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## Response of different levels of FYM, PSB and Neem Cake on soil health, yield attribute and nutritional value of field pea (*Pisum sativum* L.) vr. ICARU

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### Abstract

A field Experiment was conducted during the winter season of 2016-17 at research farm of Soil Science and Agricultural Chemistry SHUATS, Allahabad. Field trails were designed in split plot arrangement based on Randomized Block Design with three replication and nine treatment. The treatment consisted of three factors namely FYM (0, 10, 20 kg), PSB (0, 1, 2 kg.) Neem Cake (0, 0.25, 0.5 t ha<sup>-1</sup>). The result shows that application of different levels combination of FYM, PSB and Neem Cake increased growth and yield of Field Pea. It was recorded from the application of Bio-fertilizers in treatment T<sub>7</sub> [(@ 100% FYM: PSB + 100% Neem Cake)] increased pH 7.1, EC 0.26 dS m<sup>-1</sup>, Organic carbon 0.63%, available Nitrogen 339.00 kg ha<sup>-1</sup>, Phosphorus 32.70 kg ha<sup>-1</sup>, Pottasium 206.56 kg ha<sup>-1</sup>. The physical parameters of soil such as bulk density g/cc, particle density g/cc, pore space % and solid spaces % increased. It was also concluded from trail that the application of fertilizers in treatment T<sub>7</sub> [(@ 100% FYM: PSB + 100% Neem Cake)] was found in increasing Plant height, No. of leaves per plant, No. of branch, Test weight (g.plot<sup>-1</sup>) and grain yield and as well as yield

**Keywords:** Field pea, yield and FYM, PSB, Neem Cake

### 1. Introduction

Pea (*Pisum sativum* L.) is one of the important vegetables in the world and ranks among the top 10 vegetable crops. Pea is commonly used in human diet throughout the world and it is rich in protein (21-25 %), carbohydrates, vitamin A and C, Ca, phosphorous and has high levels of amino acids lysin and tryptophan (Bhat *et al.*, 2013) [2]. Its cultivation maintains soil fertility through biological nitrogen fixation in association with symbiotic rhizobium prevalent in its root nodules and thus play a vital role in fostering sustainable agriculture (Negi *et al.* 2006) [6]. Therefore, apart from meeting its own requirement of nitrogen, peas are known to leave behind residual nitrogen in soil 50-60 kg/ha (Kanwar *et al.*, 1990) [5].

Biofertilizers are known to play an important role in increasing availability of nitrogen and phosphorus besides improving biological fixation of atmospheric nitrogen and enhance phosphorus availability to crop (Bhat *et al.*, 2013) [2]. Therefore, introduction of efficient strains of rhizobium in soils with low nitrogen may help augment nitrogen fixation and thereby boost production of crops. Phosphorus is known to play an important role in growth and development of the crop and have direct relation with root proliferations, straw strength, grain formation, crop maturation (Bhat *et al.*, 2013) [2].

Enhancing P availability to crop through phosphate-solubilizing bacteria (PSB) holds promise in the present scenario of escalating prices of phosphatic fertilizers and a general deficiency of P in Indian soils (Alaguwadi and Gaur, 1988) [1]. A judicious use of organic manures and biofertilizers may be effective not only sustaining crop productivity and in soil health, but also in supplementing chemical fertilizers of crop (Jaipal *et al.*, 2011) [4].

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The addition of neem cake (NEC) also positively affected the available soil organic C (SOC), N, P, K, and Mn content of soil resulting better growth and grain yield of mung bean (*Vigna radiata*) and chick pea besides suppressing soil born pathogens. The inoculation, of seed with *Rhizobium leguminosarum* bv. Phaseoli (RHL) is known to increase nodulation, nutrient uptake, growth and yield response of crop plant and soil fertility. The phosphate solubilising bacteria (PSB) – *Pseudomonas fluorescence* (PSF) also improves grain yield and soil nutrients

besides suppressing soil born pathogen. Co-inoculation of RHL and PSB and their combination with FYM improved plant biomass production, grain yield.

