



P-ISSN: 2349-8528

E-ISSN: 2321-4902

IJCS 2019; 7(3): 214-217

© 2019 IJCS

Received: 20-03-2019

Accepted: 24-04-2019

Deborah Rachel Rane

Department of Soil Science and
Agricultural Chemistry Sam
Higginbottom University of
Agriculture, Technology and
Sciences, Prayagraj, Uttar
Pradesh, India

N Swaroop

Department of Soil Science and
Agricultural Chemistry Sam
Higginbottom University of
Agriculture, Technology and
Sciences, Prayagraj, Uttar
Pradesh, India

P Smriti Rao

Department of Soil Science and
Agricultural Chemistry Sam
Higginbottom University of
Agriculture, Technology and
Sciences, Prayagraj, Uttar
Pradesh, India

Impact of organic manures and different levels of inorganic fertilizers on growth and yield attributes of French bean (*Phaseolus vulgaris* L.) cv. NBR-Ratna

Deborah Rachel Rane, N Swaroop and P Smriti Rao

Abstract

The present study entitled “Impact of organic manures and different levels of inorganic fertilizers on growth and yield attributes of French Bean (*Phaseolus vulgaris* L.)” was carried out during the *Rabi* season 2018-2019. The experiment was conducted in a Randomized Block Design (RBD) with a treatment combination of three levels of inorganic fertilizers (NPK) and FYM (0, 50 and 100% dosage). The treatments were replicated three times and arranged under 9 plots. The variety NBR- RATNA was used for sowing, which matures within 90-120 days. The seeds are sown in a row to row distance of 45 cm and plant to plant distance of 30 cm. In this investigation, the results revealed that application of $T_8 = @N_{40}P_{50}K_{40} + @ 20 \text{ t ha}^{-1}$ FYM, significantly increased the growth parameters and yield *viz.*, Plant height (cm), Number of leaves per plant, Number of Branches per plant, Number of nodules per plant, Fresh weight (g), Dry weight (g), Number of pods per plant, Number of seed per plant, Length of pod (cm), Test weight (g), Pod yield (kg) per plot, Pod yield (q ha^{-1}).

Keywords: NPK, FYM, growth, yield, French bean

Introduction

India is blessed with diverse agro climatic zones with distinct seasons thereby making it the second largest producer of vegetables in the world after China. In India, vegetables are grown in 10.10 m ha with a production of 169.06 MT and productivity of 16.73 t ha^{-1} . (NHB, 2017) [8]. Vegetables are important part of healthy eating and provide a source of many nutrients including potassium, fibre, folate (folic acid) and vitamins A, E and C. Potassium may help to maintain healthy blood pressure. Dietary fibre from vegetables helps reduce blood cholesterol levels and may lower risk of heart disease. Folate (folic acid) helps the body form healthy red blood cells.

Pulses crop offers a stable source of protein in vegetarian diet of masses. Besides their role in soil fertility restoration and its physical conditions, pulses has provided succulent and nutritious to our cattle therefore, have been described as “Unique jewels of Indian crop husbandry” (Swaminathan 1998) [14]. Pulses add 0.8 to 1.5 tons of organic matter to the soil in the form of their roots left after harvesting of the crops. Nitrogen, phosphorus and potassium have great effects in plant growth and development. Their deficiencies or excesses result in marked effects on the growth and yield of crops. Nitrogen is a chlorophyll component and it promotes vegetative growth and green coloration of foliage (Jones, 1983) [4]. Phosphorus plays a major role in photosynthesis, respiration, energy storage, cell division and maturation. Potassium is important in plant metabolism, protein synthesis and chlorophyll development (Remison, 2005) [10]. Urea and muriate of potash are fertilizers that supply nitrogen and potassium, respectively (Jones, 1983) [4] while crystallizer supper is a phosphorus fertilizer (Mgbeze and Abu, 2010) [7]. Organic sources of the plant nutrients have been reported to improve growth, yield attributes, yield and soil fertility status. Inadequate use of the organic manures has rendered Indian soils deficient in macro and micro nutrients (Acharya and Mandal, 2002) [2].

Materials and Methods

The research work was carried out during the *Rabi* season 2018-2019 at the research farm of Department of Soil Science and Agricultural Chemistry, Naini Agriculture Institute, Sam Higginbottom University of Agriculture, Technology and Sciences (U.P.).

