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Influence of different rates of SSP, neem cake and vermicompost on yield of pea (*Pisum sativum* L.)

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Abstract

A field experiment was conducted at Himalayan University, Jollang, Arunachal Pradesh during the rabi season of 2020-2021 to evaluate the effect of vermicompost and neem cake on the yield of field pea. The experiment was laid out in a Randomized Block Design with six treatments and four replications. Treatment consisted of different combinations of vermicompost (0, 1 and 2 kg), neem cake (0, 0.25 and 0.5 t ha⁻¹), along with a uniform application of single super phosphate (SSP) at 4 g per plot. Results indicated that combined application of vermicompost and neem cake significantly enhanced pod yield and overall yield of field pea compared to control. Among the treatments, T₂ (50% vermicompost + 50% neem cake) recorded the highest pod yield per plot and yield performance, suggesting the effectiveness of integrated organic nutrient management in improving field pea productivity.

Keywords: Pea, pod, RBD, neem cake

Introduction

Pisum (*Pisum sativum* L.) is an annual crop that completes its life cycle within a single growing season. It is a cool-season legume cultivated widely across different regions of the world, with sowing time varying from winter to early summer depending on local climatic conditions. As a pod-bearing plant, pea belongs to the legume group, characterized by fruits that develop from a single-chambered ovary and split open along two sutures upon maturity. Like other legumes, pea contributes to the improvement of soil fertility and soil structure through biological nitrogen fixation.

The pea plant typically attains a height of 35-60 cm and is a short-lived, herbaceous, glaucous annual that climbs using tendrils formed from modified leaflets. The stem is slender, cylindrical and weak in nature. Although the root system is generally shallow, a distinct taproot is present. Pea can be grown successfully in a wide ranges of soils, from light sandy loams to heavy clay soils. However, excessive irrigation promotes excessive vegetative growth and may adversely affect pod development (Singh and Joshi, 1970) ^[1].

In India, Pea is cultivated over an area of about 0.408 million hectares, with a total production of approximately 3.74 million tonnes (Anonymous, 2012) ^[1]. In Rajasthan, the crop occupies nearly 12, 520 hectares, producing around 22, 580 metric tonnes of green pods annually. Jaipur district is the major pea growing region in the state, accounting for about 9, 261 hectares with a production of nearly 14, 745 metric tonnes of pods. The average productivity of pea ranges between 70 and 80 quintals of green pods per hectare, with a shelling percentage of 30-35 percent (Fageria *et al.*, 2003) ^[5]. India possesses the largest area under pulse cultivation globally and contributes nearly one-fourth of total pulse production. Pulses form a vital component of the predominantly vegetarian diet of the population by providing an affordable and stable source of protein. In addition to their well-known role in improving soil fertility and physical condition, pulse crops also supply nutritious fodder for livestock and are therefore often described as the "unique jewels of Indian crop husbandry". Pulse contribute approximately 0.8-1.5 tonnes of organic matter per hectare through root biomass left after harvest and add about 15-30 kg of readily available nitrogen per hectare on average.

With India's population increasing rapidly and projected to reach around 1, 280 million by 2020, the demand for pulse is expected to rise substantially.

At the current growth rate, the country will require nearly 30 million tonnes of pulses not to meet domestic needs (Kumar *et al.*, 2004) [6].

In recent years, the contribution of vegetable crops to the national economy has gained increasing recognition. India ranks second globally, after China, in both area and production of pea. Despite this substantial production, the per capita availability of vegetables in the country is only about 208 g per day, which falls short of the recommended dietary intake of 275g for adult males and 250 g for adult females engaged in moderate work (Sharma *et al.*, 2003) [10]; Swaminathan, 2002) [12]. During 2017-2018, the total area under pea cultivation in India was approximately 540.48 thousand hectares, with a production of 5, 422, 14 thousand metric tonnes and an average productivity of 10.0t ha⁻¹. Major pea-producing states include Uttar Pradesh, Madhya Pradesh, Jharkhand, Punjab, Himachal Pradesh, West Bengal, Haryana, Bihar, Uttarakhand, Odisha and Karnataka. Among these, Himachal Pradesh ranked fifth, with a production of about 294.96 thousand metric tonnes during the same period (Anonymous, 2018) [2].

