrient through FYM	21.21	27.66	37.80	4.88	9.00	10.64
100% nutrient through vermicompost	16.22	26.66	34.33	4.77	10.89	11.44
100% nutrient through poultry manure	18.10	27.67	32.80	4.88	9.66	10.33
50% nutrient through FYM + 50% nutrient through VC+ rhizobium	20.66	26.44	35.00	4.22	9.78	10.66
50% nutrient through FYM + 50% nutrient through PM+ rhizobium	18.44	29.78	34.44	4.66	9.44	10.16
50% nutrient through PM + 50% nutrient through VC+ rhizobium	17.21	23.66	31.33	4.11	8.92	10.25
1/3 through FYM + 1/3 through PM + 1/3 + 50% through VC + rhizobium	20.66	28.66	37.66	4.22	10.55	12.10
1/3 through FYM + 1/3 through PM + 1/3 + 50% through VC + rhizobium + PSB	21.22	31.44	38.44	5.00	11.89	12.21
SE. m±.	1.38	0.83	1.22	0.11	0.44	0.41
C. D. (P = 0.05)	N/A	2.52	3.71	0.33	1.35	1.25

Treatments	Leaves/plants (number)			Fresh shoot weight (g)		
	30DAS	45DAS	60DAS	30DAS	45DAS	60DAS
Control	13.00	21.00	29.11	5.12	11.55	23.66
100% nutrient through FYM	14.68	21.00	31.00	5.42	15.98	26.55
100% nutrient through vermicompost	14.33	21.00	27.55	6.18	18.10	27.78
100% nutrient through poultry manure	14.68	20.00	34.55	5.82	15.11	28.89
50% nutrient through FYM + 50% nutrient through VC+ rhizobium	12.68	20.00	29.33	5.57	11.51	23.76

50% nutrient through FYM + 50% nutrient through PM+ rhizobium	14.00	21.00	25.44	5.86	20.22	18.88
50% nutrient through PM + 50% nutrient through VC+ rhizobium	12.33	18.00	27.00	5.44	14.33	19.55
1/3 through FYM + 1/3 through PM + 1/3 + 50% through VC + rhizobium	13.33	19.68	26.78	6.40	15.66	29.21
1/3 through FYM + 1/3 through PM + 1/3 + 50% through VC + rhizobium + PSB	14.33	21.68	34.78	6.84	18.66	29.44
SE. m±.	0.50	0.576	1.14	0.46	0.64	0.73
C. D. (P = 0.05)	1.50	1.74	3.45	N/A	1.95	2.23

Table 2.Effect of managing nutrients from organic sources on number of leaves and fresh shoot weight.

Table 3: Effect of managing nutrients from organic sources on dry shoot weight plant^{-1} and fresh root weight plant^{-1}

Treatments	**Dry shoot weight plant^{-1}(g)**			**Fresh root weight plant^{-1}(g)**		
	30DAS	45DAS	60DAS	30DAS	45DAS	60DAS
Control	1.06	2.03	5.69	0.38	0.54	1.32
100% nutrient through FYM	1.24	2.54	7.56	0.36	0.81	1.78
100% nutrient through vermicompost	1.04	4.39	8.81	0.40	0.81	2.00
100% nutrient through poultry manure	1.18	2.92	8.11	0.41	0.68	1.65
50% nutrient through FYM + 50% nutrient through VC+ rhizobium	1.16	3.31	6.17	0.40	0.53	1.66
50% nutrient through FYM + 50% nutrient through PM+ rhizobium	1.30	3.20	4.30	0.37	0.71	1.32
50% nutrient through PM + 50% nutrient through VC+ rhizobium	1.27	2.17	5.92	0.37	0.56	1.42
1/3 through FYM + 1/3 through PM + 1/3 + 50% through VC + rhizobium	1.26	3.75	5.61	0.45	0.68	1.97
1/3 through FYM + 1/3 through PM + 1/3 + 50% through VC + rhizobium + PSB	1.4	4.50	7.56	0.50	0.90	2.28
SE. m±.	0.15	0.26	0.37	0.039	0.043	0.18
C. D. (P = 0.05)	N/A	0.80	1.37	N/A	0.13	0.54

Treatments	**Dry root weight (g)**			**Nodules plant^{-1} (Number)**		
	30DAS	45DAS	60DAS	30DAS	45DAS	60DAS
Control	0.16	0.23	0.53	21.32	42.37	72.30
100% nutrient through FYM	0.17	0.23	0.70	38.44	58.48	87.67