Correspondence

Deborah Rachel Rane

Department of Soil Science and
Agricultural Chemistry Sam
Higginbottom University of
Agriculture, Technology and
Sciences, Prayagraj, Uttar
Pradesh, India

The climate in Prayagraj, UP, has been classified as semi-arid with both the extent of temperature during winter and summer. During December to January, the temperature may drop down to as low as 2°C, while it may exceed to 47°C during May- June. Frost during winter and hot air during summer are common occurrences. It comes under subtropical climate receiving the mean annual rainfall of about 1100mm, major rainfall from July to end of September. However, occasional precipitation was also not uncommon during winter. The winter months were cold while summer months were very hot and dry. The minimum temperature during the crop season was 5.9 °C and the maximum was 29.04 °C. The minimum humidity was 42.72.0% and maximum was 93.28%. The experiment was carried out at the research farm of Soil Science and Agricultural Chemistry Department (SSAC), Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (UP), during *Rabi* season of November 2018 - Feb 2019. The experiment was conducted in a Randomized Block Design (RBD) with a treatment combination of three levels of inorganic fertilizers, NPK, and FYM (0, 50 and 100% dosage). The treatments were replicated three times and arranged under 9 plots. The variety NBR- RATNA was used for sowing which matures within 90-120 days. The seeds were sown in a row to row distance of 45 cm and plant to plant distance of 30 cm.

Results and Discussion

The result presented in Table 1 and Fig.1 shows the significant influence of different levels of NPK and FYM on plant height, number of leaves per plant, number of branches per plant, number of nodules per plant, fresh weight and dry weight of French bean. As far as interaction between NPK and FYM levels is concerned; the maximum plant height (15.57), number of leaves per plant (27.44) and number of branches per plant (12.72), number of nodules per plant (30.42), fresh weight (1.05g) and dry weight (19.50) was obtained with treatment T₈=@N₄₀P₅₀K₄₀ + @ 20 t ha⁻¹ FYM where as the minimum plant height (26.11cm), number of leaves per plant (18.59) and number of branches per plant (8.22), number of nodules per plant (18.31), fresh weight

(0.43) and dry weight (10.93) remained with treatment T₀=@N₀P₀K₀ + @ 0 t ha⁻¹ FYM. The improvement in growth in the treatment combination (T₈=@N₄₀P₅₀K₄₀ + @ 20 t ha⁻¹ FYM) might be due to combined application of FYM that influenced the physical, chemical and biological properties of soil through supplying macro and micro nutrients leading to better plant growth and development which supports the findings of Meelu (1996) [6], Patidar and Mali (2004) [9], Singh *et al.* (2009) [13] and Sharma *et al.* (2011) [11]. This finding has close conformity with Choudhari *et al.*, (2001) [3], Sathe *et al.*, (2007) [12] and Kumar *et al.*, (2009) [5] who reported the highest green pod yield ha⁻¹ in French bean was due to combine application of organic and inorganic fertilizers. NPK fertilizer is a good way of making judicious and efficient use of applied nutrients (Ayoola and Adeniyani, 2006) [1].

Table 2 and Fig.2 depicted that the mean value of number of pods per plant, number of seeds per pods, length of pods (cm), test weight, pods yield (kg) per plot and pods yield (112.67q ha⁻¹) of French bean was found significant of different levels of NPK and FYM. It was also observed the number of pods per plant was gradually increased with an increase in dose of NPK and FYM. The maximum number of pods per plant (36.49), number of seeds per pods (9.11), length of pods (cm) (17.91cm), test weight (84.34g), pods yield (kg) per plot (4.21kg) and pods yield (112.67q/ha⁻¹) of French bean was found in T₈=@N₄₀P₅₀K₄₀ + @ 20 t ha⁻¹ FYM and minimum number of pods per plant (12.33) seeds pods (4.52), length of pods (cm) (9.31), test weight (34.44g), pod yield (kg) per plot (1.43g) pod yield (kg) per plot (34.84q ha⁻¹) was found in T₀=@N₀P₀K₀ + @ 0 t ha⁻¹ FYM respectively. The improvement in growth and yield parameters in the treatment combination (T₈=@N₄₀P₅₀K₄₀ + @ 20 t ha⁻¹ FYM) could be due to combined application of FYM and NPK that influence the physical, chemical and biological properties of soil through supplying macro and micro nutrients leading to better plant growth and development which support the findings of Meelu (1996) [6], Patidar and Mali (2004) [9], Singh *et al.*, (2009) [13] and Sharma *et al.*, (2011) [11].

