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Response of Organic Manures, Inorganic Fertilizers and Bio-fertilizers on Growth and Yield of Field Pea (Pisum sativum L.)

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ABSTRACT

A field experiment was carried out in Agriculture farm, Department of Agronomy, Mewar University, Chittorgarh, Rajasthan, during the Rabi season of 2021-2022 to find out the "Effect of Organic Manures, Inorganic Fertilizers and Bio-Fertilizers on Growth and Yield of Field Pea (Pisum sativum L.)". The experiment was laid out in Randomized Block Design (RBD) comprising of 9 treatments with three replications. The results revealed that the treatment T_6 ((55:90:40) NPK + Rhizobium + PSB) was found to be the most suitable for various parameters; days to germination (9.08), number of days till the first bloom appears (44.42), days to pod set (63.67), number of pods/plant (24.75), Seed index (15.03) and Yield (68.26 q/ha).

Keywords: *Bio-Fertilizer, Field Pea, Inorganic Fertilizers, Organic Manures and Yield.*

INTRODUCTION

Field Pea (*Pisum sativum L.*) being an important pulse crops of India also ranks fifth among the vegetables grown in India. Some of the districts in Rajasthan where pea is being grown are Jaipur, Baran, Bundi, Kota and Bharatpur (Bunker *et al.,* 2018). It is an extremely nutritive Rabi season legume carries excessive percentage of digest able protein, along with carbohydrates, vitamin A, C, calcium and phosphorus (Jitender 2011). Field pea or dry pea is stored further for human consumption or livestock food. It is cultivated mainly in Uttar Pradesh, Madhya Pradesh, Himachal Pradesh, Punjab, Haryana, Rajasthan, Maharashtra, Bihar and Karnataka (Anonymous, 2016) Pea plays a crucial role in encouraging sustainable agriculture as pea has the ability to fix nitrogen in association with symbiotic rhizobium as it is widespread in its root nodules by maintaining its soil fertility (Negi *et al.,* 2006). Nitrogen fertilizers are very important during the initial stage of the growth for leaf, stem and vegetative growth, also it additionally increase the protein content in pea. However application of phosphorus is equally important for better growth and yield (Bunker *et al.,* 2018). Phosphorus is the key to proper growth and maturation of the crop, and it has a straight connection with root proliferation, straw strength, grain formation and crop quality (Bhat *et al.,* 2013). Phosphorus are inadequate in most of the

soils because of its "precipitation with ions such as calcium and iron (Marra *et al.*, 2011). To bypass P-availability, Phosphate solubilizing bacteria (PSB) can play a major part in to supply P to plants in more eco-friendly and sustainable manner. Available of soil P to plants is greatly impacted by activity of soil micro-organisms through their" Capability to solubilize and mineralize inorganic and organic soil P, amid the PSB, "Rhizobium is of specific importance because of its double function i.e. its capability to fix N_2 and to solubilize P (Kundu *et al.*, 2009). Boosting of seeds with Rhizobium, PSB and PGPR earlier before sowing is the low-price means to ameliorate the productivity of grain. Legumes, as it impact the nodulation, biological nitrogen fixation, produced growth hormones and ultimately higher the grain yield. Usage of systematic strains of Rhizobium, PSB and PGPR, thereby increases the nutrient use efficiency and yield, but reduce the cost of cultivation. (Chahal 1991) noticed that with the sowing of legumes the dry matter production and grain yield has also been increased along with the rise in modulation, it all happen because of the inoculation with Rhizobium. Boosting of field pea with Rhizobium improve the symbiotic parameters and caused an eminent rise in nitrogenous activity which in return gave rise to plant dry weight and nitrogen content (Buttery and Gibson 1990; Ryderberg 1990). Therefore use of organic manures, inorganic fertilizers and bio-fertilizers has been encourage for best result of the crop yield and also to maintain soil health (Qureshi *et al.*, 2015).