## Material and Method

### Soil Sampling

The soil of experimental area falls in order of Inceptisol and in experimental plots is alluvial soil in nature. The soil samples randomly collect from five different sites in the experiment plot prior to tillage operation from a depth of 0-15 cm. The size of the soil sample reduce by conning and quartering the composites soil sample is air dry and pass through a 2 mm sieve by way of preparing the sample for physical and chemical analysis. The experimental details are given below under different heading:

### Design and treatment

The experiment was carried out in 3×3 factorial randomized block design with three levels of FYM, PSB and Neem Cake, The treatments were replicated three times and were allocated at random in each replication.

### Experimental sites

The experiment was conducted on the research farm of department of Soil Science and agricultural chemistry, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad which situated six km away from Allahabad city on the right bank of Yamuna river, the experimental site is located in the sub – tropical region with 25° N latitude 81.500° E longitude and 95° MS Latitude.

### Result and Discussions

Plant height increased with the successive addition of FYM, PSB and Neem Cake. Highest Plant height at 15 DAS (6.08cm), 30 DAS (12.72cm), 45 DAS (31.82cm), 60 DAS (55.38cm) was recorded with integrated application of T<sub>7</sub>-100% Neem Cake + 100% FYM: PSB. Maximum number of branches with mean at 15 DAS (2.67), 30 DAS (5.54), 45 DAS (9.47), 60 DAS (12.07), was also obtained with T<sub>7</sub>-100% FYM: PSB + 100% Neem Cake. Maximum number of leaves with mean at 15 DAS (5.60), 30 DAS (22.94), 45 DAS (34.14), 60 DAS (58.07), was also obtained with T<sub>7</sub>-100% FYM: PSB + 100% Neem Cake.

Fresh weight per plant after harvest was recorded to be

highest in T<sub>7</sub>- 100% FYM: PSB + Neem Cake (25.40gm.) and minimum in control T<sub>0</sub>. 0% FYM: PSB + 0% Neem Cake (13.67gm.). Dry weight was recorded to be highest in T<sub>7</sub>-100% FYM: PSB + 100% Neem Cake (9.82gm.). and lowest in T<sub>0</sub>- 0% FYM : PSB + Neem Cake (6.45gm). The test weight was significantly higher in T<sub>7</sub>- 100% FYM: PSB + 100 % Neem Cake (40.53). and lowest in T<sub>0</sub>- 0% FYM : PSB + 0% Neem Cake (35.85). The seed yield was also recorded higher with T<sub>7</sub>- 100% FYM: PSB + 100% Neem Cake (1.59kg.).