Table 1: Impact of organic manures and different levels of inorganic fertilizers on growth and yield attributes of French bean (*Phaseolus vulgaris* L.)

Level of FYM	Plant height (cm)	Number of leaves per plant	Number of Branches	Number of nodules per plant	Fresh weight (g)	Dry weight (g)	
0 t ha ⁻¹	12.57	22.96	8.34	19.51	0.64	14.43	
10 t ha ⁻¹	14.24	24.85	8.79	21.15	0.84	16.57	
20 t ha ⁻¹	14.80	25.84	11.64	26.03	0.91	18.63	
Level of NPK							
0% NPK	13.34	23.53	9.22	20.77	0.68	14.90	
50% NPK	13.73	25.20	9.39	22.44	0.83	16.93	
100% NPK	14.54	24.92	10.16	23.47	0.92	17.81	
F-Test	S	S	S	S	S	S	
S.Ed.	0.438	0.507	0.162	0.408	0.027	0.149	
C. D. at 0.05	0.936	0.878	0.345	0.872	0.058	0.319	
Interaction (FYM x NPK)							
T ₀	Control	11.30	18.59	8.22	18.31	0.43	10.93
T ₁	@N ₀ P ₀ K ₀ + @ 10 t ha ⁻¹ FYM	12.75	25.89	8.13	20.78	0.68	15.89
T ₂	@N ₀ P ₀ K ₀ + @ 20 t ha ⁻¹ FYM	13.67	24.42	8.67	19.44	0.82	16.48
T ₃	@ N ₂₀ P ₂₅ K ₂₀ + @ 0 t ha ⁻¹ FYM	14.22	26.71	8.67	20.56	0.80	15.92
T ₄	@ N ₂₀ P ₂₅ K ₂₀ + @ 10 t ha ⁻¹ FYM	14.11	24.93	8.63	22.33	0.93	16.36
T ₅	@N ₂₀ P ₂₅ K ₂₀ + @ 20 t ha ⁻¹ FYM	14.39	22.91	9.08	20.56	0.89	17.44
T ₆	@N ₄₀ P ₅₀ K ₄₀ + @ 0 t ha ⁻¹ FYM	14.50	25.29	10.78	23.44	0.80	17.84
T ₇	@N ₄₀ P ₅₀ K ₄₀ + @ 10 t ha ⁻¹ FYM	14.34	24.78	11.41	24.22	0.87	18.55
T ₈	@N ₄₀ P ₅₀ K ₄₀ + @ 20 t ha ⁻¹ FYM	15.57	27.44	12.72	30.42	1.05	19.50
F-Test	NS	S	S	S	S	S	
S.Ed.	0.758	0.507	0.162	0.707	0.047	0.259	
C.D. at 5%	-	0.878	0.345	1.511	0.101	0.553	

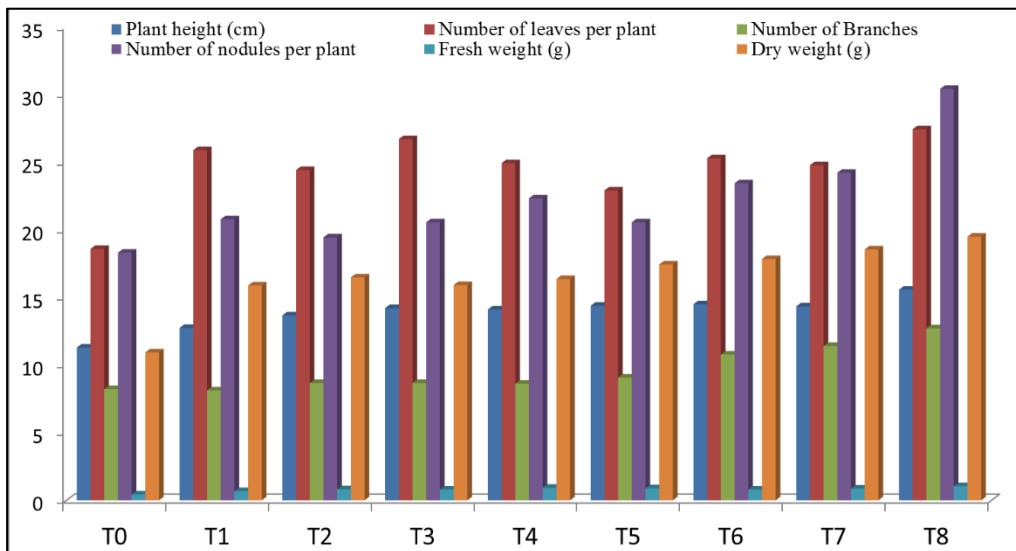


Fig 1: Impact of organic manures and different levels of inorganic fertilizers on growth and yield attributes of French bean (*Phaseolus vulgaris* L.)

