

Impact of Organic Manure and Inorganic Fertilizer on Growth and Yield Attributes in French Bean (*Phaseolus vulgaris* L.) under Dhampur Condition

Ajay Kumar Sharma, S. L. Pal, Ravi, Vikas Kumar

Received 10 January 2022, Accepted 8 February 2022, Published on 10 March 2022

ABSTRACT

The present investigation on “Impact of organic manure and inorganic fertilizer on growth yield and yield attributes of french bean (*Phaseolus vulgaris* L.) cv Pant Anupama” was conducted at Horticulture Research Farm, Dhampur (Bijnor) during *rabi* season 2019-2020. The experiment was laid out in RBD with three replication and comprising of eight Treatments of organic manure and inorganic fertilizer viz. Control (T₁), 100% RDF (T₂), 100% FYM (T₃), 100% Vermicompost (T₄), 50% RDF+ Vermicompost (T₅), 50% FYM+ RDF (T₆), 33% RDF+ Vermicompost+ FYM (T₇), 50% FYM+ RDF (T₈). The results showed that the growth attributes were very much fluctuated in different treatments. As far as yield characters

are concerned, it was found that the treatment 50 % RDF+ FYM (T₈) was found superior over all other treatment studied.

Keywords Organic manure, Inorganic fertilizer, French bean, Yield, RBD.

INTRODUCTION

Vegetables are important food and highly beneficial for the maintenance of our health and preventions of disease. They contain valuable health promoting constituents, which can be utilized successfully to build up and repair the body. French bean (*Phaseolus vulgaris* L.) is a versatile short duration legume crop with high grain yielding potential and can be used both pulses and vegetables. It belongs to the family Leguminaceae. Southern Mexico and Central America considered being the primary center of origin, while Peruvian–Ecuadorian–Bolivian region to be the secondary center of origin. In literature, it is known as various name viz., pole bean, snap bean, kidney bean, navy bean, string bean, field bean, haricot bean, common bean, marrow bean, dwarf bean and Rajmah etc. It is recognized as an excellent source of protein (17.5 to 28.7% in dry seeds, about 1.0-2.5% in green pods), carbohydrates (61.4%), mineral content (3.2-5.0%), crude fiber (4.2-6.3%), crude fat

Ajay Kumar Sharma*, S.L. Pal
Department of Horticulture, R.S.M. (PG) College, Dhampur
246761, Bijnor, Uttar Pradesh

Ravi
Department of Soil Science & Agricultural Chemistry, R.S.M. (PG)
College, Dhampur 246761, Bijnor, Uttar Pradesh

Vikas Kumar
Department of Agriculture, Dhampur 246761, Bijnor, Uttar Pradesh
Email : ajaygoursharma@gmail.com
*Corresponding author

(1.2-2.0%) and vitamins A and C (Messina 1999). Globally french bean is cultivated over an area of 29.92 million hectares with an annual production of 23.23 million tons while in India is cultivated over an area of more than 12.25 million hectares with an annual production of 4.97 million tons (Anonymous 2021). French bean being a fertilizer responsive crop, due to lack of nodulation in roots it is insufficient in trapping atmospheric nitrogen. Therefore, it does require large quantity of nitrogen and phosphorus, potash for growth and yield through nitrogenous fertilizer as well as through organic manures. Organic manures viz., FYM and Vermicompost are eco-friendly cheap source of nutrients and are potentially sound for supplying nutrients which can reduce dependence non-chemical fertilizer (Datt 2013), these are not only the source of organic matter and nutrient, but also boost microbial population, physical, biological and chemical properties of soil that improves the productivity of crop (Albiach 2000).

In current arena, due to the use of excess chemical fertilizer it has been observed that the soil fertility is declining. So the main aim is to cultivate the crop in such a way that soil remains sustainable for maximum quality production. Hence, the present experiment was undertaken to determine the best organic and in-organic fertilizer combination for maximum growth, yield attributes in french bean.

MATERIALS AND METHODS

Experimental site and crop: The field experiment was conducted at Horticulture Research Center (HRC) in RSM (PG) College Dhampur, Bijnor, Uttar Pradesh, India from October 2019 to Jan 2020 in *rabi* season. Geographically, it is situated between 29°15' 27.5328" latitude in north and 78°30' 0.2196" longitudes in the eastern elevation of about 235m above mean sea level. The climate of experimental site was under subtropical climate, characterized by three distinct season viz., Rainy, winter and summer season. The experimental field had sandy loam soil, low in organic carbon, nitrogen, medium in phosphorus, potash and slightly alkaline (pH- 8.0) in nature. The mechanical mixture of soil was 30.7 % coarse sand, 35.5 % fine sand 20.6% silt and 13.2 % clay. In this

investigation, Pant Anupama (UPF 191) a bush type french bean having dwarf with dark green foliage and it is a prolific bearer with tender, non stringy, medium long, translucent and green pods.

