Effect of Organic Manures and Foliar Application of Zinc on Growth and Yield of Field pea (*Pisum Sativum*)

ABSTRACT

A field experiment was carried out during *rabi* season of 2022 on Field Pea crop at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj, (U.P.). The soil of the experimental plot was Sandy loam in texture, with a pH of 7.2, that was neutral with EC- 0.26 (dS/m), organic carbon (0.72%), available N (178.48kg/ha), available P (27.80kg/ha) and available K (233.24kg/ha). The treatments consisted of 2t/ha Neem Cake, 2t/ha Vermicompost, 10t.ha Farm Yard Manure and foliar application of Zinc and a control. The experiment was laid out in Randomized Block Design (RBD) with 10 treatments and replicated thrice. Application of 10t/ha Farm Yard Manure and foliar application of zinc at 1.0% produced higher plant height (94.82 cm), No of Nodules/plant (5.63) No. of pods/plant (19.09), No. of seeds/pod (5.92), seed yield (2.73 kg/ha) and stover yield (4.08 kg/ha).

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Keywords: Field pea, Neem Cake, Vermicompost, Farm Yard Manure, Zinc, etc.

1. INTRODUCTION

Pea are grain legume and member of the Leguminosae grown throughout the world. It is a native legume of central Southeast Asia. It grows well in cool weather in the presence of ample moisture. Peas are recognized as one of the earliest agricultural crops domesticated by human beings. It is the most important cultivated legume next to soyabean, groundnuts and beans [2] Peas are mostly used in diet throughout the world and are consumed in both fresh and dry conditions. It is widely cultivated in temperate regions for its fresh green seed. Peas are excellent human food [3], either eaten as vegetables or used in preparation of soup. Peas are full of nutrition because its grain is rich in protein, complex carbohydrate, vitamins, minerals, dietary fibers and anti-oxidant compound [4]

Organic manures improve the quality of green pods. Therefore, the applications of plant nutrients through organic sources like compost, farm yard manure and biofertilizers remains the alternative choice of the growers for maintaining its sustainable production. Organic manures can supply practically all the elements of soil fertility that the crops require, though not in adequate amounts and in right proportions. The plant food elements contained in manure are released in an available form upon decomposition by soil microorganism. Neem cake organic manure is the by-product obtained in the process of cold pressing of neem tree

fruits and kernels, and the solvent extraction process for neem oil cake and also used as a fertilizer. It is used to enrich the soil by providing essential required nutrients. It also acts as a biofertilizer by providing the required nutrients, nitrogen and phosphorus necessary for growing crops and plants. Its use basically ensures a high yield of crop. It reduces alkalinity in soil, as it produces organic acids on decomposition. Being natural, it is compatible with soil microbes and rhizosphere microflora. Furthermore, Zn, Cu, Mg and Fe indicated a 91%, 67%, 56% and 10% increase in nutrient composition. The peas showed vigor and vitality during the period of growth. Pea can be grown on a variety of soils from light sandy loam to clay though best results are obtained on well drained, loose friable loamy soil. The pH range falls in between 6.0- 7.5 [5]

Farmyard manure are the major source of nutrient supply also on small farm holdings. It is a varying mixture of animal manure, urine, bedding material, fodder residues, and other components is the most common form of organic manure applied. It improves the soil structure and increases the soil capacity to hold more water and nutrients. Vermicompost stimulates growth, seed germination and development, flowering, and fruit production of a variety of plant species. Vermicompost increases soil organic matter and nutrient content, improves the soil structure and cation exchange capacity. The vermicompost serves as organic manure, since it is a source of nutrients, such as nitrogen, phosphate, potassium and micronutrients etc. It increases the availability of oxygen, maintains normal soil temperature, and increases soil porosity and infiltration of water. It is used in farming and small scale sustainable, organic farming and can also be applied for treatment of sewage.

Zinc plays an outstanding role in the synthesis of chlorophyll, protein and regulates water absorption. Moreover, it also plays a role in carbohydrates metabolism and activation of various enzymes which help in inducing alkalinity tolerance in crops by enhancing Na/K and Na/Ca ratio. Zinc plays a vital role in metabolism processes including carbohydrate, lipid, protein and nucleic acid synthesis and degradation. It also plays a key role in pollination and seed set processes, so their deficiency can cause decrease in seed formation and subsequent yield reduction. Zinc is required for pollen function and fertilization nodule formation [6] Unfortunately, about 50% of Indian soils are deprived of Zinc which does lead to visible abnormalities in plants like stunted growth, chlorosis, smaller leaves, spikelet sterility and increases the plant susceptibility to high light or temperature injury and fungal infections. The foliar spraying of Zinc does have significant effect on the chemical constituents including protein content, NPK % as well as oil %. It has been iterated that increasing zinc concentrations from 0.5-1.0 g/L significantly increases the characteristics of the chemical constituents [7]

[[XX et al. [8] stated that deficiency of zinc is most widely spread [do you mean in the soil?] [8]. [there is no reference 8 in the submitted article] Zinc deficiency is particularly reported from Punjab tarai area of U.P, some parts of Haryana, Western U.P, and Delhi. If zinc deficiency is acute, a dose of 50 kg Znso4/ha is recommended. The deficiency of zinc has increased from 44%- 48% and it is expected to further increase up to 63% by 2025 [9]. The poor use efficiency of zinc application has compelled the search for alternatives and hence different modes of alternative application have been widely studied and adopted [10].

