The Pharma Innovation Journal 2023; 12(12): 550-553

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(12): 550-553

www.thepharmajournal.com
Received: 01-09-2023
Accepted: 08-10-2023

Abhishek
Department of Soil Science and Agricultural Chemistry, AKS University, Satna, Madhya Pradesh, India

Atul Kumar Singh
Department of Soil Science and Agricultural Chemistry, AKS University, Satna, Madhya Pradesh, India

Prasant
Department of Soil Science and Agricultural Chemistry, AKS University, Satna, Madhya Pradesh, India

Corresponding Author:
Abhishek
Department of Soil Science and Agricultural Chemistry, AKS University, Satna, Madhya Pradesh, India

Effect of different levels of organic manure on yield and uptake of nutrients in Pea (*Pisum sativum* L.)

Abhishek, Atul Kumar Singh and Prasant

Abstract
In the winter (Rabi) season of 2022-23, a field experiment was conducted at the Research farm, Department of Soil Science and Agricultural Chemistry, AKS University, Sherganj, Satna (M.P.) to investigate the impact of organic manure on the yield and uptake of N, P, K in pea. The experiment comprised ten treatments employing a randomized block design with three replications. The study revealed that T_9 (40kg N/ha through VC 27.2q/ha) demonstrated that as the levels of organic manure increased, there was a consistent enhancement in root nodulation, yield attributing characters, and nutrient uptake in seeds. The highest number of root nodules (22.59), fresh and dry weight of root nodules (48.34 and 39.03, respectively), number of pods per plant (14.62), pod length (8.64 cm), number of grains per pod (7.56), pod weight (6.29 g) and yield (49.77 q/ha) of pea crop. Furthermore, the uptake of nitrogen (24.12 kg/ha), phosphorus (4.62 kg/ha) and potassium (6.69 kg/ha) were also highest in the same treatment (T_9).

Keywords: Organic manure, pea, root nodulation, uptake and yield

Introduction
Pea (*Pisum sativum* L.) is a highly nutritious legume belonging to the *Fabaceae* family. Ethiopia is believed to be the primary place of origin of pea. It is a prominent leguminous crop grown for its mature, edible seeds, which are a significant part of human diets. Ranking as the third most vital pulse crop, right after pigeon pea and chickpea, peas are an abundant source of essential nutrients, boasting a protein content of 22.5%, carbohydrates at 62.1%, and an appreciable amount of vitamins, including vitamin A and C, as well as dietary fiber, antioxidants, and amino acids. Additionally, the straw produced by green peas serves as a valuable nutritional resource for livestock. Notably, peas, much like other legumes, harbour a beneficial partnership with symbiotic bacteria known as *Rhizobium* within specialized root nodules. These bacteria possess the unique capability to convert atmospheric nitrogen (N_2) into ammonia (NH_3), thereby enriching the soil with essential nitrogen nutrients. In India, pea production in 2020 reached an estimated 4.6 million tons, marking a remarkable 7.9% increase from the previous year and a substantial 24.5% rise compared to the 10-year average of 3.7 million tons (Datt *et al*., 2003) [1]. Uttar Pradesh stands out as the leading state for field pea cultivation, contributing approximately 49% of the nation's pea production. Madhya Pradesh follows closely as the second-largest pea producer in India.

Organic manure not only contribute to increased production, but they also improve the physical, chemical, and biological aspects of soil, leading to positive effects on moisture retention, nutrient preservation, soil fertility, productivity, and the soil's capacity to retain water. Vermicompost, a nutrient-rich organic manure, is produced through the natural decomposition of organic waste materials by earthworms. This unique process yields an enhanced quality of manure with numerous advantages for enhancing soil fertility, promoting robust pea plant growth, and maximizing yield. Vermicompost enriches the soil by supplying vital nutrients and micronutrients in a readily accessible form. It also boosts the microbial activity in the soil, fostering beneficial bacteria and fungi that contribute to the overall health of pea crops. Furthermore, consistent utilization of manures results in an elevation of the soil's organic carbon content. The application of organic manures over time enhances the accessibility of micronutrients such as iron, manganese, and zinc. Additionally, it greatly invigorates the soil's biological activity (Pawar *et al*., 2017) [7]. This stimulation not only aids in the decomposition of organic matter but also promotes nitrogen fixation, enhances phosphorus solubility, and augments the availability of essential plant nutrients to crops.

