

Original Research Article

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Effect of Inorganic Fertilizers and Neem-cake on Growth and Yield of Pea Crop (*Pisum sativum* L.)

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ABSTRACT

The present investigation was carried out at Research farm, Department of Soil Science and Agricultural Chemistry, Naini Agricultural Institute, SHUATS, Allahabad (U.P.) during the *Rabi* season of 2019-20 with the objective to response of different levels of N P K and Neem cake on soil health, growth and yield attributes of Field pea (*Pisum sativum* L.). The experiment was laid out in a Randomized Block Design with nine treatment combinations, consisting of three N P K levels (0, 50 and 100%) and Neem cake (0, 50 and 100%). It was observed that for postharvest, treatment T₈ (i.e. @n 40kg + p@ 50kg + k@ 40kg and neem cake @2.5 q ha⁻¹) was best in terms growth parameters in maximum plant height (86.54 cm), number of leaves (74.59 cm), number of branches (17.31), number of pods per plant (17.93) and total green pod yield was highest i.e. (71.47 qha⁻¹), maximum gross return of (Rs. 107205.00) and net profit was (Rs. 76417.00) with cost benefit ratio (B:C) (1:2.48). However treatment T₆ (i.e. N @40kg + p@ 50kg + k @ 40kg and neem cake @ 0 q ha⁻¹) was best in terms economic parameters was found maximum cost benefit ratio of (1: 2.99), showed medium results in growth parameters soil properties with a highest net returns it was best and has suitable treatment combination regarding all aspects.

Keywords

Soil parameters, Inorganic fertilizers, NPK levels, Neem cake, Field pea

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Introduction

Pulses are important source of dietary protein and have unique ability of maintaining and restoring soil fertility through biological nitrogen fixation as well as addition of ample number of residues to the soil. Pulse crops leave behind reasonable quantity of nitrogen in soil to the extent of 30 kg ha⁻¹. India has a major world's crop area under pulses and one fourth of the total production. Pulse crops offer and stable source of protein in vegetarian diet of masses. Pulses add 0.8 to

1.5 tonnes of organic matter to the soil in the form of their roots left after harvesting of the crops, on an average, one-hectare crop adds 15 to 30 kg nitrogen in readily available form (Singh, 2001).

Legumes have been recognized as an important component of any cropping system and as a low input approach towards improvement of soil fertility. Peas are now grown throughout the world and are consumed in both fresh and dried conditions. It is widely cultivated in temperate regions for

its fresh green seed. Peas are an excellent human food (Kakar *et al.*, 2002), either eaten as a vegetable or used in preparation of soup. The peas are full of nutrition because its grain is rich in protein, complex carbohydrates, vitamins, minerals, dietary fibers and antioxidant compounds (Bhatt *et al.*, 2013).

In Gujarat, it is cultivated in 2.09 lakh hectares with an annual production of 1.14 lakh metric tonnes leading to average productivity of 546 kg ha⁻¹ (Anonymous, 2011). Peas (*Pisum sativum* L.) is one of the most important Rabi season Pulses crop of Uttar Pradesh. Total production of pulse, reported 2012-2013 (April/ May) will be at 17.3 million tonnes. In which from them pea will be covered in production 3744.84 tonnes) (FAO stat, 2012).

Materials and Methods

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, Allahabad (UP), during *Rabi* season of November 2019 - March 2020. The experiment was conducted in a Randomized Block Design (RBD) with three levels of inorganic fertilizers N, P, K, and Neem cake (0, 50, 100% dosage) respectively, the treatments were replicated into three time dividing the experimental area into twenty-seven plots (Table 1).

Pre- and post-harvest observations

Plant height (cm)

Height of crop plants under different treatments was recorded at 30, 60 and 90 days after sowing. For these three plants were randomly selected from each plot and tagged for observation to be recorded. Height of plant in cm was from ground level up to the

base of the last fully opened leaf of the main shoot.

Pods length

The number pods were collected from three tagged plants from each plot was counted and average pods length per plant was calculated.

No. of pods per plant

The number pods were collected from three tagged plants from each plot was counted and average number of pods per plant was calculated.

Green pod yield (q ha⁻¹)

The pod yield from the net plot area was recorded in kg plot⁻¹ and figure converted into q/ha.

Results and Discussion

Growth parameters

Plant height (cm)

The data presented in table 2 and depicted in fig. 1 clearly shows the response of plant height of pea recorded at 30 DAS, 45 DAS and 60 DAS as influenced by different levels N P K and *Neem cake* seed inoculation. The plant height of pea was found to be increased significantly with the increase in levels of N P K and *Neem cake* seed inoculation.

