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Effect of biofertilizers and organic manures on growth and yield of field pea (*Pisum Sativum* L.)

Farhin Siddiqui and Victor Debbarma

Abstract
A field experiment was conducted during *Rabi* season of 2021-22 at an experimental field of the Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology And Sciences, Prayagraj, Uttar Pradesh, India to determine the "Effect of Biofertilizers and Organic Manures on growth and yield of Field Pea. (*Pisum sativum* L,)". Three different levels of FYM, Vermicompost, rhizobium and PSB. There are 9 treatments and each replicated thrice. The result showed T7 [(Rhizobium 10 g/kg) + (PSB 10 g/kg) + (Vermicompost 1t/ha)] was recorded significantly higher plant height (87.50 cm), maximum number of nodules/plant (14.60) maximum number of pods/plant (20.60), highest seed yield (2.7 t/ha), highest stover yield (2.19 t/ha) was observed in treatment 7, [(Rhizobium 10 g/kg) + (PSB 10 g/kg) + (Vermicompost 1t/ha)] compared to other studied treatments.

Keywords: Field pea, organic manures, bio-fertilizers, growth parameters and yield

1. Introduction
Pulses occupy a unique position in agriculture and are rich in protein, ranging from 17-27%. Besides being a rich source of protein, they maintain soil fertility through biological nitrogen fixation in soil and thus play a vital role in furthering sustainable agriculture.
Pea belongs to the family Leguminosae. The field pea is a cool-season legume crop that is grown on over 25 million acres worldwide. The field pea is a type of pea sometimes called P. sativum subsp. *arvense* (L.) Asch. It is also known as dun (grey-brown) pea, and it is one of the oldest domesticated crops, cultivated for at least 7,000 years. Field peas are now grown in many countries for both human consumption and stock feed. There are several cultivars and colors including blue, dun (brown), maple and white. The field pea is a cool-season legume crop that is grown all over worldwide. The total area of pulses was 288.33 lakh/hectare. The total production of pulses 25.72 million/tonnes and yield was 892 kg/hectare. The production of Field pea in India 2020-21 was
7.92 lakh/ha. Uttar Pradesh having the highest production of field pea in 2020-21 by producing 4.953 lakh/ha. As of 49% of total production in India. (GOI, 2021) [8]
Peas flavour a cool climate with an average temperature range of 10-18 C during its growth period. However, frost during the later stages of crop growth cause considerable injury to the newly opened flowers and young developing pods. Pods grow best in those regions where there is a slow transition from cool to warm weather in spring. Phosphate-solubilizing bacteria may also improve P availability and crop growth by promoting biological nitrogen fixation, through releasing growth promoters such as indoleacetic acid, gibberellic, and cytokinin's. Additionally, PSB inoculation has been found to improve the yield and P nutrition of crops such as rice, maize, and other cereals. Thus, PSB can be an efficient, environmentally friendly and economically beneficial substitute for expensive P fertilizers. However, the potential of PSB in soils of a calcareous nature and with an alkaline reaction has not been well documented. (Krishnaraj *et al.* 2014) [15].
In early growth stage, hairy vetch plants sometimes show very poor plant growth and exhibit nutritional disorder that the leaves and stems turn to red color. From the results we investigated, the poor plant growth and the nutritional disorder is caused by nitrogen deficiency. For that reason, hairy vetch cannot easily utilize soil nitrogen under low temperature conditions. On the other hand, it is considered that nitrogen deficiency is related to the poor nodule formation and low nitrogen fixation activity of the rhizobia in the nodules. It is assumed that there is no rhizobia compatible with hairy vetch in the soil or some indigenous rhizobia show low nitrogen fixing activity under low temperature conditions in northeast area of Japan.

Thus, rhizobium helps in better growth of crops. Vermicomposting (VC) is a simple and effective technique to reprocess of agricultural waste, city garbage and kitchen waste along with bioconversion of organic waste materials into nutritious compost by earthworm action. VC technology involves the bio- conversion of organic waste into vermi casts, vermi wash utilizing earthworms. These earthworms feed on the waste and their gut act as the bioreactor where the vermi casts are produced (Ansari and Sukhraj 2010) [2]. Organic manures *viz*, FYM, Vermicompost, poultry manure and oilcakes help in the improvement of soil structure, aeration and water holding capacity of soil. These vermi casts are also termed VC and are rich in NPK and micronutrients (Palanichamy *et al*., 2011) [16]. Therefore, the present investigation entitled, "Effect of Biofertilizers and Organic Manures on growth and yield of Field Pea. (*Pisum sativum* L,)" was carried out at Crop Research Farm of Naini Agricultural Institute, Sam Higginbottom University of Agricultural Technology and Sciences, Prayagraj during Rabi Season 2021-22 for Field Pea crop.

