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## EFFECT OF SYNTHETIC FERTILIZERS WITH DIFFERENT LEVELS OF SOLUBLE SYNTHETIC FERTILIZERS ON GROWTH AND YIELD OF FIELD PEA AT DEHRADUN INDIA

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### ABSTRACT

A field experiment was conducted during Rabi season of 2020-21 at research farm, Department of Agriculture Dev Bhoomi institute of management studies, Dehradun, Uttarakhand. In order to investigate the effect of synthetic fertilizers with different levels of soluble synthetic fertilizers on growth and yield of field pea crop. The layout of experimental field was laid randomized block design (RBD) with 10 treatments and 3 replications. Consisting of T1 (Control), T2 (N:P:K Soluble@2%), T3 (DAP@5%), T4 (SSP@5%), T5 (N:P:K Soluble@5% + SSP@5%), T6 (N:P:K Soluble@2%+DAP@2%), T7 (N:P:K Soluble@ 2%+SSP@2%), T8 (N:P:K Soluble @5%+DAP @5%) T9 (N:P:K Soluble@5%), T10 (N:P:K Soluble@6%). The results indicated that among all the treatments, T5 ((N:P:K Soluble@5% + SSP@5%), overall was found best for farmer point of view with respect to plant height (68.02cm), number of leaves per plant (43.68), branches per plant (15.17), number of pods per plant (26.31), Seed yield (18.69q/ha), straw yield (25.05 q/ha) and biological yield (43.59q/ha).

Based on present investigation, it can be concluded that the combination of both SSP@5% as basal application & N:P:K @5% as foliar application are applied that improved growth and yield of field pea crop under present agro-climatic conditions.

**Keywords:** Synthetic fertilizers, field pea, foliar application, SSP, DAP.

### INTRODUCTION

Pea (*Pisum sativum L.*) is one of the important crops cultivated both for green pods (Table purpose *i.e.* Garden pea) and dry seeds (Pulse purposes *i.e.* Field pea). Pea plants were first grown in the Mediterranean region in 7000 B.C. to provide food for humans and animal feed. From this origin, peas have spread over most temperate regions (McPhee, 2004) and are now grown for human consumption and for hay, or silage to support animal production (Uzun *et al.*, 2005). Garden pea is cultivated in 74 countries and Field pea in 89 countries of the world. Pea is grown as vegetable in various states of India. Major pea growing states are Bihar, Haryana, Punjab, H.P. Orissa, and Karnataka. Uttarakhand is also emerging as vegetable pea growing state as farmers are taking three crops in a year. Uttar Pradesh is the major field pea growing state. Field pea is grown in an area of 6205 thousand hectares with production of 11914 thousand metric tonnes and productivity 1.92 tonnes /ha. In India, Garden pea is grown in 350 thousand hectare with annual production of 3200 thousand metric tonnes. The high requirement of Phosphorus in legumes is consistent with its involvement in the high rates of energy transfer that must take place in the nodule. In addition, phosphorus has an enhancing impact on plant growth and biological yield through its importance as energy storage and transference necessary for metabolic processes (Srivastava *et al.*, 1998 and, Nassar and Ismail, 1999). Sharma (2002) reported that one of the advantages of

feeding the plants with phosphorus is to create deeper and more abundant roots. Phosphorus causes early ripening in plants, decreasing grain moisture, improving crop quality and is the most sensitive nutrient to soil pH (Malakooti, 2000). It also raised the efficiency of plants to photosynthesis, enhances the activity of rhizobia and increases the number of branches and pod /plants, consequently produces a greater total yield of pea (Omar *et al.*, 1990).

### MATERIAL AND METHODS

The present investigation entitled “Effect of synthetic fertilizers with different levels of soluble synthetic fertilizers on growth and yield of field pea crop in Dehradun, India” Valley was carried out during Rabi season of 2020–2021 in the research farm, Department of Agriculture Dev Bhoomi Group of Institutions, Dehradun, Uttarakhand. It is located in the north western region of Uttarakhand at an altitude of 450 m above mean sea level (MSL) and 3088 square kilometer in size. Geographically, the location of Dehradun is in between 29°58' and 31°30' North latitude and 77°34'45" and 78°18'30" east longitudes.