MATERIALS AND METHODS

The research, was conducted in the Rabi season of 2021-2022 at the Agriculture farm, Department of Agronomy, Mewar University, Chittorgarh, Rajasthan. The soil was clay loamy soil having organic C content 0.57, available N 575.74, available P 19.84, available K 327.87 and pH 7.97. The experiment was conducted with 9 treatments (Table 1) in randomized block design with three replications. All the organic manures i.e FYM, Vermicompost was applied during the time of sowing along with the inorganic fertilizers i.e Urea, diammonium phosphate and muraite of potash.

Seeds of Rachna variety field pea was treated with Bio-fertilizers (Rhizobium and PSB) before sowing after which the seeds was sown 3-4cm deep through line sowing. Spacing of the crop was 30cm row to row and 20cm plant to plant. The plot size for each treatment was 2.4x3.5. The crop was irrigated right after sowing and thereafter which it was done at intervals , but frequent irrigation was given during the flowering and pod filling stage. Hand weeding was also done in weekly. The crop was infested by aphids during the initial stage of the growth but no serious damage was done to the crop as timely spraying of insecticides i.e Imidacloprid was done to protect the crop, whereas Wilt Fusarium disease was found in T_9 (control) during the experiment where the symptoms was such that early yellowing and drying out of young leaves, which maybe seen during the seedling stage as well as the progress stage. The borders of the leaflets curve inwards and downward.

TABLE 1 Treatment Details

Treatment	Treatment details
T_1	Vermi compost + Rhizobium + PSB
T_2	FYM + Rhizobium + PSB

T_3	(30:60:40) NPK + Rhizobium + PSB
T_4	(30:75:40) NPK + Rhizobium + PSB
T_5	(45:60:40) NPK + Rhizobium + PSB
T_6	(55:90:40) NPK + Rhizobium + PSB
T_7	FYM + NPK : Rhizobium + PSB
T_8	Vermi compost + NPK : Rhizobium + PSB
T_9	Control

RESULT AND DISCUSSION

Growth Characters and Yield parameters

Plant height (cm)

The data in the table 2 showed that the highest plant height was reported in Treatment T_3 (30:60:40) NPK+ Rhizobium+PSB (92.83), followed by T_6 (55:90:40) NPK+ Rhizobium+ PSB (90.83) and the lowest was reported in Treatment T_9 (control) (81.92). It can be further seen that all the treatments was notably good other than the control. (Table 2). As they stimulate cell development, bacteria that fix nitrogen and remove phosphorus from the environment make certain organic acids and other biochemical substances. As a result, nitrogen as a whole helps plants grow taller by increasing the number of and lengths of the internodes, which then in turn demonstrates a continual growth in plant height. Pandey *et al.,* 2017 also reported results that were quite similar to these.

Number of leaves per plant

The data in Table 2 showed that the maximum number of leaves per plant was reported in Treatment T_8 (Vermi compost+ NPK: Rhizobium+ PSB) (101.67), followed by T_5 (45:60:40) NPK+ Rhizobium+ PSB) (99.67) and the minimum was reported in T_9 (control) (82.50). When organic manures are supplemented with inorganic fertilisers, it may lead to the micro - organisms in the quick decomposition of natural manures, that also tends to increase the availableness of nutrient content, particularly nitrogen, that support in protein synthesis, that also ultimately leads to a greater plant rate of growth, more leaves, & branches. This is because the slow release of nutrient content from organic manures causes the microorganisms to speed up the decomposition of organic manures. These results match the conclusions that were found by Naidu *et al.,* (2001), Mandal and Maiti. (1992), and Singh and Singh. (2003) in fenugreek and pea, respectively.

Days to Germination

The data related to days to germination can be seen Table 2 where the minimum number of days to germination was in Treatment T8 (Vermi compost + NPK: Rhizobium + PSB) (9.08), followed by T4 (30:75:40) NPK + Rhizobium + PSB (9.17) and the maximum days taken was in T9 (control) (12.00).