2. Materials and Methods

The experiment was conducted during the Rabi season of 2021-22, at Crop Research Farm, Department of Agronomy, Naini Agricultural Institute at Sam Higginbottom University of Agriculture, Technology And Sciences (SHUATS), Prayagraj (U.P.) which is located at 25.28oN latitude, 81.54oE longitude and 98 m altitude above the mean sea level (MSL). The experiment was conducted in Randomized Block Design (RBD) with 9, treatments each replicated thrice.

The size of each treatment was 3 m x 3 m. There are four factors which are FYM, Vermicompost, Rhizobium and PSB. The field pea variety Rachana was sown on 8th December 2021 by maintaining a spacing of 30×10 cm. The treatments details are T1 [Rhizobium (20 g/kg) + Vermicompost (1t/ha)], T2 [Rhizobium (20 g/kg) + FYM (6t/ha)], T3 [Rhizobium (20 g/kg)+Vermicompost (0.5t/ha) +FYM (3t/ha)], T4 [PSB (20 g/kg) + Vermicompost (1t/ha)], T5 [PSB (20 g/kg) + FYM (6t/ha)], T6 [PSB (20 g/kg) + Vermicompost (0.5 t/ha) + FYM (3t/ha)], T7[Rhizobium (10 g/kg) + PSB (10 g/kg) + Vermicompost (1t/ha)], T8 [Rhizobium (10 g/kg) + PSB (10 g/kg) + FYM (6t/ha)], T9[Rhizobium (10 g/kg) +PSB (10 g/kg) + Vermicompost (0.5t/ha) + FYM (3t/ha)]. Growth parameters are plant height, and nodules/plant are recorded and yield parameters like pods/plant, nodules/plant, seed yield, stover yield were recorded and statistically analyzed using analysis of variance (ANOVA) as applicable to Randomized Block Design (Gomez K.A. and Gomez A.A. 1984) [9].

3. Results and Discussion

3.1 Growth Parameters

3.2 Plant Height (cm)

At 80 DAS, significant and highest plant height (87.50 cm) was observed in treatment 7 [Rhizobium (10 g/kg) + PSB (10 g/kg) + Vermicompost (1t/ha)], however treatment 1 [Rhizobium (20 g/kg) + Vermicompost (1t/ha)], treatment 2 [Rhizobium (20 g/kg) + FYM (6t/ha)], treatment 3 [Rhizobium (20 g/kg) + Vermicompost (0.5t/ha) + FYM (3t/ha)], treatment 6 [PSB (20 g/kg seed) + Vermicompost (0.5t/ha) + FYM (3t/ha)], and treatment 8 [Rhizobium (10 g/kg) + PSB (10 g/kg) + FYM (6t/ha)] was found statistically at par with treatment 7 [Rhizobium (10 g/kg) + PSB (10 g/kg) + Vermicompost (1t /ha)]. Significant increase in plant height was with the application of Rhizobium (10 g/kg), PSB (10 g/kg) might be due to the role in increasing soil fertility, increasing availability and uptake of nutrient elements (N, P, K) which ultimately led to improved vegetative growth of pea. (Bhat *et al*., 2013) [3]. Further, Vermicompost (1t/ha) increases the efficiency of inorganic phosphorus. Actually, organic fertilizers help to increase the organic matter contents of soil, thus reducing the bulk density and decreasing compaction. Thus, plants get a suitable growing environment which promotes better growth and development. Similar findings was also reported by (Arsalan *et al.* 2016) [1]

3.3 Nodules/Plant

During 80 DAS significant and maximum number of nodules/plant (14.60) was recorded in treatment 7 [Rhizobium (10 g/kg) + PSB (10 g/kg) + Vermicompost (1t/ha)], however treatment 4 [PSB (20 g/kg seed) + Vermicompost (1t/h)], was found statistically at par with treatment 7 [Rhizobium (10 g/kg) + PSB (10 g/kg) + Vermicompost (1t/ha)]. Mention in the table. Significant increase in nodules/plant was with the application of Rhizobium and PSB might be due to increase number of rhizobia and PSB in the rhizosphere due to inoculation, which synergistically increase the amount of nodules/plant. Maximum number of root nodules/plant was due to the fact the PSB in plant system enhances growth attributes. Similar findings also reported by (Bhat *et al*. 2013) [4]. Further, Vermicompost (1t/ha) increase in nodules/plant might be due to the rate of uptake of nutrients with increase in the symbiotic microbial association in field crop with the use of Vermicompost. Similar reports were also found in (Manivannam *et al.* 2007) [17].

3.4 Yield

3.5 Pods/Plant

The data presented on amount of pods/plant of field pea have been presented in table 4.2.1.