100% nutrient through vermicompost	0.14	0.28	0.70	35.55	62.98	92.22
100% nutrient through poultry manure	0.10	0.26	0.65	37.33	55.60	96.00
50% nutrient through FYM + 50% nutrient through VC+ rhizobium	0.15	0.23	0.50	34.67	56.66	99.55
50% nutrient through FYM + 50% nutrient through PM+ rhizobium	0.14	0.26	0.46	45.88	53.81	98.96
50% nutrient through PM + 50% nutrient through VC+ rhizobium	0.12	0.24	0.51	38.55	60.44	110.55
1/3 through FYM + 1/3 through PM + 1/3 + 50% through VC + rhizobium	0.16	0.28	0.63	33.22	55.81	104.97
1/3 through FYM + 1/3 through PM + 1/3 + 50% through VC + rhizobium + PSB	0.17	0.29	0.71	43.78	70.14	112.98
SE. m±.	0.008	0.010	0.036	1.03	1.15	3.06
C. D. (P = 0.05)	0.023	0.030	0.108	3.12	3.50	9.25

Table 4.Effect of managing nutrients from organic sources on dry root weight plant^{-1} and number of nodules plant^{-1}.

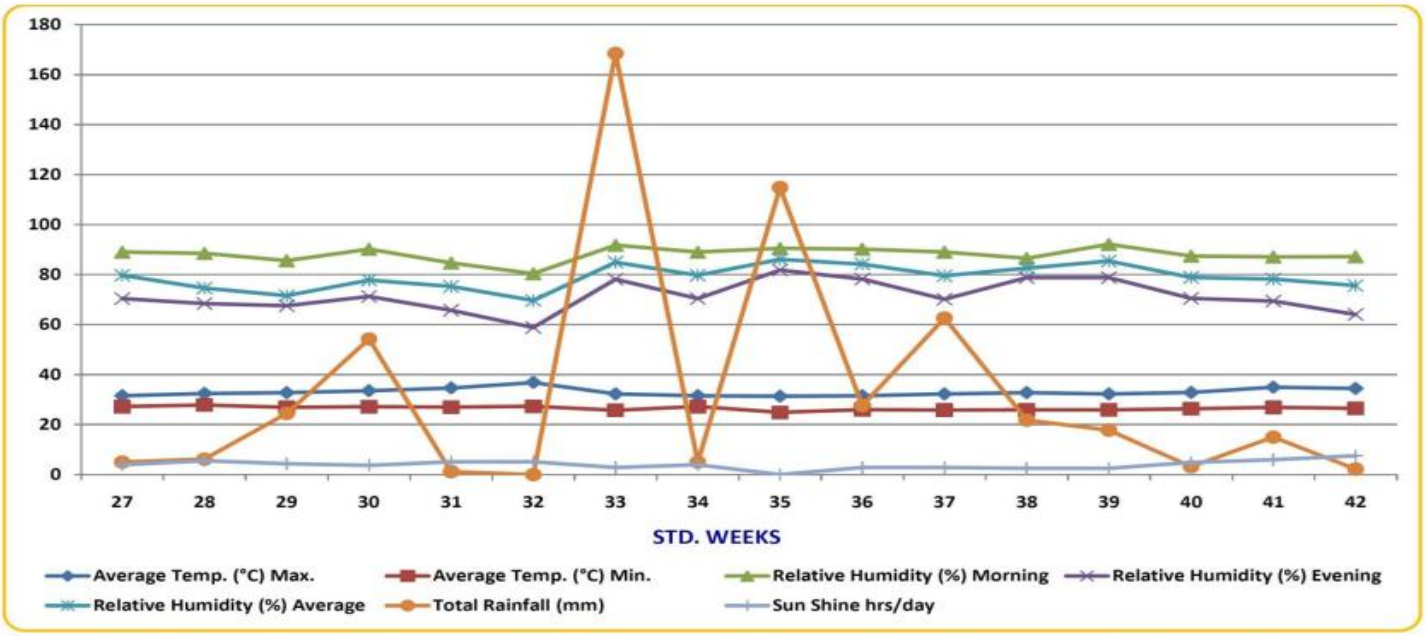
Table 5. Effect of managing nutrients from organic sources on various yield attributes