Experimental design and treatments

The field experiment was laid down in Randomized Block Design (RBD) with three replications and consisting of eight treatment combinations, comprising control: No treatment (T_1), 100% RDF (T_2), 100% FYM (T_3), 100% Vermicompost (T_4), 50% RDF+ Vermicompost (T_5), 50% FYM + RDF (T_6), 33% RDF+ Vermicompost + FYM (T_7), 50% FYM + RDF (T_8). Well decomposed FYM @ 25t/ha and vermicompost @ 5 t/ha was applied at the time of land preparation according to the treatment combinations. Half dose of nitrogen through urea; full dose of phosphorus through single super phosphate and full dose of potash through murate of potash were applied according to the treatment combination and remaining half dose of nitrogen through urea was applied after 20 DAS. Treated the seed with trichoderma @ 4 g/kg of seed 24 h before sowing to control fungal disease. Seed of variety pant Anupama were sown at spacing of 50x15 cm in a plot having dimensions of 3.0 m × 1.5 m. All cultural practices and plant protection measures were taken as per recommendations.

Observations During experiment

The observations were recorded during experiment on plant height (cm), number of leaves/plant, days to first and 50% flowering, days to first and final picking, length of green pod (cm), diameter of green pod (mm), number of green pod/plant (g), weight of individual green pod (g), green pod yield/plant (gm), green pod yield/plot (kg), green pod yield (q/ha). Average of data from the sampled plant of each treatment was used for statistical analysis in order to draw valid conclusions.

RESULTS AND DISCUSSION

The result obtained from the study on growth and yield attributes of french bean are discussed. The yield and yield attributes of all observations are furnished in Table 1.

Table 1. Impact of Organic and Inorganic fertilizer on Growth and Yield attributes in French bean.

	Plant height (cm)	Number of leaves /plant	Days to first flowering	Days to 50% flowering	Days to first picking	Days to final picking	Green pod length (cm)	Pod diamet (mm)	Number of pod /plant	Weight of individua green pod (gm)	Green pod yield/ plant (gm)	Green pod yield plot (kg)	Green pod yield q/h
T ₁ -CONTROL	18.75	31.7	37.5	44.07	48.3	73.47	9.5	4.92	21.73	4.92	103.03	5.04	112.07
T ₂ -100 % NPK	21.88	32.5	35.1	41.97	47.53	72.13	9.56	5.26	22.8	5.91	109.83	5.64	125.25
T ₃ -100%FYM	21.47	33.83	32.87	41.06	47.6	72.03	9.71	5.74	21.3	5.71	110.89	5.69	126.36
T ₄ -100% VC	21.65	33.57	32.63	41.89	46.37	71.37	10.8	5.22	22.51	5.79	108.19	5.89	130.95
T ₅ -50%NPK+VC	21.83	33.4	36.37	42.16	47.1	71.63	9.42	5.32	23	6.46	107.72	5.36	119.02
T ₆ -50%FYM+VC	22.75	33.69	33.73	41.2	46.33	70.32	11.15	5.99	23.9	4.9	111.19	5.93	131.69
T ₇ -33%NPK+VC + FYM	23.13	36.87	32.53	39.91	45.27	69.63	14.1	6.34	26.27	6.78	132.99	6.08	135.17
T ₈ -50% NPK + FYM	24.5	36.93	31.13	36.7	44.33	69.17	14.9	7.88	29.13	7.18	133.99	6.46	143.47
Mean	22	34.07	33.98	41.12	46.6	71.22	11.14	5.83	23.83	5.96	114.73	5.76	128
Minimum	18.75	31.7	31.13	36.17	44.33	69.17	9.5	4.92	21.73	4.92	103.03	5.04	112.07
Maximum	24.5	36.93	37.3	44.07	48.3	73.47	14.9	7.88	29.13	7.18	133.99	6.46	143.47
SEm±	0.88	0.9	0.51	0.74	0.35	0.32	0.49	0.23	0.97	0.28	1.76	0.04	0.77
CD at 5%	2.69	2.75	1.56	2.25	1.06	0.98	1.48	0.71	2.97	0.86	5.38	0.11	2.37
CV (%)	6.92	4.57	2.59	3.1	1.28	0.78	7.53	6.9	7.04	8.12	2.65	1.05	1.05