The climate of Dehradun is humid subtropical. Summer temperatures can reach up to 44°C for a few days and a hot wind called Loo blows over North India. Winter temperatures are usually between 1 and 20°C and fog is quite common in winters like plains. Although the temperature in Dehradun can reach below freezing during severe cold snaps,

this is not common. During the monsoon season, there is often heavy and protracted rainfall.

The soil of experimental site is classified as 'sandy loam' with characteristics as deep, well drained, coarse loamy cover over fragmental soils and of medium fertility. Total five soil samples were taken from upper (0-15cm) layer of the soil and mixed properly from different sites of the field. After proper mixing of the soil, a representative sample was taken for its physiochemical process. A composite soil sample was prepared and analyzed separately for different physio-chemical characteristics of the soil. The analysis revealed that the soil of the experimental site was Sandy loam in texture poor in organic matter, low in available nitrogen, medium in available phosphorus and Potassium contents with neutral in reaction and normal in electrical conductivity.

The experimental site having neutral pH and experiment was laid out in completely Randomized block design (RBD). The experiment was replicated thrice with 10 treatments viz., T<sub>1</sub> (Control), T<sub>2</sub> (N:P:K Soluble @ 2%), T<sub>3</sub> (DAP @ 5%), T<sub>4</sub> (SSP @ 5%), T<sub>5</sub> (N:P:K Soluble @ 5% + SSP @ 5%), T<sub>6</sub> (N:P:K Soluble @ 2% + DAP @ 2%), T<sub>7</sub> (N:P:K Soluble @ 2% + SSP @ 2%), T<sub>8</sub> (N:P:K Soluble @ 5% + DAP @ 5%), T<sub>9</sub> (N:P:K Soluble @ 5%), T<sub>10</sub> (N:P:K Soluble @ 6%). Gross plot size was 9.2m (4m x 2.3m) and net plot size was 6m (3m x 2m). Total number of plots were 30.

## RESULT AND DISCUSSION

### Growth Attribute

#### Plant Height

Observations on the plant height were recorded at harvest and the data were statistically analyzed. The mean values have been presented in Table 1.1. At harvest stage, maximum height recorded under T<sub>5</sub> (68.02 cm) i.e. N:P:K Soluble @ 5% + SSP @ 5%, followed by T<sub>8</sub> (65.49cm),

T<sub>7</sub> (63.38cm), and least height recorded on control plots i.e. T<sub>1</sub> (34.69cm). Further, it was also observed that all the other treatments were significantly better in plant height than the control treatment.

#### Number of leaves per plant

Observations on the number of leaves per plant were recorded at harvest and the data were statistically analyzed. The mean values have been presented in Table 1.1. At harvest stage, maximum number of leaves per plant recorded under T<sub>5</sub> (43.68) i.e. N:P:K Soluble @ 5% + SSP @ 5%, followed by T<sub>8</sub> (41.35), T<sub>7</sub> (40.47), and least number of leaves were recorded on control plots i.e. T<sub>1</sub> (24.85). Further, it was also observed that all the other treatments were significantly better in number of leaves than the control treatment.