Treatments	**Pods /plant (number)**	**Grains /Pod (number)**	**Pod length (cm)**	**Weight of pods/Plant (g)**	**Test weight (g)**
Control	9.88	9.98	5.47	3.97	32.15
100% nutrient through FYM	14.11	10.07	5.79	5.25	33.78
100% nutrient through vermicompost	14.66	9.91	6.02	5.43	34.24
100% nutrient through poultry manure	14.22	9.97	6.00	5.24	36.15
50% nutrient through FYM + 50% nutrient through VC+ rhizobium	13.33	10.58	5.49	4.54	33.44
50% nutrient through FYM + 50% nutrient through PM+ rhizobium	12.99	10.08	5.80	5.09	34.77
50% nutrient through PM + 50% nutrient through VC+ rhizobium	10.99	10.16	6.52	4.55	34.02
1/3 through FYM + 1/3 through PM + 1/3 + 50% through VC + rhizobium	13.88	10.23	5.75	5.61	36.40
1/3 through FYM + 1/3 through PM + 1/3 + 50% through VC + rhizobium + PSB	17.78	10.84	6.65	6.75	36.72
SE. m±.	0.71	0.17	0.18	0.29	0.67
C. D. (P = 0.05)	2.15	0.51	0.55	0.88	2.03

Table 6. Effect of managing nutrients from organic sources on grain and straw yield of green gram

Treatments	**Grain yield (q/ha)**	**Straw yield**

		(q/ha)
Control	7.36	9.44
100% nutrient through FYM	9.95	12.05
100% nutrient through vermicompost	8.20	10.49
100% nutrient through poultry manure	7.68	11.49
50% nutrient through FYM + 50% nutrient through VC+ rhizobium	7.36	9.08
50% nutrient through FYM + 50% nutrient through PM+ rhizobium	8.76	9.01
50% nutrient through PM + 50% nutrient through VC+ rhizobium	7.48	8.78
1/3 through FYM + 1/3 through PM + 1/3 + 50% through VC + rhizobium	9.75	9.70
1/3 through FYM + 1/3 through PM + 1/3 + 50% through VC + rhizobium + PSB	10.50	13.50
SE. m±.	0.34	0.19
C. D. (P = 0.05)	1.05	0.59



Fig, 1. Metrological scenario of Jhansi.

References:

1. Chaudhary, R. P., Sharma, S. K., &Dahama, A. K. Yield components of mung bean [Vignaradiata (L.) wilczek] as influenced by phosphorus and thiourea. Ann. Agri. Res. 2003;24(2): 203-204.

2. Kumawat, N., Sharma, O. P., & Kumar, R. Effect of organic manures, PSB and phosphorus fertilization on yield and economics of mung bean [Vignaradiata (L.) Wilczek]. Environ Ecol. 2010;27(1):5-7.

3. Meena, J. S., Verma, H. P., &Pancholi, P. Effect of fertility levels and biofertilizers on yield, quality and economic of cowpea. Agriculture for Sustainable Development. 2014;2(2):162-164.

4. Bahadur, L., &Tiwari, D. D. (2014). Nutrient management in mung bean (Vignaradiata L.) through sulphur and biofertilizers. Legume Res. 2014;37(2):180-187.

5. Singh, M. Efficiency of biofertilizers and weed control methods on productivity of green gram [Vignaradiata L. Wilczek]. M. Sc. (Ag) Thesis, Raj. Agril. Univ., Bikaner. 1998
6. Meena, R. S. Response to different nutrient sources on green gram (Vignaradiata L.) productivity. Indian J Ecol. 2013;40(2):353-355.
7. Mujahid, A. M., & Gupta, A. J. Effect of plant spacing, organic manures and inorganic fertilizers and their combinations on growth, yield and quality of lettuce (Lactuca sativa L.). Indian j agr sci. 2010;80(2):177-181.
8. Meena, R. S., Dhakal, Y., Bohra, J. S., Singh, S. P., Singh, M. K., Sanodiya, P., &Meena, H. Influence of bioinorganic combinations on yield, quality and economics of Mung bean. Am J Exp Agric. 2015;8(3):159-166.
9. Panse, V. G., &Sukhatme, P. V. Statistical methods for agricultural workers. Statistical methods for agricultural workers.1954.
10. Sangeetha, M., Paramasivam, P., &Jegadeeswari, D. Response of Catharanthusroseusl to organic and inorganic fertilization. Agricsci dig. 2012;32(4):329-331.
11. Kamble, M. Y., Kalalbandi, B. M., Kadam, A. R., &Rohidas, S. B. Effect of organic and inorganic fertilizers on growth, green pod yield and economics of French bean (Phaseolus vulgaris L.) cv. HPR-35. Legume Res. 2016;39(1):110-113.
12. Channaveerswami, A. S. Studies on integrated nutrient management and planting methods on seed yield and quality of groundnut. J Fr Sci. 2005;14(2):76-78.
13. Verma, R. K., Verma, R. S., Rahman, L. U., Yadav, A., Patra, D. D., &Kalra, A. Utilization of distillation waste–based vermicompost and other organic and inorganic fertilizers on improving production potential in geranium and soil health. Commun Soil Sci Plant Anal. 2014;45(2):141-152.