Phosphorus plays a vital role in crop growth and development and is closely associated with root expansion, stem strength, grain formation and timely crop maturity (Bhat *et al.*, 2013) [4]. To sustain soil nutrient balance and achieve optimum yields, the adoption of integrated nutrient management practices has become increasingly important. Challenges emerging in the post-green revolution era pose serious threats to the sustainability of Indian agriculture and national food security. These challenges include stagnation or decline in crop productivity, deterioration of soil fertility, reduced factor productivity, narrowing of cropping systems, and rising input costs that render farming economically less viable. Consequently, there has been a growing emphasis on environmentally sustainable and eco-friendly agricultural practices, particularly organic farming (Saini and Pandey, 2009) [9].

Field pea cultivation is adversely affected by several insect pests and diseases, including powdery mildew, rust, stem fly and pod borer. The indiscriminate use of synthetic agrochemicals has led to escalating production costs, destruction of beneficial organisms, development of pest resistance, and cross resistance in many cases. In view of these concerns, the use of organic sources and eco-friendly management practices is increasingly advocated to reduce chemical dependency, improve soil health and manage pests and diseases in field pea cultivation.

The regular application of organic inputs in quantities adequate to meet crop nutrient requirements not only enhances crop productivity but also improves soil fertility and organic matter status (Ramesh *et al.*, 2008) [8]. In contrast, prolonged reliance on inorganic fertilizers has resulted in the depletion of beneficial soil flora and fauna. Organic production systems help sustain and restore soil health by promoting biological activity in the soil, while the use of organic manures improves soil physical properties and enhances the efficiency of nutrient utilization (Pandey *et al.*, 2007) [7].

Materials and methods

The field experiment was carried out at Himalayan University, Jullang, Arunachal Pradesh during the rabi season of 2020-2021. Arunachal Pradesh is located in the north-eastern part of India 26° 28' N and 29° 33' N and longitudes 91° 31' E and 97° 30' E. The study area lies in

the Northern Hemisphere and experiences a warm temperate climate, characterized by comparatively lower rainfall during winter than in summer. According to the Koppen-Geiger classification, the climate of the region falls under the Cwa category. The mean temperature ranges approximately between 20.8° F and 69.5°F and the area receives an average annual rainfall of about 2, 789 mm. The experiment was conducted using a Randomized Block Design (RBD) with four replications. The experimental field was divided into four blocks, each comprising six treatment plots, to ensure uniformity and minimize experimental error.

Table 1: Details of treatment combinations and nutrient sources

Treatments	%	Treatments combination
T ₁ (V ₀ N ₀ SSP ₀)	0	0% (Vermicompost) + 0% (Neemcake) + 0% (SSP)
T ₂ (V ₁ N ₂ SSP ₀)	100	50% (Vermicompost) + 50% (Neemcake) + 0% (SSP)
T ₃ (V ₂ N ₂ SSP ₃)	75	35% (Vermicompost) + 35% (Neemcake) + 50% (SSP)
T ₄ (V ₁ N ₁ SSP ₂)	50	25% (Vermicompost) + 25 (Neemcake) + 50% (SSP)
T ₅ (V ₁ N ₁ SSP ₃)	25	15% (Vermicompost) + 15% (Neemcake) + 70% (SSP)
T ₆ (V ₀ N ₀ SSP ₃)	0	0% (Vermicompost) + 0% (Neemcake) + 100% (SSP)