At harvest significant and maximum number of pods/plant (20.60) was recorded in treatment 7 [Rhizobium (10 g/kg) + PSB (10 g/kg) + Vermicompost (1t/ha)]. However, treatment 1 [Rhizobium (20 g/kg) + Vermicompost (1t/ha)] and treatment 9 [Rhizobium (10 g/kg) + PSB (10 g/kg) + Vermicompost (0.5t/ha) + FYM (3t/ha)] were found to be statistically at par with in treatment 7 with application of [Rhizobium (10 g/kg) + PSB (10 g/kg) + Vermicompost (1t/ha)].

Significant increase in pods/plant was with the application of Rhizobium (10 g/kg), PSB (10 g/kg) might be due to the more formation of photosynthates, there will be more survival of the flowers and that will lead to the development of more number of pods. (Khanna *et al*. 2019) [13]. Further, Vermicompost (1t/ha) and inorganic fertilizers improves soil physical properties, which provide health and favorable soil conditions to enhance nutrient use efficiency. Combination of Vermicompost and inorganic phosphorus fertilizers increased the number of pods plant. (Arsalan *et al*. 2016) [1]

3.6 Seed Yield (T/Ha)

At harvest significant and highest seed yield (2.70 t/ha) found in treatment 7 with application of [Rhizobium (10 g/kg) + PSB (10 g/kg) + Vermicompost (1t/ha)]. Mention in the table. Significant increase in yield was with the application of PSB (10 g/kg) might be due to the function of yield attributes

character is due the fact that the process of tissue differentiation from somatic to reproductive merismatic activity and development of floral primordial might have increased with increasing sulphur and phosphorus with inoculation of PSB resulting in more flowers and pods and ultimately the higher grain yield. **(**Chaurasiya *et al.* 2020) [6]. Further, Vermicompost (1t/ha) which improved the physical conditions of the soil which support better aeration to plant root, drainage of water, facilitation of cations N,P,K exchange, sustained availability of nutrients and thereby the uptake by the plants resulting in better growth. Similar reports were also found in (Manivannam *et al.* 2007) [17]

3.7 Stover Yield (T/Ha)

At harvest significant and highest stover yield (2.19 t/ha) was recorded in treatment 7 [Rhizobium (10 g/kg) + PSB (10 g/kg) + Vermicompost (1t/ha)] and it was found statistically significant as compared to the rest in the mention table. Significant increase in stover yield was with the application of Rhizobium and PSB might be due to the yield attributes influenced by genetic factors rather than the external environmental factors. Similar reports was also found in (Khanna *et al.* 2019) [13].

Table 1: Effect of biofertilizers and organic manures on the of field pea

S. No	Treatment	Plant height (cm)	Nodule s/plant
1	Rhizobium 20 g/kg + Vermicompost 1t/ha	85.66	12.73
2	Rhizobium 20 g/kg + FYM 6t/ha	85.67	11.93
3	Rhizobium 20 g/kg + Vermicompost 0.5t/ha+ FYM 3t/ha	85.34	11.40
4	PSB 20 g/kg seed + Vermicompost 1t/ha	84.80	13.60
5	PSB 20 g/kg seed + FYM 6t/ha	84.74	12.33
6	PSB 20 g/kg seed + Vermicompost 0.5t/ha+ FYM 3t/ha	85.60	11.60
7	Rhizobium 10 g/kg+ PSB 10 g/kg + Vermicompost 1/ha	87.50	14.60
8	Rhizobium 10 g/kg + PSB 10 g/kg+ FYM 6t/ha	85.46	12.93
9	Rhizobium 10/kg + PSB 10 g/kg +Vermicompost *0*.5t/ha FYM 3t/ha	80.82	12.60
10	F test	S	S
11	SEm±	0.83	0.27
12	CD (P= 0.05)	2.55	0.81

Table 2: Effect of biofertilizers and organic manures on the yield of field pea

S. No	Treatment	Pods/plant	Seed yield	Stover/ yield
1	Rhizobium 20 g/kg + Vermicompost 1t/ha	18.73	2.24	2.16
2	Rhizobium 20 g/kg + FYM 6t/ha	16.66	2.04	1.19
3	Rhizobium 20 g/kg + Vermicompost 0.5t/ha+ FYM 3t/ha	14.86	1.9	2.01
4	PSB 20 g/kg seed + Vermicompost 1t/ha	20.33	2.1	1.87
5	PSB 20 g/kg seed + FYM 6t/ha	17.33	2.3	2.09
6	PSB 20 g/kg seed + Vermicompost 0.5t/ha+ FYM 3t/ha	16.60	2.1	2.17
7	Rhizobium 10 g/kg+ PSB 10 g/kg + Vermicompost 1/ha	20.60	2.7	2.19
8	Rhizobium 10 g/kg + PSB 10 g/kg + FYM 6t/ha	17.66	1.8	2.04
9	Rhizobium 10/kg + PSB 10 g/kg + Vermicompost *0*.5t/ha FYM 3t/ha	18.73	2.1	1.84
10	F test	S	S	S
11	SEm±	0.755	0.16	0.5
12	CD (P= 0.05)	2.26	0.49	0.44

4. Conclusions

It may be concluded that application of biofertilizers and organic manures performs positively and improves the growth parameters and yield attributes of field pea. The data showed that plant height, number/nodules, pods/plant, seed yield and stover yield was recorded highest with the application of [Rhizobium (10 g/kg) + PSB (10 g/kg) + Vermicompost (1t/ha)]. These findings are based on one season therefore, further trials may be required for further confirmation.