The introduction of nitrogen-based fertilizers diminishes soil organic carbon levels, and the restoration to their original state is achievable solely through the incorporation of organic manures. Therefore, keeping in view of the above-mentioned content, an investigation was proposed to find out the effect of organic manures on root nodulation, yield and uptake of nutrients in peas.

Materials and Methods

During the *Rabi* season of 2022-2023, a field experiment was conducted to investigate the impact of organic manures on root nodulation, yield and nutrient uptake in pea. The trial took place at the Research Farm of the Department of Soil Science and Agriculture Chemistry, AKS University, Satna (M.P.). This region experiences a sub-tropical climate and falls within the semi-arid zone, characterized by a warm and moderately humid monsoon, a cold and dry winter, and a hot, arid summer. The experimental plot had clay loam soil with a slightly alkaline pH (7.5), an electrical conductivity (EC) of 0.16 dS/m, low organic carbon content (0.43%), and available nitrogen at 176.6 kg/ha. Additionally, the soil displayed available phosphorus of 12.5 kg/ha and available potash of 200.00 kg/ha. The experiment was carried out in Randomized Block Design with three replication and involved ten treatments, as follows: T_1: control; T_2: 5kg N/ha through Vermicompost 3.4q/ha; T_3: 10kg N/ha through Vermicompost 6.8q/ha; T_4: 15kg N/ha through Vermicompost 10.2q/ha; T_5: 20kg N/ha through Vermicompost 13.6q/ha; T_6: 25kg N/ha through Vermicompost 17q/ha; T_7: 30kg N/ha through Vermicompost 20.4q/ha; T_8: 35kg N/ha through Vermicompost 23.8q/ha; T_9: 40kg N/ha through Vermicompost 27.2q/ha; T_{10}: 45kg N/ha through Vermicompost 30.6q/ha. Pea var. KN-5 was sown on November 5th, 2022, following the recommended seeding rate of 80 kg/ha and a spacing of 30×10 cm. The seeds were manually sown at a depth of approximately 4-5 cm. The data on various aspects were collected and statistically analysed at 5% significance level.

Results and Discussion

Root nodulation

Data in Table 1 indicated that the incorporation of organic manures into the soil brought significant variation in root nodulation in pea crop. Maximum number of root nodules (22.59) were obtained from T_9 (40kg N/ha through Vermicompost 27.2q/ha); however, it was at par with T_6 (25kg N/ha through Vermicompost 17q/ha). Fresh weight of nodules (48.34 g) was also higher in T_9 (40kg N/ha through Vermicompost 27.2q/ha) but statistically similar to all the treatments except control (T_1) while dry weight of nodules (39.03 g) was higher in the treatment T_9 (40 kg N/ha through Vermicompost 27.2 q/ha) which was statistically similar to T_6, T_{10}, T_5 andT_8. The higher number and weight of root nodules might be on account of more availability of nutrients due to the incorporation of 40 kg N/ha through Vermicompost 27.2 q/ha. The findings are also in agreement with the findings of Nishith *et al.* (2016) [6].

Yield attributes and yield

The data arranged in Table 1 indicated that yield attributes and yield of pea were significantly influenced by the organic manures. A higher number of pods per plant (14.62) was observed under treatment T_9 (40kg N/ha through Vermicompost 27.2q/ha) which was at par with T_7 and T_{10}. The maximum pod length (8.64) was observed in T_9 (40kg N/ha through Vermicompost 27.2q/ha**)**; however, it was at par with Treatment T_{10}, T_8 and T_7. A significantly higher weight of pod (6.29 g) was recorded under T_9 (40kg N/ha through Vermicompost 27.2q/ha) which was statistically similar to T_6 and T_5.The treatment T_9(40kg N/ha through Vermicompost 27.2q/ha) was effective in terms of the number of pods per plant (7.56) but this treatment was comparable to T_{10}, T_8 and T_7. In terms of grain yield, the highest grain yield (49.77 q/ha) was obtained under T_9 (40kg N/ha through Vermicompost 27.2q/ha); however, it was at par with T_{10}, T_8, T_7, T_6 and T_5. All the aforementioned yield-defining traits and yield of pea were obtained to be lowest under the Control treatment (T_1). Augmented availability of nutrients might have resuled in better yield attributes and yield of pea due to better photosynthetic activity resulting from improved growth. The findings are in agreement with the findings of Gopinath *et al.* (2011) [3], Dubey *et al.* (2012) [2], Ray *et al.* (2014) [9], Nishith *et al.* (2016) [6] and Kharadi *et al.* (2020) [4].