Agronomical operation

A clean and well pulverized seedbed with good tilth is required for germination so the land was prepared first by ploughing deep with spade and cover on 20 November 2020, followed by breaking up clods and smoothing out the surface of the soil. Each ploughing is followed by irrigation, so that the soil becomes well pulverized and level. Single super phosphate, vermicompost and neem cake was applied at the rate of 4 g m⁻², 1.5 kg/m² and 600 g/m². According to treatment the full quantity of single super phosphate, vermicompost, neem cake were applied as a basal doses at the time of sowing. All intercultural operations and crop management practices were carried out in accordance with the recommended package of practices for pea cultivation. Certified, healthy and good-quality seeds of the pea variety Arkel were used for the experiment. Prior to sowing, the seeds were soaked in water for 24 hours to enhance early and uniform germination. Sowing was done in rows at a spacing of 30 x 10 cm², with seeds placed at a depth of 2-3 cm and covered lightly with soil.

Manual weeding was performed twice, at 25 and 45 days after sowing, to maintain weed-free conditions. A pre-sowing irrigation was applied, followed by subsequent irrigations to maintain optimum soil moisture throughout the crop growth period.

Table 2: Schedule of irrigations and dates of application

Irrigation	Date
First	21 st December
Second	9 th January
Third	2 nd February

Crop was harvested when plants turns its colour from green to creamy. At harvesting stage whole plant dried up. The colour of pod was also changed from green to creamy. The crop was harvested on 26th February. The experimental materials comprise of 1 pea variety Arkel in Random Block Design with 4 replications.

Yield Attributes

Number of pods/plant

Total number of pods picked from the tagged plants were counted under each plot and divided with the number of tagged plants to get average number of pod per plant.

Number of seed/pod

Five pods were picked randomly from the harvested pods of each plot and their seeds were counted. Thereafter, average values were worked out.

Pod length (cm)

Five pod of each treatment were taken in each replication randomly for measuring the pod length. The pod length was measured with the help of meter scale and average value was worked out. The pod length was expressed in centimeter.

Average seed yield/hectare (q)

Seed yield per plot was recorded in gram which was converted into quintal per hectare as given below.

$$\text{Total seed yield (q/ha)} = \frac{\text{Total seed yield per plot (kg)} \times 10,000}{\text{Net area of plot (m)} \times 100}$$

Biological yield (g/plot)

The weight of the thoroughly sun dried harvested produce of each plot was recorded separately before threshing and expressed as biological yield in g/plot.

Economic yield (g/plot)

The economics of cultivated were estimated based on the prevailing market prices of all inputs, including seed, manures, fertilizers, herbicides and labour. The total cost of cultivation for each treatment was calculated by accounting for land rent, labour cost, input expenses and interest on the invested capital. Net returns for individual treatments were determined by subtracting the total cost of cultivation from the gross value of produce obtained from grain and straw. In addition, net profitability was assessed by computing the net return per unit cost, expressed as the ratio of net return to total cost of cultivation.

Harvest index

A critical examination of data revealed that nutrient application had significant effect on harvest index of Indian mustard. Indian mustard sown with 100% fertilizer fetched significantly higher harvest index as compare to the plot without any fertilizer application.

Results

Number of pod/plant

The data presented in Table.3. showed the significant influence of different treatment on number of pod per plant. Highest number of pod per plant was found in T₂ (50% vermicompost + 50% Neemcake + 0%) (7.25) followed by T₃ and T₄ (6.97, 6.77) respectively. Lowest number of pod was observed in T₁ (5.89) followed by T₅ and T₆ (6.15, 6.40) respectively.

Pod length (cm)

The data presented in Table.3. denoted significant on the pod length. Maximum pod length was recorded in T₄ (25%

vermicompost + 25% Neemcake + 50%) i.e (6.90 cm) followed by T₂ (100% vermicompost) i.e (6.38 cm) and T₅ (15% vermicompost + 15% Neemcake + 50% SSP) i.e (6.16 cm). Lowest pod length was observed in T₁ (4.99cm) followed by T₃ and T₆ (6.13 and 5.78 cm)

Number of seed/pod

The finding table.3. indicate the significant effect on number of seed per pod. The maximum number of seed per pod was recorded in T₂ (50% vermicompost + 50% Neemcake + 0% SSP) (5.80) followed by T₆, T₄ and T₅ (4.97, 4.72, 4.70). Lowest number of seed per pod was observed in T₁ (control) (4.25) followed by T₃ (4.45).