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6. References

1. Arsalan MS, Ahmed JN, Chauhdary, Sarwar M. Effect of Vermicompost and phosphorus on crop growth and nutrient uptake in mungbean. Journal Appl. Agric. Biotechnol. 2016;1(2):38-46.
2. Ansari, A, Sukhraj K. Effect of vermiwash and Vermicompost on soil parameters and productivity in Guyana. African Journal of Agricultural Research. 2010;5(14):1794-1798.
3. Bhatt PK, Patel PT, Patel BT, Raval CH, Vyas KG, Ali S. Productivity, quality, nutrient content and soil fertility of summer green gram (*Vigna radiata L.*) as influenced by different levels of vermi-compost and phosphorus with and without PSB. International Journal of Agricultural Sciences. 2013;9:659-662.
4. Bhat T, Gupta M, Mahdi S, Ganai M, Bhat AJA, Bhat Iqbal A, *et al*. Growth, Yield and Economics of Field pea (*Pisum sativum L.*) as Influenced by Phosphorus and bio-fertilizers under subtropical conditions of Jammu Journal of pure and applied microbiology; c2013. p. **7**-3.
5. Chuahan S, Raghav B. Effect of phosphorus and phosphate solubilizing bacteria on growth, yield and quality of chickpea (*Cicer arietinum*). Annals of Plant and soil Research. 2017;19(3):303-306.

6. Chaurasiya P, Kumar S, Verma A. Kumawat L. Effect of PSB Inoculation with and Without P and S Application on Productivity of Mungbean (*Vigna radiata L.*) in Western U.P.India Int.J Curr.Microbiol.App.Sci. 2020;**9**(03):2418-2426.
7. Dakshayini G, Reddy JB, Kumar SC. Evaluation of the efficient Phosphate Solubilising Bacteria on growth of chickpea under greenhouse conditions. Advances in Life Sciences. 2016;**5**(2):662-666.
8. GOI. Economics and Statistics of Indian Agriculture. Annual Report, Government of India, New Delhi; c2021 .p. 21.
9. Gomez KA, Gomez AA. Statistical procedures for agricultural research (2 ed.). John Wiley and Sons, New York; c1984. p. 680.
10. https://agricoop.nic.in › sites › files › crop condition (Crops and PHNF division under Rabi crops 2021)
11. https://agricoop.nic.in/sites/default/files/crop%20condition.pdf (Directorate of Economics and statistics, DAC and FW 2021)
12. Heisnam P, Sah D, Moirangthem AM, Singh C, Pandey P, Mahato N, *et al*. Effects of Rhizobium, PSB Inoculation and Phosphorus Management on Soil Nutrient Status and Performance of Cowpea in Acid Soil of Arunachal Pradesh. Int. J Curr. Microbiol. App. Sci. 2017; 6(8):937-942.
13. Khanna R, Singh A, Singh S, Singh V, Kumar P, Singh SP. Effect of varying phophorous levels and rhizobium inoculation on growth and yield of cowpea. (*Vigna unguiculata L.)* Progressive Research – An International Journal Volume. 2019;14(4):314.319. Print ISSN:0973-6417, Online ISSN : 2454-6003.
14. Manivannan S, Balamurugan M, Parthasarathi K, Gunasekaran G, Ranganathan LS. Effect of Vermicompost on soil fertility and crop productivity - beans (Phaseolus vulgaris) Journal of Environmental Biology. 2009;30(2):275-281. ISSN : 0254-8704
15. Krishnaraj PU, Dahale S. Mineral phosphate solubilization:Concepts and prospects in sustainable agriculture. Indian National Science Academy. 2014;80 (2):389-405.
16. Raja AS, Palanichamy P. Leadership styles and its impact on organizational commitment. Asia Pacific business review. 2011 Jul;7(3):167-75.
17. Manivannan P, Jaleel CA, Sankar B, Kishorekumar A, Somasundaram R, Lakshmanan GA, Panneerselvam R. Growth, biochemical modifications and proline metabolism in Helianthus annuus L. as induced by drought stress. Colloids and Surfaces B: Biointerfaces. 2007 Oct 1;59(2):141-9.