Uptake of nutrients

The beneficial effect of organic manures on the uptake of nutrients was evident. Higher uptake of Nitrogen (24.12 kg/ha) by pea was displayed in Treatment T_9 (40 kg N/ha through Vermicompost 27.2 q/ha). However, the uptake of Nitrogen under T_5 and T_6 was statistically at par with T_9. Similarly, the highest uptake of Phosphorus (4.62 kg/ha) was recorded in T_9 (40 kg N/ha through Vermicompost 27.2 q/ha) which was statistically similar to T_6, T_5, T_8 and T_{10}. In terms of uptake of Potassium, it was highest (6.69 kg/ha) in T_9 (40 kg N/ha through Vermicompost 27.2 q/ha) but was comparable to all the treatments except T_1 and T_2. The uptake of N, P and K was lowest under T_1.Due to the increased availability of nitrogen, phosphorus and potassium in sufficient amounts during the crop's growth and reproductive stages which was provided by organic manures—the crop underwent a higher N, P and K content uptake with these treatments. The findings are also in agreement with the findings of Nishith *et al.* (2016) [6].

Table 1: Effect of different levels of organic manure on root nodulation, yield and uptake of nutrients in pea.

Treatments	Root nodulation			Yield attributes and yield					Uptake of nutrients (kg/ha)		
	Number of nodules per plant	Fresh weight of nodules (g)	Dry weight of nodules (g)	Number of pods per plant	Length of pod (cm)	Weight of pod (g)	Number of grains per pod	Yield (q/ha)	Nitrogen uptake	Phosphorus uptake	Potassium uptake
T_1	14.7	46.06	35.78	11.63	7.19	3.45	5.67	33.70	19.94	3.36	4.86
T_2	15.63	47.26	36.96	12.33	7.50	3.83	5.89	43.83	20.03	3.69	5.34
T_3	18.07	47.37	37.36	12.44	7.55	4.75	6.10	45.81	21.13	4.13	5.98
T_4	16.32	47.49	37.82	12.54	7.59	4.23	6.20	45.92	20.28	3.88	5.62
T_5	19.66	47.60	38.05	12.64	7.62	5.93	6.31	46.50	22.38	4.32	6.94

T_6	21.21	47.71	38.19	12.96	7.65	6.03	6.41	46.88	22.90	4.51	6.53
T_7	17.40	48.10	37.62	13.79	8.36	4.51	7.35	47.04	20.74	4.02	5.83
T_8	19.42	48.19	37.98	14.11	8.52	5.21	7.43	48.11	21.81	4.28	6.20
T_9	22.59	48.34	39.03	14.62	8.64	6.29	7.56	49.77	24.12	4.62	6.69
T_{10}	18.75	48.25	38.11	13.77	8.60	5.06	7.52	49.18	21.48	4.22	6.11
S.Em±	0.75	0.41	0.39	0.40	0.28	0.23	0.24	1.21	0.66	0.19	0.39
C.D. (*P*=0.05)	2.19	1.19	1.12	1.15	0.81	0.38	0.71	3.54	1.93	0.55	1.14