#### Number of branches per plant

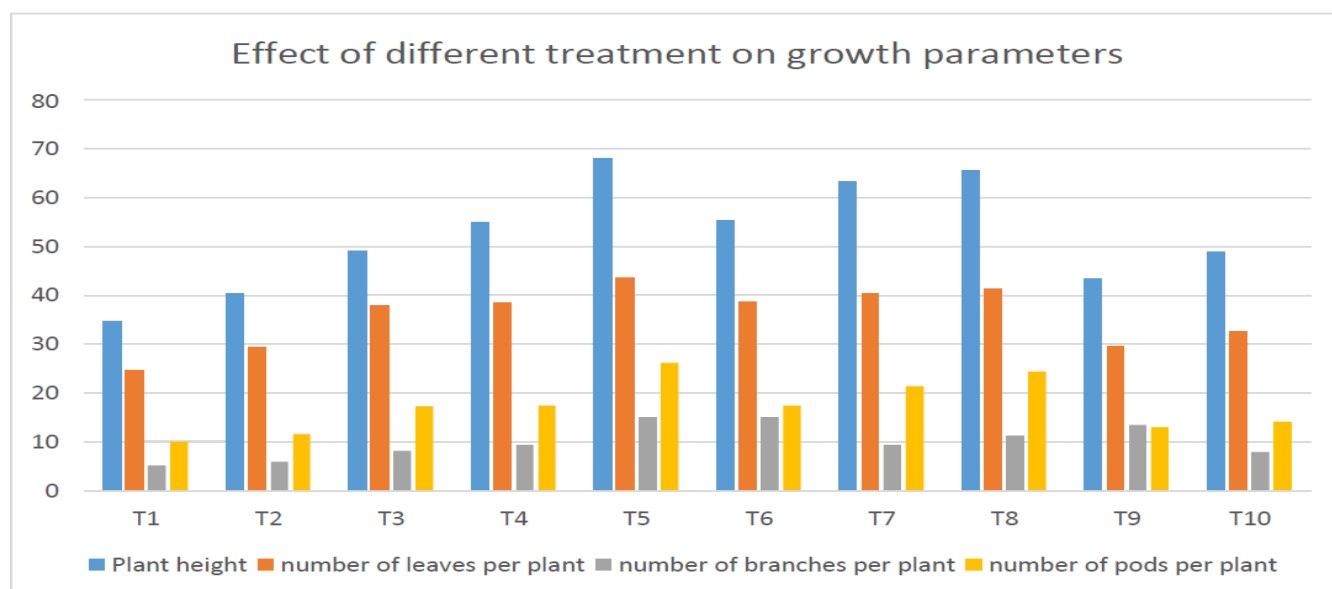
The data showed that there were significant differences in number of branches per plant among the treatment (Table 1.1). The treatments T<sub>5</sub> (N:P:K Soluble @ 5% + SSP @ 5%), produced highest number of branches i.e. 15.17 branches per plant followed by T<sub>8</sub> i.e. 13.56, T<sub>7</sub> 11.25 and the least with T<sub>1</sub> i.e. 5.20.

#### Number of pods per plant

Observations on the pods per plant were recorded at harvest and the data were statistically analyzed. The mean values have been presented in Table 1.1. At harvest stage, maximum number of pods per plant were recorded under T<sub>5</sub> 26.31 i.e. N:P:K Soluble @ 5% + SSP @ 5%, followed by T<sub>8</sub> 24.52, T<sub>7</sub> 21.51, and least number of pods recorded on control plots i.e. T<sub>1</sub> 10.19. Further, it was also observed that all the other treatments were significantly better in number of pods per plant than the control treatment.

**Table 1.1:** Effect of different treatments on growth parameters of field pea.

	Treatments	Plant height (cm)	Number of leaves/plant	Number of branches/plant	Number of pods/plant
T <sub>1</sub>	Control	34.69	24.85	5.20	10.19
T <sub>2</sub>	N:P:K Soluble @ 2%	40.37	29.52	6.03	11.74
T <sub>3</sub>	DAP @ 5%	49.17	37.93	8.25	7.42
T <sub>4</sub>	SSP @ 5%	54.92	38.53	9.51	17.49
T <sub>5</sub>	N:P:K Soluble @ 5% + SSP @ 5%	68.02	43.68	15.17	26.31
T <sub>6</sub>	N:P:K Soluble @ 2% + DAP @ 2%	55.45	38.83	9.51	17.52
T <sub>7</sub>	N:P:K Soluble @ 2% + SSP @ 2%	63.38	40.47	11.25	21.51
T <sub>8</sub>	N:P:K Soluble @ 5% + DAP @ 5%	65.49	41.35	13.56	24.52
T <sub>9</sub>	N:P:K Soluble @ 5%	43.45	29.62	6.24	13.08
T <sub>10</sub>	N:P:K Soluble @ 6%	48.88	32.71	7.93	14.21
SEm ±		1.28	1.01	0.95	0.87
CD(P=0.05)		3.68	3.16	2.73	2.05



**Fig. 1 :** Graphical presentation of effect of different treatments on growth parameters

**Yield attribute**

**Seed yield**

The grain yield differed significantly due to addition of different combinations of basal application and foliar application of synthetic fertilizer treatments. The maximum seed yield were recorded under Treatment T5 18.69q/ha i.e. N:P:K Soluble@5% +SSP@5%, followed by T8 18.23q/ha, and least seed yield recorded on control plots i.e. T1 9.09q/ha.