Table 3: Effect of Different Doses of SSP, Neem Cake and Vermicompost on yield attributes of pea

Treatments	Number of pod/plant	Pod length (cm)	Number of seed/pod
T ₁	5.89	4.99	4.25
T ₂	7.25	6.38	5.80
T ₃	6.97	6.13	4.45
T ₄	6.77	6.90	4.72
T ₅	6.15	6.16	4.70
T ₆	6.40	5.78	4.97
G.M	6.57	5.01	4.96
CV	6.40	5.01	4.96
Sed	0.21	0.15	0.12
CD (5%)	0.63	0.44	0.36

Economic yield/plot (g/m²)

The presented in table.4. showed the significant effect and maximum economic yield per plot was observed in T₂ (50% vermicompost + Neemcake 50% + 0% SSP) (665.25) followed by T₃, T₄ and T₅ (649.50, 645.00, 643.00). The lowest economic yield was observed in T₁ (control) (609.75) followed by T₆ (633).

Biological yield/plot (g/m²)

Finding out the present investigation Table.4. showed the significant influence of different treatment on biological yield per plot was observed in T₃ (35% vermicompost + 35% Neemcake + 50% SSP) (1241.25g) followed by T₄ (25% vermicompost + 25% Neem cake + 50% SSP) (1233.00 g) then T₅ (15% V + 15% N.C + 70% SSP) (1232.25 g). Also lowest biological yield was observed in T₁ (1193.50 g) followed by T₆ and T₂ (1222.75, 1223.25 g).

Table 4: Effect of Different Doses of SSP, Neem Cake and Vermicompost on yield of pea

Treatments	Economic yield/plot(g/m ²)	Biological yield/plot (g/m ²)	Harvest index (%)
T ₁	609.75	1193.50	51.08
T ₂	665.25	1223.25	54.39
T ₃	649.50	1241.25	52.38
T ₄	645.00	1233.00	51.21
T ₅	643.00	1232.25	52.18
T ₆	633.00	1222.75	51.76
G.M.	640.92	9.04	52.18
C.V	5.40	9.04	5.36
S.E.M.	17.30	55.32	1.40
C.D.5%	--	-	-

Harvest index (%)

The data presented in Table .4. revealed significant on harvest index of economic yield upon biological yield by

multiply with 100. The maximum harvest index percent was observed in T₂ (50% Vermicompost + 50% Neem cake. + 0% SSP) (54.39%) followed by T₃ (35% vermicompost + 35%Neemcake + 30% SSP) (52.38 %), T₅ (15% V + 15% N.C + 70% SSP) (52.18). Lowest harvest index was observed in T₁ (51.08) followed by T₄ (25% V + 25% N.C + 50% SSP) (51.21) then T₆ (0% V + 0% N.C + 100% SSP).

Discussion

Arkel Variety of Field pea (*Pisum sativum* L.) was studied with respect to number of pods per plant, pod length, number of seed per pod and seed yield per plant as well as seed yield (q/ha).

There was significant difference among the different with respect to number of pods per plant. Maximum number of pods per plant was found in T₂ (7.25) with vermicompost + Neemcake 100% followed by T₄ (6.77) with combined effect of vermicompost 50% and SSP 50% (single super phosphate). Lowest pod per plant was observed in T₁ (control) (5.89).

The examination data recorded number of seed per pod indicated significant effect in yield. Maximum number of seed per pod was recorded in T₂ (5.80) followed by T₆ (4.97), T₄ (4.72). Lowest was observed in T₁ (control) (4.25). it has observed that treatment of vermicompost 50% + neemcake 50% increasing the pod length number seed per pod and giving good quality of pod per plant. It also improves the soil physical, biological and chemical conditions for plant growth and nutrient uptake.