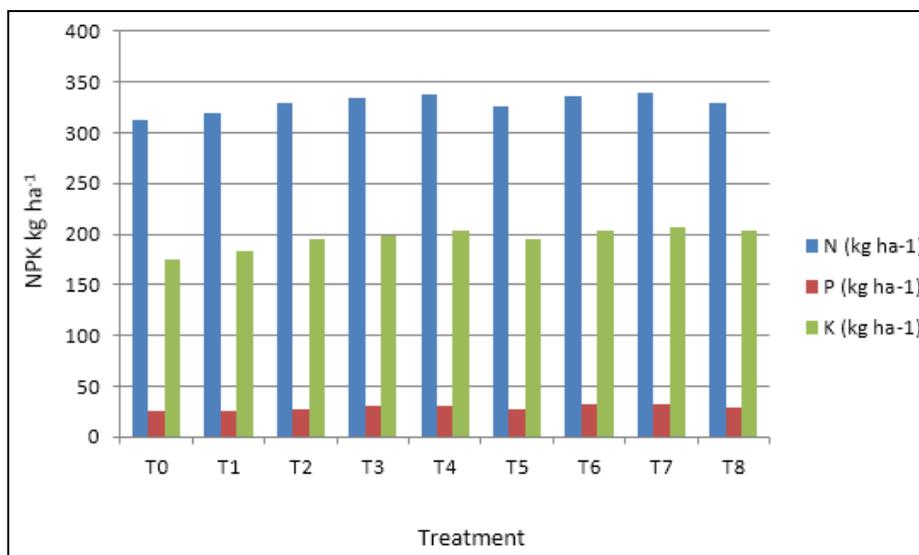
The maximum pH 7.1 was recorded with T<sub>7</sub> (100% FYM: PSB + 100% Neem Cake) treatment combination followed by 7.06 with T<sub>4</sub> (100% FYM: PSB + 50% Neem Cake) treatment whereas the minimum 6.69 pH was recorded with control T<sub>0</sub> - (0% FYM: PSB + 0% Neem) Cake treatment. The trend of EC the maximum EC dSm<sup>-1</sup> 0.26 was recorded with T<sub>4</sub> (100% FYM: PSB + 50% Neem Cake) treatment combination followed by 0.24 with T<sub>7</sub> (100% FYM: PSB + 100% Neem Cake) treatment whereas the minimum 0.20 EC was recorded with control T<sub>0</sub> (0% FYM: PSB + 0% Neem Cake) non difference in EC interaction between FYM, PSB and Neem Cake. The result of the data depicted that the maximum organic carbon 0.63 was recorded with T<sub>7</sub> (100% FYM: PSB + 100% Neem Cake) treatment combination followed by 0.59 with T<sub>8</sub> treatment whereas the minimum 0.34 organic carbon was recorded with control T<sub>0</sub> treatment. The statistical analysis of organic carbon data indicates that there was non-significant difference in organic carbon interaction between FYM, PSB and Neem Cake. In case of available nitrogen the maximum available nitrogen 339.00 was recorded with T<sub>7</sub> (100% FYM: PSB + 100% Neem Cake) treatment combination followed by 337.80 with T<sub>4</sub> (100% FYM: PSB + 50% Neem Cake) treatment combination whereas the minimum 132.36 available nitrogen was recorded with control T<sub>0</sub> - (0% FYM: PSB + 0% Neem Cake) treatment. The maximum available phosphorus 32.30 was recorded with T<sub>7</sub> (100% FYM: PSB + 100% Neem Cake) treatment combination followed by 31.4 with T<sub>4</sub> (100% FYM: PSB + 100% Neem Cake) treatment combination whereas the minimum 25.03 available phosphorus was recorded with control T<sub>0</sub> - (0% FYM: PSB + 0% Neem Cake) treatment. The statistical analysis of available phosphorus data indicates that there was significant difference in available phosphorus interaction between FYM, PSB and Neem Cake.

**Table 1:** Effect of FYM, PSB and Neem Cake on physico-chemical properties of Field Pea (*Pisum sativum* L.) var. icarus

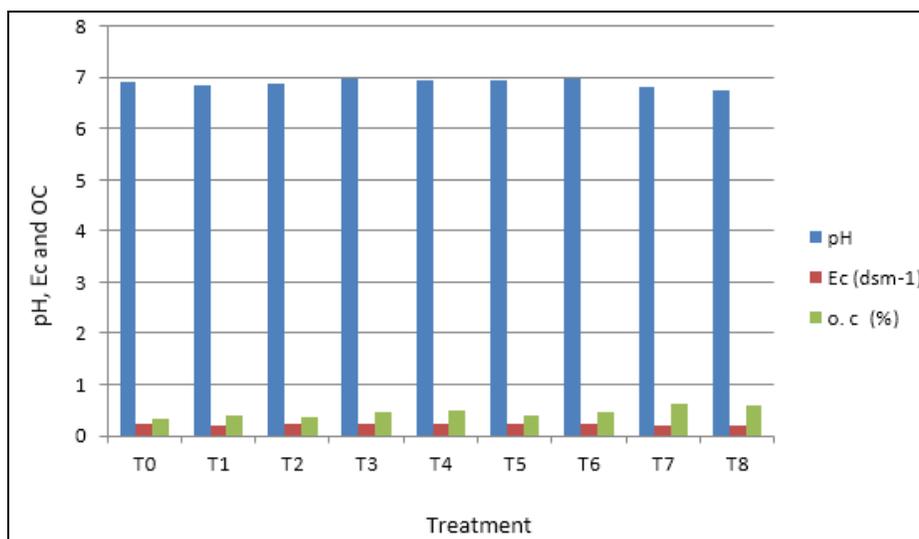
Treatment	Bulk Density	Particle density	pore Space (%)	Solid Space (%)	Soil pH	EC (dSm <sup>-1</sup> )	Organic Carbon (%)	N (kg ha <sup>-1</sup> )	P (kg ha <sup>-1</sup> )	K (kg ha <sup>-1</sup> )
T <sub>0</sub>	1.05	2.28	41.63	52.82	6.90	0.22	0.34	312.36	25.03	175.40
T <sub>1</sub>	1.03	2.24	46.49	53.50	6.84	0.21	0.40	319.63	25.36	183.10
T <sub>2</sub>	1.05	2.52	42.08	57.91	6.88	0.22	0.36	328.53	27.63	195.53
T <sub>3</sub>	1.07	2.40	44.74	55.26	6.98	0.23	0.46	334.56	31.10	199.03
T <sub>4</sub>	1.03	2.50	41.40	58.59	6.93	0.23	0.49	337.80	31.40	203.73
T <sub>5</sub>	1.09	2.43	45.42	54.58	6.96	0.23	0.41	326.00	27.43	195.23
T <sub>6</sub>	1.05	2.24	47.37	52.63	6.97	0.24	0.45	335.23	31.70	203.50
T <sub>7</sub>	1.05	2.45	38.29	56.16	6.80	0.21	0.63	339.00	32.30	206.56
T <sub>8</sub>	1.09	2.56	37.92	56.52	6.76	0.21	0.59	330.06	2.53	203.80