The maximum plant height was recorded as 34.38 cm, 64.40 cm and 86.54 cm in T₈ N₄₀ P₅₀ K₄₀ + *Neem cake* @ 2.5q ha⁻¹) at 30 DAS, 60 DAS and 90 DAS respectively and the minimum plant height was recorded as 18.63 cm, 43.63 cm and 69.16 cm in T₀(control) at 30 DAS, 60 DAS and 90 DAS respectively. Increase in plant height due to increase in N P K and *Neem cake* fertilizers may be due to

adequate supply of nutrients which in turn helps in vigorous vegetative growth of plants and subsequently increase the plant through cell elongation, cell division, photosynthesis and turbidity of plant cell. The increase in nodulation and nitrogen fixation leads to more plant height. Similar findings were reported by Singh *et al.*, (2011) and Jat *et al.*, (2012).

Number of Leaves per plant

The data presented in table 2 and depicted in fig. 2 clearly shows the response of number of leaves plant⁻¹ of pea recorded at 30 DAS, 60 DAS and 90 DAS as influenced by different levels N P K and *Neem cake* seed inoculation. The number of leaves plant⁻¹ of pea was found to be increased significantly with the increase in levels of N P K and *Neem cake* seed inoculation.

The maximum number of leaves was recorded as 14.57, 45.06 and 74.59 in T₈ (N₄₀P₅₀K₄₀ + *Neem cake* @ 2.5q ha⁻¹) at 30 DAS, 60 DAS and 90 DAS respectively and the minimum number of leaves were recorded as 9.33, 16.63 and 45.83 in T₀ (control) at 30 DAS, 60 DAS and 90 DAS respectively.

Increase in number of leaves may be due to adequate nutrients supply which enhanced the

vegetative growth of plant and subsequently the number of leaves. Similar findings were reported by Khan *et al.*, (2017) and Shete *et al.*, (2010).

Yield and yield attributes

Number of pods per plant

The data presented in table 2 and depicted in fig. 3 clearly shows the response of number of pods plant⁻¹ of pea recorded as influenced by different levels N P K and *Neem cake* seed inoculation.

The number of pods plant⁻¹ of pea was found to be increased significantly with the increase in levels of N P K and *Neem cake* seed inoculation. The maximum number of pods was recorded as 17.93 in T₈ (N₄₀P₅₀K₄₀ + *Neem cake* @ 2.5q ha⁻¹) and the minimum number of pods were recorded as 8.33 in T₀ (control).

Increased in number of pods may be due to adequate availability of nutrients during reproductive stage of crop results in the formation of more pods. Similar results were also reported by Datt *et al.*, (2013) and Hussain *et al.*, (2014).

Table.1 Treatment combinations

Treatment	Treatment combination
T ₀	Control
T ₁	@0%(N,P,K) + @ 50 % <i>Neem cake</i>
T ₂	@0%(N,P,K) + @ 100 % <i>Neem cake</i>
T ₃	@50%(N,P,K) + @ 0 % <i>Neem cake</i>
T ₄	@50%(N,P,K) + @ 50 % <i>Neem cake</i>
T ₅	@50%(N,P,K) + @ 100 % <i>Neem cake</i>
T ₆	@100%(N,P,K) + @ 0 % <i>Neem cake</i>
T ₇	@100%(N,P,K) + @ 50 % <i>Neem cake</i>
T ₈	@100%(N,P,K) + @ 100 % <i>Neem cake</i>

Table.2 Effect of different levels of N P K and *Neem cake* on plant height, No. of leaves per plant, No. of pods per plant and green pod yield

Treatment	Plant height (cm)			No. of leaves per plant			No. of pods per plant	green pod yield (q ha ⁻¹)
	30 Days	60 Days	90 Days	30 Days	60 Days	90 Days		
T ₀	18.63	43.63	69.16	9.33	16.63	45.83	8.33	49.27
T ₁	21.17	45.37	72.09	10.32	17.67	49.70	9.42	51.27
T ₂	23.38	47.79	74.38	10.82	19.80	55.79	11.00	54.27
T ₃	24.73	51.19	76.80	11.66	23.63	60.02	12.24	57.31
T ₄	26.37	53.71	78.70	11.93	28.87	66.08	13.52	59.73
T ₅	28.80	55.78	80.06	12.21	32.30	68.47	14.56	62.18
T ₆	30.56	58.07	82.22	12.78	37.66	71.66	15.70	65.33
T ₇	33.22	61.19	83.56	13.83	42.13	73.42	16.80	68.00
T ₈	34.38	64.40	86.54	14.57	45.06	74.59	17.93	71.47
F-test	S	S	S	S	S	S	S	S
SE. d	0.325	0.276	0.277	0.18	0.42	0.39	0.12	1.05
C.D. (P=0.05)	0.689	0.585	0.589	0.38	0.90	0.83	0.24	2.22