Growth attributes

It is clearly indicate that maximum plant height (24.50 cm), was found with the treatment T₈- (50% RDF+50% FYM) followed by (36.27) in treatment T₇ (33% RDF+FYM+VC), whereas, the minimum plant height (18.75cm) was obtained in treatment T₁ (Control). In terms of maximum number of leaves/ plant(36.93) were recorded in treatment T₈- (50% RDF+ FYM) followed by (36.87) in treatment T₇ (33% RDF+FYM+VC), while, the minimum (31.33) number of leaves/plant was observed in treatment T₁ (Control). It is clearly indicate that minimum number of daystaken to first flower appearance was evident in treatments T₈ (50% RDF+NPK) followed by (32.53) in treatments T₇ (33% RDF+FYM+VC),whereas, the maximum days (37.50 days) was taken to first flowering obtained in treatment T₁ (Control). In terms of days to 50% flowering, the earliest 50% flowering (36.17) was found with treatment T₈ (50%RDF+FYM) followed by (39.91 days) in treatment T₇ (33% RDF+FYM+VC) whereas, treatment T₁ (Control) had maximum days (44.07) for 50% flowering. The minimum number of days to first picking(44.33) was performed in treatment T₈(50%RDF+FYM) followed by (45.27 days) in treatment T₇ (33%RD-F+FYM+VC) over (T₁, control) (48.30 days). The

results found have wide range of variation in respect of days to final picking of all treatments. Treatment T₈ (50% RDF+FYM) had taken to minimum number of days to final picking of pods at (69.17 days) followed by treatment T₇ (33% RDF+FYM+VC) at (69.63 days), whereas, treatment T₁ (control) had taken maximum number of days of final picking at (73.47days).Nitrogen, phosphorus and potassium are source of inorganic fertilizer in which nitrogen is the most in dispensible of all mineral nutrients for growth and development of plant as it is basis of fundamental constituents of all living matter. Result of Kaker *et al.* (2002), Mathur *et al.* (2008). Phosphorus and potassium plays an important role in metabolic reaction, energy conservations, biological energy transformation and regulating the opening closing stomata water retention and overall growth in term of plant height, number of leaves/plant. Growth activity of plant enhanced due the photosynthesis activity and carbohydrate metabolism in plant. Formation of storage compounds (ATP and ADP) leads to increase activity in cell growth and provide energy to the cells.

Yield attributes

The maximum (14.90cm) green pods length was noted in treatment T₈ (50% RDF+FYM) followed by

(14.10 cm) in treatments T_7 (33%RDF+FYM+NPK), whereas, the minimum (9.50cm) green pod length was observed in treatment T_1 (Control). The treatment T_8 (50% RDF+FYM) had maximum pod diameter (7.88 mm) followed by (6.34mm) in treatments T_7 (33%RDF+FYM+NPK), while, the minimum (4.92) green pod length was observed in treatment T_1 (Control). The maximum (29.13) number of pods was performed in treatment T_8 (50% RDF+FYM) followed by (26.27) in treatments T_7 (33%RDF+FYM+NPK), whereas, the minimum (21.73) number of pods was found in treatment T_1 (Control). It is clear that maximum individual green pod weight was recorded in treatments T_8 (50% RDF+FYM, 7.18 g) followed by treatments T_7 (33% RDF+FYM+VC, 6.78 g), whereas, the minimum individual green pod weight was observed in treatments T_1 (Control, 4.92 g) may be due to combined application of NPK and organic manures which significantly help in increasing the pod diameter, pod length with maintaining the soil fertility and plant nutrient supply at an optimal level which supports the findings of Singh *et al.* (2010), Wani *et al.* (2011) which reported that the excessive amount of organic and inorganic fertilizer is used to achieve to higher yield attributing characters.

In terms of green pod yield/plant, treatment T_8 (50% RDF+FYM) observed maximum (133.99 g) followed by T_7 (33%RDF+FYM+VC) with (132.99 g), whereas the minimum green pod yield/plant (103.03 g) was recorded in treatment T_1 (Control). The maximum green pod yield/plot (6.46kg) was obtained in treatment T_8 (50%RDF+FYM) followed by (6.08 kg) in treatment T_7 (33%RDF+FYM+VC), whereas T_1 (control) had minimum green pod yield/plot (5.04 kg). It was observed that green pod yield/ha for all the treatment has influenced by various organic manure, inorganic fertilizer and mixed combination of both. Treatment T_8 (50%RDF+FYM) had maximum green pod yield/ha (143.47 q/ha) followed by (135.17q/ha) in treatment T_7 (33% RDF +FYM+VC), whereas T_1 (control) recorded minimum green pod yield/ha (112.07). The interactive influence of vermicompost and FYM on growth might be due to improved physico-chemical and biological properties like water holding capacity, hydraulic conductivity, high rate of microbial transformations due to availability of organic carbon in the form of FYM for heterotrophic