2. MATERIAL AND METHODS

The experiment was carried out during *Rabi* season of 2022 at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (U.P) which is located at 25.39”42” N latitude, 81.50”56” E longitude, and 98m altitude above the mean sea level. This area is situated on

the right side of the river Yamuna and by the opposite side of Prayagraj City. All the facilities required for crop cultivation were available. The soil of the experimental field constituting a part of central Gangetic alluvial is neutral and deep. The soil was sandy loam in texture, low in organic carbon and medium in available nitrogen, phosphorus, and low in potassium. Nutrient sources were urea, and Muriate of Potash to fulfil the requirement of Nitrogen and Potassium. The phosphorus was applied in 40, 50, and 60 kg/ha through Single Super Phosphate nutrient source. The crop was sown on 5th November 2022. The experiment was laid out in Randomized Block Design with 10 treatments each replicated thrice viz., T1- 2t/ha Neem cake + 0.50% Zinc, T2- 2t/ha Neem cake + 0.75% Zinc, T3- 2t/ha Neem cake + 1.0% Zinc, T4- 2t/ha Vermicompost + 0.50% Zinc, T5- 2t/ha Vermicompost + 0.75% Zinc, T6- 2t/ha Vermicompost + 1.0% Zinc ,T7- 10t/ha FYM +0.50 % Zinc, T810t/ha FYM +0.75 % Zinc, T9- 10t/ha FYM +1.0 % Zinc T10- Control (20-50-50 NPK kg/ha). The growth parameters reading such as plant height (cm), Number of nodules/plant, plant dry weight (g) and also, yield parameters such as number of pods/plant, number of seeds/pod, seed yield (kg/ha), and stover yield (kg/ha). The growth parameters were recorded at an intervals of 20, 40, 60, 80, 100 DAS and at harvest stage, from the randomly selected five plants in each treatment. Statistically analysis was done using all the parameters in one-way Anova and means were compared at 0.05 probability level of significant results.

3. RESULTS AND DISCUSSION

3.1. Influence of organic matter and foliar application of zinc growth attributes of field pea.

3.1.1. Plant height (cm)

Significantly highest plant height (94.82cm) was observed in treatment 9 (10t/ha FYM+ 1.0% Zinc*).* However, treatment 8 (10t/ha FYM + 0.50z% Zinc) was statistically at par with treatment 9. The application 10t/ha FYM+ 1.0% Zinc resulted in significantly superior plant height to the rest of the treatments. The increase in plant height may be owing to the improvement in vigor of plants possibly by balanced supply and higher uptake of nitrogen and phosphorus [5].

3.1.2. Dry weight (g/plant)

Significantly maximum dry weight (30.35g) was observed in treatment 9 (10t/ha FYM+ 1.0%) However, treatment 9 (10t/ha FYM + 1.0% Zinc) was statistically at par with treatment 8. The seed inoculation with PSB + *Rhizobium sp*. improved the dry matter accumulation as compared to uninoculated treatment. [5].

Table 1. Influence of biofertilizers on growth attributes of field pea.

S.No.	Treatments	Plant height (cm)	Dry weight (g/plant)
1.	2 t/ha Neem Cake + 0.50 % Zinc	91.39	26.47
2.	2 t/ha Neem Cake + 0.75 % Zinc	90.43	27.18
3.	2 t/ha Neem Cake + 1.00 % Zinc	91.68	28.20
4.	2 t/ha Vermicompost + 0.50 % Zinc	91.55	27.76
5.	2 t/ha Vermicompost + 0.75 % Zinc	92.63	28.04

6.	2 t/ha Vermicompost + 1.00% Zinc	93.62	29.20
7.	10t/ha Farm Yard Manure + 0.50 % Zinc	92.99	27.74
8.	10t/ha Farm Yard Manure + 0.75 % Zinc	93.02	28.08
9.	10t/ha Farm Yard Manure + 1.00 % Zinc	94.82	30.35
10.	Control (20-50-50 NPK kg/ha)	90.11	26.08
	F test	S	S
	SEm(±)	0.49	0.17
	CD (p=0.05)	1.46	0.52