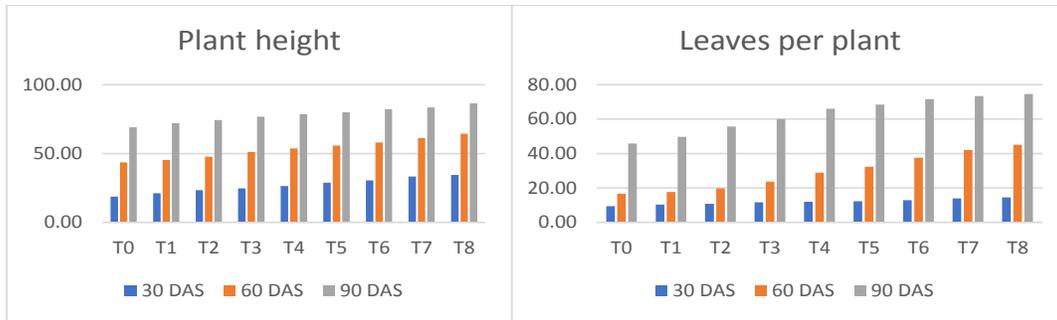


Fig: 1

Fig : 2

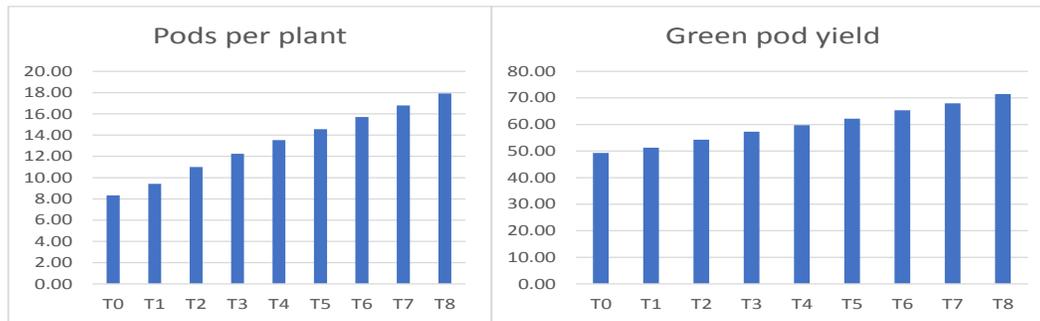


Fig : 3

Fig:4

Green pod yield (q ha⁻¹)

Table 2 and fig. 4 shows the green pod yield (q ha⁻¹) as influenced by N P K, and neem cake. The number of pods plant⁻¹ of pea was found to be increased significantly with the increase in levels of N P K and neem cake seed inoculation. The highest green pod yield was recorded as 71.47 in T₈ (N₄₀P₅₀K₄₀ + Neem cake @2.5q ha⁻¹) and the minimum green pod yield was recorded as 49.27 in T₀ (control). Application of full doses of inorganic fertilizers along with the neem cake has given the good results regarding Green pod yield. Similar findings were reported by Dhruwe *et al.*, (2017) and Prasad and Prasad (2003).

In conclusion the treatment T₈ (*i.e.* @ N 40kg + P@ 50kg + K@ 40kg and neem cake @2.5 q ha⁻¹) was best in terms growth parameters in maximum plant height (86.54 cm), Number of leaves (74.59 cm), Number of branches (17.31), number of pods per plant (17.93) and

total green pod yield was highest *i.e.* (71.47 qha⁻¹), maximum gross return of (107205.00) and net profit was (76417.00) with cost benefit ratio (C:B) (1:2.48). However Treatment T₆ (*i.e.* N @40kg + P@50kg + K@ 40kg and neem cake @ 0 q ha⁻¹) was best in terms economic parameters was found maximum cost benefit ratio of (1: 2.99), showed medium results in growth parameters soil properties with a highest net returns it was best and has suitable treatment combination regarding all aspects. Since the results were based on one-year experimental data. It is suggested that the further work could be carried out for more than one season.

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