Table 2: Impact of organic manures and different levels of inorganic fertilizers on yield attributes of French bean (*Phaseolus vulgaris* L.)

Level of FYM	Number of pods per plant	Number of seed per plant	Length of pod (cm)	Test weight (g)	Pod yield (kg) per plot	Pod yield (q/ha ⁻¹)	
0 t ha ⁻¹	17.04	5.13	10.42	41.31	1.91	54.48	
10 t ha ⁻¹	23.20	6.35	13.25	70.892	3.20	77.83	
20 t ha ⁻¹	30.27	8.12	15.72	83.13	3.75	94.81	
Level of NPK							
0% NPK	19.57	5.83	11.08	61.61	2.59	64.47	
50% NPK	23.47	6.45	13.87	64.47	2.88	74.44	
100% NPK	27.46	7.32	14.44	69.17	3.39	88.22	
F-Test	S	S	S	S	S	S	
S.Ed.	0.674	0.090	0.527	0.201	0.080	0.70	
C. D. at 0.05	1.441	0.192	1.127	0.429	0.171	0.102	
Interaction (FYM x NPK)							
T ₀	Control	12.33	4.52	9.31	38.44	1.43	34.84
T ₁	@N ₀ P ₀ K ₀ + @ 10 t ha ⁻¹ FYM	17.44	5.08	11.26	40.37	1.79	55.3
T ₂	@N ₀ P ₀ K ₀ + @ 20 t ha ⁻¹ FYM	21.33	5.78	10.70	45.312	2.50	73.31
T ₃	@ N ₂₀ P ₂₅ K ₂₀ + @ 0 t ha ⁻¹ FYM	22.15	5.85	11.64	64.73	2.85	74.95
T ₄	@ N ₂₀ P ₂₅ K ₂₀ + @ 10 t ha ⁻¹ FYM	22.89	6.13	13.39	69.62	3.32	79.86
T ₅	@N ₂₀ P ₂₅ K ₂₀ + @ 20 t ha ⁻¹ FYM	24.56	7.08	14.72	78.12	3.45	78.66
T ₆	@N ₄₀ P ₅₀ K ₄₀ + @ 0 t ha ⁻¹ FYM	24.22	7.12	12.28	81.66	3.50	83.61
T ₇	@N ₄₀ P ₅₀ K ₄₀ + @ 10 t ha ⁻¹ FYM	30.09	8.13	16.97	83.41	3.53	88.14
T ₈	@N ₄₀ P ₅₀ K ₄₀ + @ 20 t ha ⁻¹ FYM	36.49	9.11	17.91	84.34	4.21	112.67
F-Test	S	S	S	S	S	S	
S.Ed.	1.168	0.156	0.913	0.347	0.138	0.138	
C.D. at 5%	2.497	0.333	1.953	0.743	0.295	0.295	