organism, buffering effect, improved soil aggregation and release of organic acid. The results obtained in the present study are supported the findings of Singh *et al.* (2005), Ram Pyare *et al.* (2017). This significant improvement in yield and yield attributes on account of application of chemicals fertilizers, Vermicompost with FYM and was found significant for number of green pods per plant, weight of individual green pod, green pod yield per plant, green pod yield per plot, green pod yield /ha. The results of present investigation are in line with those of Khan *et al.* (2015) in cowpea Vikrant *et al.* (2005).

CONCLUSION

On the basis of results evaluated from the present experiment carried out during *rabi* season 2019-20. It may be concluded that the treatment T_8 (50%RDF+50% FYM) was found to be significantly better in respect of growth and yield parameters. It indicate that we can save 25% recommended dose of fertilizer supplemented by making effective combination of chemical fertilizer with FYM. The application of 50 % RDF+50%FYM were found better than the rest of the treatments for yield and most of the yield attributing characters. These treatments may be considered as guidelines for further enhancement of growth, yield and quality parameters in french bean.

REFERENCES

- Anonymous (2021) Indian Horticulture Database, Gurgaon, <https://www.nhb.gov.in>.
- Albiach R, Canet R, Pomares F, Ingelmo F (2000) Microbial biomass content and enzymatic activities after the application of organic amendments to a horticultural soil. *Biores Technol* 75: 43-48.
- Datt N, Dubey YP, Chaudhary R (2013) Studies on the impact of organic, inorganic and integrated use of nutrients on symbiotic parameters, yield, quality of french bean (*Phaseolus vulgaris* L.) Vis-a-Vis soil properties of an acid alfisols. *Afr J Agric Res.* 8 (22): 2645-2654.
- Kaker AA, Saleem M, Shah R, Shah Q (2002) Growth and marketable green pod yield performance of pea (*Pisum sativum* L.) under varying levels of NPK fertilizers. *Asian J Pl Sci* 1(5): 532-534.
- Khan VM, Manohar KS, Kumawat SK, Verma HP (2015) Effect of vermicompost and biofertilizer on yield and soil nutrient status after harvest of harvest of cowpea (*Vigna unguiculata* L.W.). *Agric Sustain Develop.* 1(1): 79-81.

- Mathur N, Singh J, Bohra A, Solanki R, Vyas A (2008) Response of moth bean genotypes to nutrient management under arid conditions of India Thar desert. *J Food Legume*, 21(1): 69-70.
- Messina ML (1999) Legumes and soybeans: Overview of their nutritional profiles and health effects. *Am J Clin Nut*. 70 (special): 439-450.
- Ram Pyare PK, Verma VK, Chauhan GV (2017) Study on the effect of sulfur, zinc and FYM on growth, Yield and economics of french bean (*Phaseolus vulgaris* L.). *Int J Appl Sci Agric* 3 (7): 123-125.
- Singh DP, Prakash HG, Singh RP (2005) Effect of phosphorus and cycocel with without Rhizobium inoculation on green pod production of pea. *Ind J Pulse Res*.18 (1): 43-45.
- Singh BK, Pathak KA, Verma VK, Dhaka BC (2011) Effect of vermicompost fertilizer and mulch on plant growth nodulation and pod yield of french bean (*Phaseolus vulgaris* L.). *Veg Crop Re Bull* 74(7): 153-165.
- Singh B, A Pathak, K& Boopathi T. (2010) Vermicompost and NPK Fertilizer effects on Morpho- Physiological trait of plants, yield and quality of tomato Fruits: (*Solanum lycopersicum* L.). *Vegetable Crops Research Bulletin*. 73: 77-86. 10.2478/v10032-010-0020-0.
- Vikrant, Singh H, Malik CVS, Singh BP (2005) Grain yield and protein content of cowpea as influenced by farm yard manure and phosphorus application. *Ind J Pulse Res* 18 (2): 250-251.
- Wani AJ, Raj Narayan, Ahmed N, Single AK. (2011) Influence of organic and inorganic source o nutrients on growth, yield and quality of cauliflower (*Brassica oleracia* var *botrytis* L.). *Environ Ecol* 29(4):1941-1947.