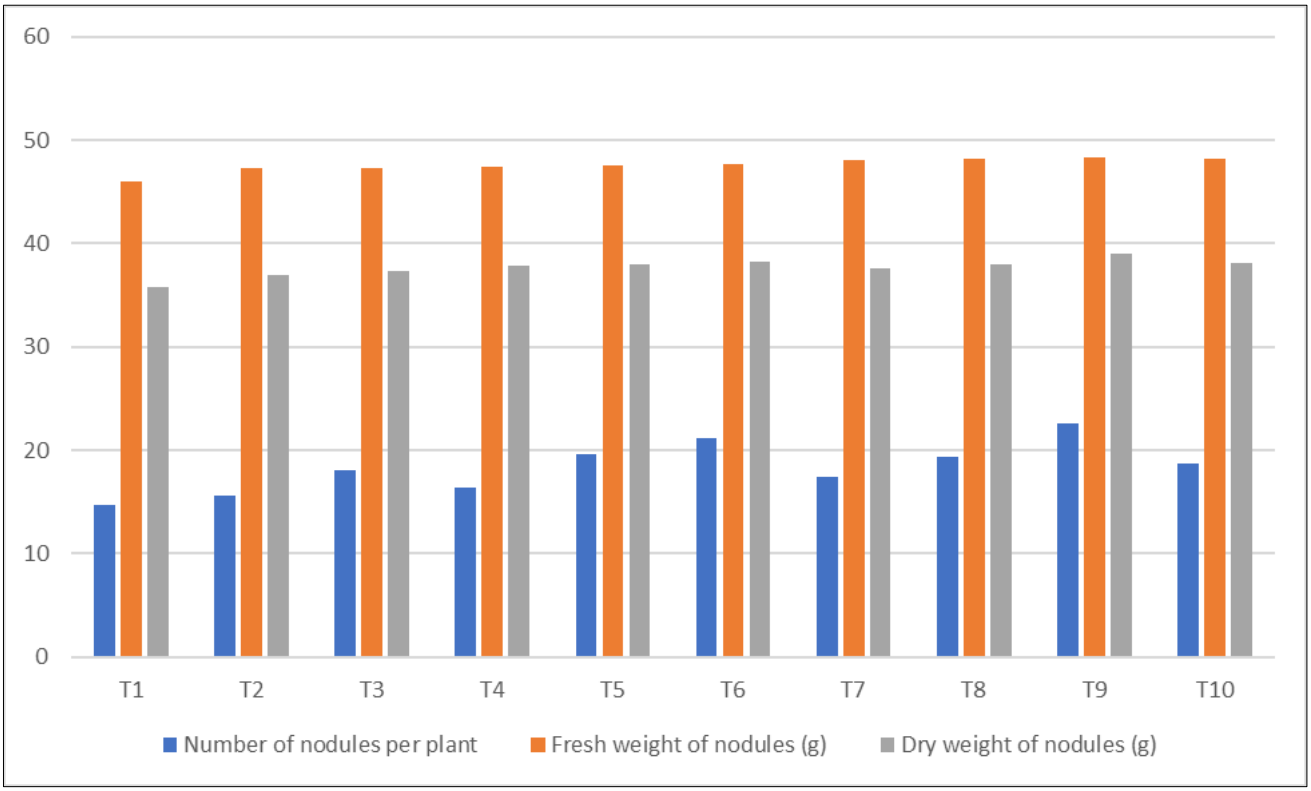

Fig 1: Effect of different levels of organic manure on root nodulation of pea