Days to first flowering

The data related to days to first flowering can be seen in Table 2 where the minimum number of days to first flowering was in Treatment T_6 (55:90:40) NPK+ Rhizobium+ PSB (44.42), followed by T_1 (Vermi compost+

Rhizobium+ PSB) (45.17) and the maximum days taken was in T_9 (control) (50.92). The application of potassium could well have resulted in an increase in the buildup of carbohydrates, which activated the reproductive section of the plant, which was the nearest sink. As a result, the plant was able to produce blooming and increased fruiting at the appropriate period. These results validate the findings that were found in pea by Vimala & Natrajan (2000), Gupta *et al.,* (2000), Singh & Singh (2002), Datt *et al.,* (2003), and Yadav and Luthra (2005).

Days to pod set

As seen in Table 2 the minimum number of pod set was in T6 (55:90:40) NPK + Rhizobium + PSB (63.67), followed by T3 (30:60:40) NPK + Rhizobium + PSB (64.42) and the maximum number of pod set was in T9 (control) (70.00). It's possible that an increase in Rhizobium is to blame for a rise in yield attributes, as this microorganism is known to stimulate root nodulation by means of enhanced root development as well as an increased availability of nutrients. This, in turn, leads to healthy plant growth and increased dry matter production, which, in turn, leads to an improvement in flowering, fruiting, as well as pod formation (Sardana *et al.,* 2006).

No of seeds per pod

In Table 2 data of seeds per pod is reported where the maximum number of seeds per pod was recorded in T_8 (Vermicompost+ NPK: Rhizobium+ PSB) (7.33), followed by T_7 (FYM+ NPK: Rhizobium+ PSB) (7.17) and the minimum was reported in T_9 (control) (5.67). It's possible that an increase in Rhizobium is to blame for a rise in yield attributes, as this microorganism is known to stimulate root nodulation by means of enhanced root development and an increased availability of nutrients. This, in turn, leads to healthy plant growth and increased dry matter production, which, in turn, leads to an improvement in flowering, fruiting, & pod formation (Sardana *et al.,* 2006).

No of pods per plant

The data presented in Table 2 significantly shows that the maximum no of pods per plant was in Treatment T_6 (55:90:40) NPK+ Rhizobium+PSB (24.75), followed by T_5 (45:60:40) NPK+ Rhizobium+PSB (23.50) and the minimum was in T_9 (control) (15.75). Increase photosynthesis, generation of photosynthates, and crop complete development when there is a prominent extend of root underneath a high reliability of phosphorus & organic manures. This may have helped in greater hold of other nutrients, namely micronutrient and secondary nutrients. This causes an increase in the quantity of pods produced per plant". The results of Singh & Singh (2002), Meena *et al.,* (2007), and Chattoo *et al.,* (2009) in garden pea have been confirmed by these results.

Pod Length (cm)

The data seen in Table 2 shows that the maximum pod length is in T_4 (30:75:40) NPK+ Rhizobium+ PSB (7.43), followed by T_3 (30:60:40) NPK+ Rhizobium+ PSB (7.28) and the minimum was in T_9 (control) (5.97). These results reveal the earlier reports of Samawat & Borah (2001), Chandrakar *et al.,* (2001), and Negi *et al.,* and show that as the plant height, number of leaves per plant, and number of branches per plant all increase, the

photosynthetic area and favourable physiological activities also boost. This results in the production of a greater number of pods per plant, as well as an increase in pod length and weight (2004).

Pods yield per plot (kg)

According to Table 2 the maximum yield of pods was in T_6 (55:90:40) NPK+ Rhizobium+ PSB (5.73), followed by T_8 (Vermi compost+ NPK: Rhizobium+ PSB) (5.55) and the minimum yield was recorded in T_9 (control) (3.41).Advancement in yield contributing characteristics, possibly as a result of the fact that combining Rhizobium expands the underlying cause nodulation by means of healthier root development and increased nutrient availability, outcomes in vigorous growing plants as well as dry matter production, and as a consequence, it gives the best flowering, fruiting, and pod creation (Sardana *et al.,* 2006).