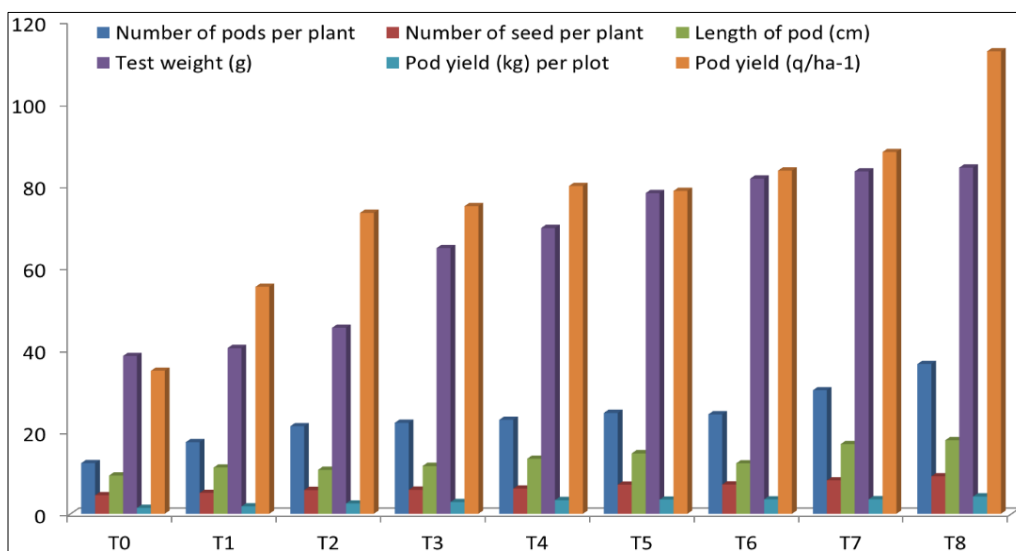


Fig 2: Impact of organic manures and different levels of inorganic fertilizers on yield attributes of French bean (*Phaseolus vulgaris* L.)

Conclusion

In view of the results summarized above, it is concluded that application of $T_8 = @N_{40}P_{50}K_{40} + @ 20 \text{ t ha}^{-1}$ FYM supplied through NPK and FYM gave the highest yield on French bean. Since the result is based on one year experiment further trial is needed to substantiate the result.

References

1. Ayoola OT, Adeniyani ON. Influence of poultry manure and NPK fertilizer on yield and yield components of crops under different cropping systems in south west Nigeria. *Afr. J Biotechnol.* 2006; 5:1386-1392.
2. Acharya CL, Mandal KG. Integrated plant nutrient supply in vegetable crops. In: Compendium recent advances in vegetable production technology. Proceedings of winter school, 3–23 December, Indian Institute of Vegetable Research, Varanasi (UP), 2002, 79-104.
3. Choudhari CS *et al.* nutrient management in French bean *J Soils and Crops.* 2001; 11(1):137-139.
4. Jones JB. A guide for the Hydroponic and Soil-less Culture Grower. Timber Press, Beaverton, Oregon, 1983, 124.
5. Kumar RP *et al.*, Effect of integrated nutrient management on growth, yield, nutrient uptake and economics of French bean. *Indian. J of Agric. Sci.* 2009; 79(211):122-128.
6. Meelu OP. Integrated nutrient management for ecologically sustainable agriculture. *J Indian Soc. Soil Sci.* 1996; 44:582-592.
7. Mgbaze GC, Abu Y. The effects of NPK and farm yard manure on the growth and development of the African yam bean (*Sphenostylis stenocarpa* Hochst ex. a rich). *African Journal of Biotechnology.* 2010; 9(37):6085-6090.
8. NHB. Horticultural Statistics at a Glance 2017, Government of India, Ministry of Agriculture and Farmers Welfare, Dept. of Agriculture, Cooperation and Farmers welfare, Horticulture statics Division, 2017, 14
9. Patidar M, Mali AL. Effect of farmyard manure, fertility level and biofertilizers on growth, yield and quality of sorghum (*Sorghum bicolor*). *Indian J Agron.* 2004; 42(2):117-120.
10. Remison SU. Basic Principles of Crop Physiology. Sadoh Press Nig. Limited. Benin City, 2005, 170.
11. Sarma I, Phookan DB, Boruah S. Effect of organic manures and biofertilizers on yield and economics of cabbage, (*Brassica oleracea* var. *capitata*). *J Eco - friendly Agric.* 2011; 6(1):6-9.
12. Sathe BA. Effect of different sources of nitrogen on growth yield and quality of French bean (*Phaseolus vulgaris* L.) M.Sc. (Agri) Thesis VNMKV Parbahni, 2007.
13. Singh SP, Choudhary R, Mishra AK.. Effect of different combinations of organic manure on growth and yield of ginger (*Zingiber officinale*. Rose.). *J Eco-friendly Agric.* 2009; 4(1):22-24.
14. Swaminathan MS. Crop production and sustainable food security pg 3-8 in Crop production and sustainability-shaping the future, proceedings of the 2nd International Crop Science Congress (Chopra V.L. Singha R. B. and Verma, Anupan, eds.) New Delhi India. Oxford and IBH Publishing Co, 1998.