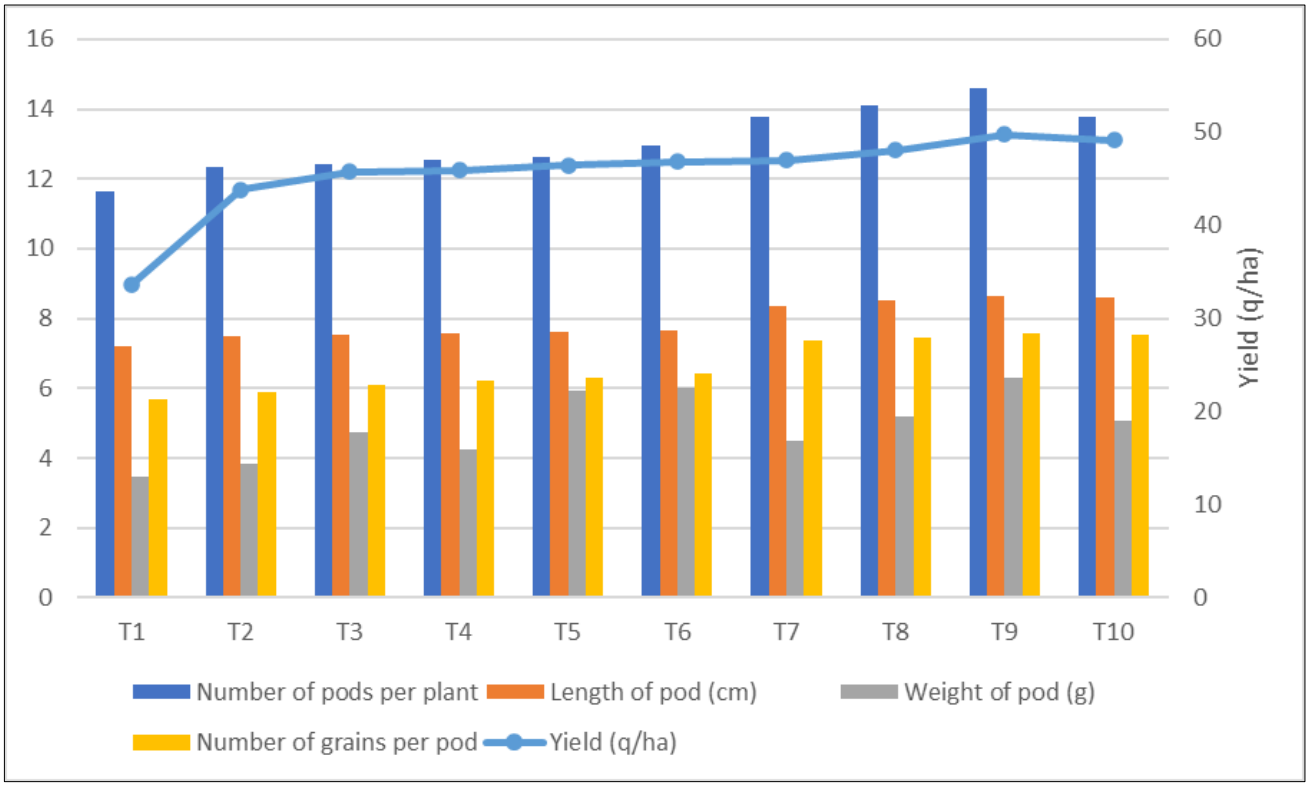

Fig 2: Effect of different levels of organic manure on yield attributes and yield of pea