14. Divyavani, B. R., Ganesh, V., &Dhanuka, D. Effect of integrated nutrient management on growth and yield in black gram (Vignamungo L. Hepper) under doon valley condition. J pharmacognphytochem. 2020;9(5):2928-2932.

15. Kalal, P. H. Effect of Integrated nutrient management on growth, yield and economics of summer green gram (Vignaradiata L.) Under south Gujarat condition. J Pharm Innov. 2021;10(12):499-501.

16. Khan, M. M. S., Singh, V. P., & Kumar, A. Studies on effect of plant densities on growth and yield of Kharifmung bean (Vignaradiata L.) Wilczek. Bulletin of Environment, Life Sci. 2017;6(1):291-295.

17. Sitaram, T., Sharma, S. K., &Reager, M. L. Growth attributes and nutrient uptake of green gram as influenced by vermicompost and zinc in arid western Rajasthan. J Crop Improv. 2013;4(1):65-69.

18. Patel, J. J., Mevada, K. D., &Chotaliya, R. L. Response of summer mung bean to date of sowing and level of fertilizers. Indian J. Pulses Res. 2003;16(2):122-124

19. Rajkhowa, D. J., Gogoi, A. K., Kandali, R., &Rajkhowa, K. M. Effect of vermicompost on green gram nutrition. J Indian Soc Soil Sci. 2000;48(1):207-208.

20. NadeemAkhtar., Muhammad Amjad and Muhammad Akbar Anjum. Growth and Yield Response of Pea (Pisumsativum L.) Crop to Phosphorus and Pottasium Application. Pak J Agric Sci. 2003; 40(3-4):217-222.

21. Yadav, A. K., Varghese, K., & Abraham, T. Response of biofertilizers, poultry manure and different levels of phosphorus on nodulation and yield of green gram (Vignaradiata L.) cv. k-851. AgricSci Dig. 2007;27(3):213-215.

22. Sharma V, Abraham T. Response of black gram to nitrogen, zinc and farm yard manure. Legume Research. 2010;33(4):295-298.

23. Sharma, A. and Guled, M. B. Effect of set-furrow method of cultivation in pigeonpea + green gram intercropping system in medium deep black soil under rainfed conditions. Karnataka J Agric Sci. (2012);25(1):18-24.

24. Priyadharshini, A.S., Singh, V., Tiwari, D., Karthik, B., Mahesh, K., Influence of spacing and organic manures on growth, yield and economics of mung bean (Vigna radiate L.). B F I Jor. 2021;13(1): 617–621.

25. Beaulah, A., Growth and development of moringa (MoringaoleiferaLan.) under organic and inorganic systems of culture. Ph.D. Thesis, Tamil Nadu Agriculture University, Coimbatore 2002.

26. Sanjutha, S., Subramanian, S., Rani, I., Maheswari., Integrated nutrient management in and rographispaniculata. Res j agricbiol sci. 2008;4(2): 141–145.

27. Nileema, S.G., Sreenivasa, M.N., Influence of liquid organic manures on growth, nutrient content and yield of tomato (Lycopersiconesculentum Mill.) in the sterilized soil Karnataka J Agric Sci. 2011;24(2): 153–157.

28. Rao, T.K., Reddy, S.D., Naidu, J.G., 2010. The quality parameters of maize as affected by organic farming. Green Farming 2010;1: 373–376.

29. Mandal KG, Mishra AK, Hati KM. Effect of combination of NPK and FYM on growth, yield and agronomic efficiency on soybean (Glycine max) in Vertisols. Ecol. Environ. 2000; 18(1): 207-9.

30. Sabale RN. Effect of sources of nitrogen on yield of soybean. Jou of Maharashtra Agricultural Universities. 2005;30(3):262-3.