**Table 2:** Effect of FYM, PSB and Neem Cake on growth and yield parameters of Field Pea (*Pisum sativum L.*) var. ICARUS

Treatment	Plant Height (cm.)	Branches plant <sup>-1</sup>	Leaves plant <sup>-1</sup>	Fresh Weight (g plant <sup>-1</sup> )	Dry weight (g plant <sup>-1</sup> )	Test weight (g)	Yield (q ha <sup>-1</sup> )
T <sub>0</sub>	20.20	6.13	25.16	13.67	6.45	35.85	25.79
T <sub>1</sub>	21.35	6.78	21.35	19.27	8.56	38.99	59.94
T <sub>2</sub>	22.72	6.82	22.72	19.00	8.30	39.83	69.83
T <sub>3</sub>	23.23	6.89	23.23	18.94	8.25	38.09	60.10
T <sub>4</sub>	22.91	7.11	22.91	19.87	8.66	39.17	79.65
T <sub>5</sub>	22.71	6.79	22.71	17.27	7.84	37.48	52.55
T <sub>6</sub>	25.91	6.91	25.91	17.93	7.95	37.97	64.47
T <sub>7</sub>	26.49	7.44	26.49	25.40	9.82	40.53	89.05
T <sub>8</sub>	23.96	6.64	23.96	16.67	7.60	39.90	73.30



**Fig 1:** Impact of Different levels of FYM, PSB and Neem Cake on their interaction on N P K of Field Pea (*Pisum sativum L.*)



**Fig 2:** Impact of Different levels of FYM, PSB and Neem Cake on their interaction on pH, EC and organic carbon of Field Pea (*Pisum sativum L.*)

The maximum potassium 206.56 was recorded with T<sub>7</sub> (100% FYM: PSB + 100% Neem Cake) treatment combination followed by 203.73 with T<sub>4</sub> (100% FYM : PSB + 50% Neem Cake) treatment combination whereas the minimum 175.40 potassium was recorded with control T<sub>0</sub> . (0% FYM : PSB + 0% Neem Cake) treatment. The statistical analysis of potassium data indicates that there was significant difference in potassium interaction between FYM, PSB and

Neem Cake.

**Conclusion**

In conclusion, it showed the best result on growth and yield of Field Pea (*Pisum sativum L.*) in comparison to other treatment combination. It was recorded from the application of Bio-fertilizers in treatment T<sub>7</sub> [(@ 100% FYM: PSB + 100% Neem Cake)] was found to be the best treatment. it could be

recommended for profitable production of Field Pea (*Pisum sativum* L.) var. Icarus and treatment is good for soil physical and chemical properties. Effect of different levels of FYM, PSB and Neem Cake is better for soil health and Pea production.

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