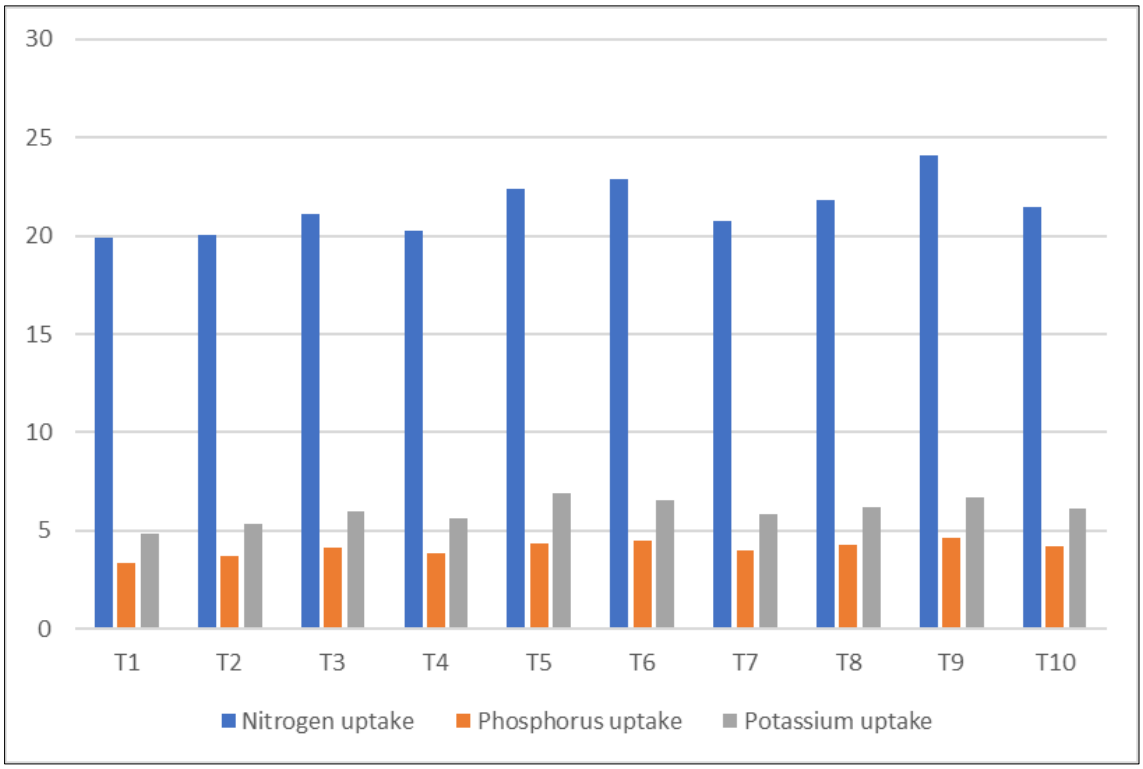

Fig 3: Effect of different levels of organic manure on uptake of nitrogen, phosphorus and potassium by grains of pea

Conclusion

The conclusive findings strongly support that the application of 40kg N/ha through Vermicompost (27.2q/ha) resulted in the highest yield and favourable yield attributing characteristics for Pea crop. Notably, this approach not only registered a superior yield of 49.77q/ha but also demonstrated significant enhancements in other yield parameters. Moreover, the utilization of this treatment showcased a remarkable uptake of nutrients-nitrogen (24.12kg/ha), phosphorus (4.62kg/ha), and potassium (6.69kg/ha) in Pea seeds.

References

1. Datt N, Sharma RP, Sharma GD. Effect of supplementary use of farmyard manure along with chemical fertilizers on productivity and nutrient uptake by vegetable pea (*Pisum sativum* L.) and build up of soil fertility in Lahaul valley of Himachal Pradesh. Indian Journal of Agricultural Sciences. 2003;73(5):266-268.
2. Dubey DK, Singh SS, Verma RS, Singh PK. Integrated nutrient management in garden pea (*Pisum sativum* var hortense). Hort Flora Research Spectrum. 2012;1(3):244-247.
3. Gopinath KA, Meena BL. Effect of organic manures on agronomic performance of garden pea (*Pisum sativum)* and on soil properties, Indian Journal of Agricultural Science. 2011;81(3):236-9.
4. Kharadi RR, Bhuriya KP. Effect of organic and inorganic fertilizers on soil chemical properties of summer green gram. Journal of Pharmacognosy and Phytochemistry. 2020;9(2):432-435
5. Metha T, Swaroop N, Thomas T. Impact of inorganic fertilizers and organic manures on soil health, growth and yield attributes of Pea (*Pisum sativum* L.) cv. Arkel. International Journal of Multidisciplinary Research and Development. 2016;3:165-67.
6. Nishith G, Sharma RP, Tiwari RJ, Bhargav KS. Response of pea (*Pisum sativum* L.) varieties to different fertility levels. Research on Crops. 2016;17(1):90-94.
7. Pawar Y, Varma LR, Verma P, Joshi HN, More SG, Dabhi JS. Influences of integrated use of organic and inorganic sources of nutrients on growth, flowering and yield of garden pea (*Pisum sativum* L.) cv. Bonneville. Legume Research-An International Journal. 2017;40:117-24.
8. Kumari MSS, Usha Kumari K. Effect of Vermicompost enriched with Rock phosphate on the yield and uptake of nutrients in cowpea. Journal of Tropical Agriculture. 2002;40:27-30.
9. Ray SK. Soil test-based nutrient management on garden pea (var. Arkel) under paddy- pea cropping sequence at Wokha district in Nagaland. Indian Journal of Hill Farming. 2014;27(1):149-152.