The yield of pea varies in different environment, the difference in pea is distributed to the complex process occurring in the various parts of the plant involve many changes are influenced by environmental factors prevailing at different stages of crop growth to understand yield variation in pea crop. In different environmental condition, agronomic manipulation and yield analysis are required. Delay in sowing shortens vegetative phase, advances flowering time and reduced in dry matter accumulation (Thakur *et al.*, 1994) [13]. Bareth, (1998) [3] was found that delay in planting resulting in high nutrient during flowering caused pod abortion and lower yield in arkel. Thiyageshwari and Perumal, (2002) [14] observed that delay in nutrients shortens vegetative phase, advances flowering time and reduced dry matter accumulation.

Conclusion

The experiment result revealed that application of organic fertilizer i.e vermicompost + Neemcake with or without inorganic fertilizer SSP (Single Super Phosphate) obtain higher pod yield as compare to single organic fertilizer i.e SSP alone. It may be concluded from the finding of present study that among different treatment T₂ (50% Vermicompost + 50 % Neem cake) (5.80) give higher pod yield followed by T₆ (100% SSP) (4.97). It is concluded from the observation of my study that among all six treatments the treatment₄ was found suitable for seeds per pods and treatment₆ was found most suitable for economic yield under Jollang, Itanagar condition of Arunachal Pradesh.

References

1. Anonymous. Indian horticulture database. Gurugram: National Horticulture Board; 2012. p. 179-284.
2. Anonymous. Annual report. New Delhi: National Horticulture Board; 2018. p. 1-150.

3. Bareth V. Effect of phosphorus, molybdenum and PSB on growth and yield of cowpea [MSc thesis]. Bikaner: Rajasthan Agricultural University; 1998. p. 1-120.
4. Bhat AT, Gupta M, Ganai MA, Ahanger AR, Bhat AH. Yield, soil health and nutrient utilization of field pea (*Pisum sativum* L.) as affected by phosphorus and biofertilizer under subtropical conditions of Jammu. Int J Mod Plant Anim Sci. 2013;1(1):1-8.
5. Fageria MS, Arya PS, Choudhary AK. Vegetable crops production technology. Vol. II. Ludhiana: Kalyani Publishers; 2003. p. 126-136.
6. Kumar S, Singh RC, Kadian VS. Performance of mungbean as influenced by seed inoculation. Indian J Pulses Res. 2004;16:67-68.
7. Pandey RK, Verma AK, Anurag K, Tripathi RS. Integrated nutrient management in transplanted hybrid rice (*Oryza sativa* L.). Indian J Agron. 2007;52(1):40-42.
8. Ramesh P, Panwar NR, Singh AB, Ramana S. Effect of organic manure on productivity, nutrient uptake and soil fertility of maize-linseed cropping system. Indian J Agric Sci. 2008;78(4):351-354.
9. Saini SK, Pandey ST. Organic farming: development and strategies in Indian perspective. Indian J Agron. 2009;54(2):193-199.
10. Sharma VK, Inder S, Singh G. Income and employment from summer vegetables vis-à-vis paddy in Punjab. J Agric Dev Policy. 2003;12:38-43.
11. Singh HB, Joshi BS. Pulse crops. New Delhi: Indian Council of Agricultural Research; 1970. p. 1-250.
12. Swaminathan MS. Food groups and balanced diet: recommended dietary allowance. In: Essentials of food and nutrition: An advanced textbook. Vol. 2. Bangalore: Bangalore Printing and Publishing Co. Ltd.; 2002. p. 1-23.
13. Thakur DS, Sanjay DR, Thakur SKD. Economics of off-season vegetable production and marketing in hills. Indian J Agric Mark. 1994;8:72-82.
14. Thiyageshwari S, Perumal R. Integrated use of sources of phosphorus with vermicompost and phosphobacteria in pea. Indian J Pulses Res. 2002;15(1):81-82.