3.2. Influence of Organic matter and foliar application on yield attributes and yield of field pea

3.2.1. Number of pods/plant

The treatment 10t/ha Farm Yard Manure + 1.00% Zinc produced the most pods per plant (19.09) significantly, however, 10t/ha Farm Yard Manure + 0.75 % Zinc, 2 t/ha Vermicompost + 1.00% Zinc and 2 t/ha Vermicompost + 0.75 % Zinc was statistically at par with the treatment of 10t/ha Farm Yard Manure + 0.75% Zinc. [7]

3.2.2. Number of seeds/pod

The treatment 10t/ha Farm Yard Manure + 1.00% Zinc produced the most seeds/pod (5.81) significantly, the treatment of 10t/ha Farm Yard Manure + 0.75 % Zinc, 2 t/ha Vermicompost + 0.75 % Zinc and 2 t/ha Vermicompost + 1.00% Zinc which was statistically at par with the treatment 10t/ha Farm Yard Manure + 1.00% Zinc
[7]

3.2.3 Seed yield (kg/ha)

The treatment 10t/ha Farm Yard Manure + 1.00% Zinc produced the most seed yield (2.73) significantly, the treatment of 2 t/ha Vermicompost + 1.00% Zinc, 10t/ha Farm Yard Manure + 0.75 % Zinc and 2 t/ha Vermicompost + 0.75 % Zinc was statistically at par with the treatment 10t/ha Farm Yard Manure + 1.00% Zinc. [7].

3.2.4. Stover yield (kg/ha)

The treatment 10t/ha Farm Yard Manure + 1.00% Zinc produced the most stover yield (4.08) significantly. The treatment of 10t/ha Farm Yard Manure + 0.75 % Zinc, 2 t/ha Vermicompost + 0.75 % Zinc and 10t/ha Farm Yard Manure + 0.50 % Zinc was statistically at par with the treatment 10t/ha Farm Yard Manure + 1.00% Zinc.

[6].

Table 2. Influence of biofertilizers on yield attributes and yield of field pea varieties.

S.No.	Treatments	No. of pods/plant	No. of seeds/ pod	Seed yield (kg/ha)	Stover yield (kg/ha)
1.	2 t/ha Neem Cake + 0.50 % Zinc	15.67	4.92	1.14	3.12
2.	2 t/ha Neem Cake + 0.75 % Zinc	16.22	5.08	1.19	3.16
3.	2 t/ha Neem Cake + 1.00 % Zinc	17.20	5.20	1.20	3.23
4.	2 t/ha Vermicompost + 0.50 % Zinc	16.66	5.12	1.06	3.29
5.	2 t/ha Vermicompost + 0.75 % Zinc	17.83	5.49	1.32	3.50
6.	2 t/ha Vermicompost + 1.00% Zinc	18.13	5.53	2.29	2.90
7.	10t/ha Farm Yard Manure + 0.50 % Zinc	17.44	5.38	1.19	3.45
8.	10t/ha Farm Yard Manure + 0.75 % Zinc	18.61	5.66	1.97	3.51
9.	10t/ha Farm Yard Manure + 1.00 % Zinc	19.09	5.92	2.73	4.08
10.	Control (20-50-50 NPK kg/ha)	15.19	4.65	1.04	2.31
	F test	S	S	S	S
	SEm(±)	0.03	0.35	0.15	0.24
	CD (p=0.05)	0.10	1.06	0.46	0.74

4. DISCUSSION

INCLUDE A LITTLE BIT OF DISCUSSION TO ADD TO THE INTRODUCTION COMPARING YOUR RESULTS OF YOUR STUDIES WITH THE RESULTS OF OTHER PREVIOUSLY REPORTED AND INDICATE WHICH AREAS OF FURTHER STUDIES YOU WOULD RECOMMEND TO SUPPORT OR NEGATE THE FINDINGS FROM YOUR RESEARCH

5. CONCLUSION

It is concluded that applying farm yard manure at 10t/ha in conjunction with foliar treatments of zinc at 1.0% recorded higher yield and benefit cost -ratio

ABBREVIATIONS: TABULATE ALL YOUR ABBREVIATIONS AND WRITE IN FULL WHAT EACH ABBREVIATION MEANS FOR THE READER TO UNDERSTAND
FOR EXAMPLE
NA – SODIUM
KA – POTASSIUM
ZN – ZINC
NO -------
AND SO ON

CONFLICT OF INTEREST; MAKE A CONFLICT-OF-INTEREST STATEMENT RELATED TO EACH AUTHOR
SOURCE OF FUNDING – DOCUMENT WHERE YOU GOT YOUR FUNDING TO PAY FOR YOUR RESEARCH
ACKNOWLEDGEMENTS – ACKNOWLEDGE ANY INDIVIDUAL OR GROUPPS THAT HAD SUPPORTED YOU IN YOUR RESEARCH
APPROVAL- DID ANY COMMITTEE SUPPORT OR GIVE YOU APPROVAL FOR THE STUDY OR TOLD YOU APPROVAL WAS NOT REQUIRED?

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