Pods yield per hectare (q)

Table 2 shows the maximum yield of pods per hectare in T_6 (55:90:40) NPK+ Rhizobium+ PSB (68.26), followed by T_8 (Vermicompost+ NPK: Rhizobium+ PSB) (66.11) and the minimum was in T_9 (control) (40.59).

TABLE 2: Effect of treatments on different growth and yield of field pea

Treatment	Days to Germination	Plant height(cm)	Leaves per plant	Days to first flowering	Days to pod set	No of seeds per pod	No of pods per plant	Pod length (cm)	Pods yield per plot(kg)	Pods yield per hectare (q)
T1	10.08	88.83	96.67	45.17	66.50	6.25	18.42	6.98	4.58	54.51
T2	11.00	85.75	97.08	47.75	67.92	7.00	17.00	6.63	4.25	50.64
T3	10.75	92.83	95.92	46.00	64.42	6.75	15.83	7.28	4.85	57.74
T4	9.17	82.67	92.08	47.17	68.25	7.08	22.00	7.43	5.15	61.31
T5	11.75	86.50	99.67	48.58	67.67	5.75	23.50	6.79	3.55	42.30
T6	11.67	90.83	92.17	44.42	63.67	6.58	24.75	6.88	5.73	68.26
T7	9.67	85.58	94.08	49.00	64.83	7.17	17.00	7.26	4.17	49.60
T8	9.08	86.40	101.67	48.67	69.17	7.33	18.17	7.13	5.55	66.11
T9	12.00	81.92	82.50	50.92	70.00	5.67	15.75	5.97	3.41	40.59
C.D at 5%	0.74	6.78	16.62	2.03	1.67	0.64	1.08	0.26	0.54	6.45
S.Ed.(±)	0.35	3.20	7.84	0.96	0.79	0.30	0.51	0.12	0.26	3.04
CV	4.02	5.09	11.44	2.47	1.44	6.28	3.24	2.48	6.83	6.83

PLATES

CONCLUSION

From the findings of this study, one can draw the conclusion that the therapy T_6 is effective ((55:90:40) NPK + Rhizobium + PSB) was found to be the most suitable over all the other treatments in relation to significantly higher the number of days till the first bloom appears (44.42), days to pod set (63.67), number of pods/plant (24.75), Seed index (15.03), Yield/plot(5.73),quintal/ha(68.26).

REFERENCES

R.R. Bunker, R.K. Narolia, P. K. Pareek, V. Nagar, K. Kumar, Chnaniya and Omprakash, *Effect of nitrogen, phosphorus and bio-fertilizers on growth and yield attributes of garden pea (Pisum sativum L.). Inter. J. Chem. Std. 6(4),* 2018, *1701-1704.*

K. Jitendra, *Effect of phosphorus and Rhizobium inoculation on the growth, nodulation and yield of garden pea (Pisum Sativum L.)Cv."Mattar AGENTA- 6". Legume Res. 34*, 2011, *20-25.*

Anonymous (2016). *Horticulture Data base, National Horticulture Board, Gurgaon, and Haryana, India.*

S. Negi, R.V. Singh, and G.K. Dwivedi, *Effect of Bio-fertilizers, nutrient sources and lime on growth and yield of garden pea. Legume Res. 29(4),* 2006, *282-285.*

L M. Marra, M. De Oliveira, C R F. Soares, and F M. Moreira, *Solubilization of inorganic phosphates by inoculant strains from tropical legumes. Scientica Agricola 68 (5),* 2011, *603–09.*

B S. Kundu, K. Nehra, R. Yadav, and M. Toma, *Biodiversity of phosphate solubilizing bacteria in rhizosphere of chickpea, mustard and wheat grown in different regions of Haryana. Indian J. Microbio. 49,* 2009, *120–7.*

L.S. Chahal, *Effect of phosphorus levels and Rhizobium culture on growth and yield of field pea (Pisum sativum L). Pl. Soil; 45,* 1991, *673-676. 5.*

B.R. Buttery, A.H. Gibson, *The effect of nitrate on the time course of nitrogen fixation and growth in Pisum sativum and Vicia faba. Pl. Soil; 127(1),* 1990, *143-146. 6.*

I. Rydeberg, *Nitrogen fixation and yield characterstics of peas. Vixtodling No; 23,* 1990, *69-75.*

F. Qureshi, U. Bashir, and T. Ali, *Effect of integrated nutrient management on growth, yield attributes and yield of field pea (Pisum sativum L.) cv. Rachna. Legume Res. 38 (5),* 2015, *701-703.*

V. Pandey, O.S. Dahiya, V.S. Mor, R. Yadav, Jitendra, O.H. Peerzada, and A. Brar, *Impact of Integrated Nutrient Management on Seed Yield and Its Attributes in Field Pea (Pisum sativum L.). Chemical Science Review and Letters ISSN,* 2017, *2278-6783.*

A. K. Naidu, S. S. Kushwah, A. K. Mehta, and P.K. Jain, *Study of organic, inorganic and biofertilizers in relation to growth and yield of tomato. JNKVV Res. J. 35,* 2001, *36-37.*

A. R. Mandal, and R. G. Maiti, *Effect of nitrogen and phosphorus on growth, flowering and seed yield of fenugreek. Indian Agric. 36,* 1992,*169 –175.*

R. Singh, and S.S. Singh, *Response of seed yield of garden pea. (Pisum sativum) to various seed rate and fertility. Veg. Sci. 30,* 2003, *71-73.*

B. Vimala, and S. Natarajan, *Effect of nitrogen, phosphorus and biofertilizers on pod characters, yield and quality of pea* (*Pisum sativum L. spp hortense*). *South Indian Horticulture, 48,* 2000, *60-63.*

C.R. Gupta, S.S. Sengar, and J. Singh, *Growth and yield of table pea (Pisum sativum L.) as influenced by levels of phosphorus and lime in acidic soil. Veg. Sci. 27,* 2000, *101-102.*

S. P. Singh, and B. Singh, *Effect of Rhizobium inoculation and phosphorus application on growth and yield of pea (Pisum sativum L.). cv. Bonneville. Bioved, 13,* 2002, *69-72.*

N. Dutt, R.P. Sharma, and G. D. Sharma, *Effect of supplementary of FYM along with chemical fertilizers on productivity and nutrient uptake by vegetable pea (Pisum Sativum Var. Arvense) and buildup of Soil fertility in lahul valley of H.P. Indian J. Agric. Sci. 7,* 2003,*: 266-68.*

V.S. Yadav, and J.P. Luthra, *Effect of organic manures at different levels of phosphorus on yield and economics of vegetable pea. Udyanika 11,* 2005, *119-121.*

V. Sardana, P. Shoeram, and S. Singh, *Effect of seed rate, row spacing, Rhizobium and nutrients application on yield of lentil under dry land conditions. Indian J. Pulses Res. 19,* 2006, *216-8.*

R.N. Meena, Y. Singh, S.P. Singh, J.P. Singh and K. Singh, *Effect of sources and level of organic manures on yield, quality and economics of garden pea* (*Pisum sativum L.*). *Veg. Sci. 34*, 2007, *60-63.*

M.A. Chattoo, N. Ahmad, S.H. Khan, S.H. Sidique, and K. Hussan, *Residual effect of organic manures and inorganic fertilizers on succeeding crop pea (Pisum sativum L.) cv. Bonneville*. *The Asian J. Horti. 4*, 2009, *299-304.*

S. Samawat, and B.C. Borah, *Effect of vermicompost and chemical fertilizers on growth and yield of cowpea. Agric. Sci. Tech., 15*, 2001, *83-89.*

A. Chandraker, D.A. Sarnaik, and B. Gupta, *Effect of organic, chemical and liquid manuring in garden pea* (*Pisum sativum L.*). *J. Agril. Issues, 6*, 2001, *79-82.*