**Straw yield**

The straw yield differed significantly due to addition of different combinations of basal application and foliar application of synthetic fertilizer treatments. The maximum straw yield were recorded under Treatment T5 25.05q/ha i.e. N:P:K Soluble@ 5% + SSP@5%, followed by T8 23.99 q/ha, and least straw yield recorded on control plots i.e. T1 17.91 q/ha.

**Biological yield**

The biological yield differed significantly due to

addition of different combinations of basal application and foliar application of synthetic fertilizer treatments. The maximum biological yield were recorded under Treatment T5 43.59 q/ha i.e. N:P:K Soluble @5% + SSP@5%, followed by T8 42.23q/ha, and least biological yield recorded on control plots i.e. T1 27.13q/ha.

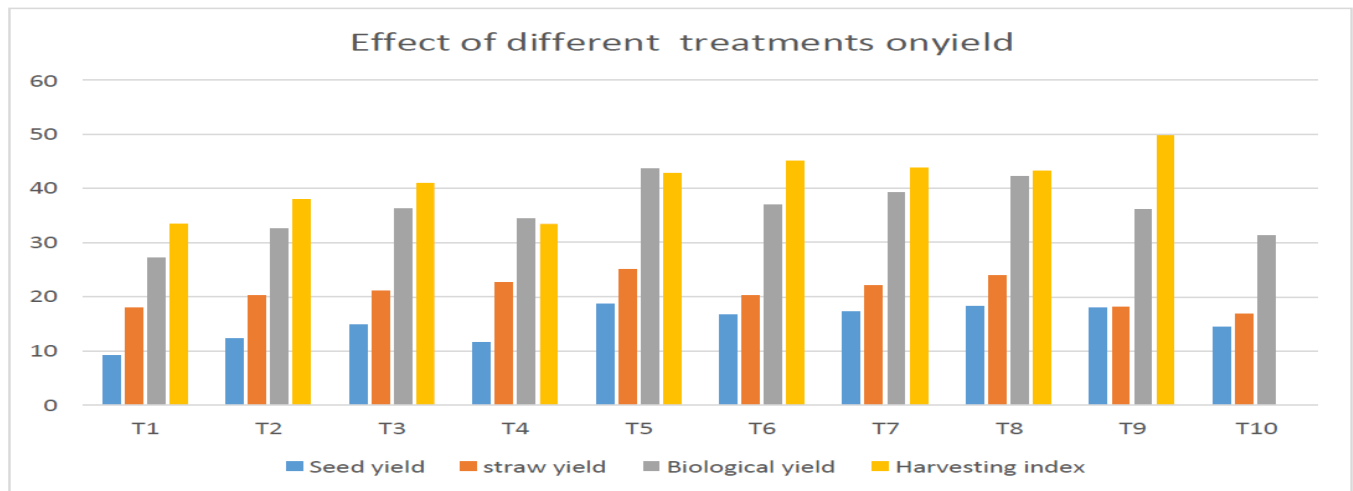
**Harvest index**

Data on the harvest index were gathered on the basis of grain yield and total biological yield and the mean data have been presented in Table 1.2. Then on-significant differences were observed among the various treatments

For harvest index. However, treatment T9 had the highest harvest index value (49.73%) followed by T10(46.05%). While the lowest harvest index was registered under T4(33.44%).

**Table 1.2 :** Effect of different treatments on yield of field pea.

Treatments	Seed yield (q/ha)	Straw yield (q/ha)	Biological yield (q/ha)	Harvesting index (%)
T1	9.09	17.91	27.13	33.47
T2	12.24	20.32	32.56	38.03
T3	14.88	21.05	36.24	41.00
T4	11.48	22.64	34.43	33.44
T5	18.69	25.05	43.59	42.72
T6	16.68	20.29	36.97	45.06
T7	17.21	22.10	39.31	43.76
T8	18.23	23.99	42.23	43.17
T9	18.01	18.19	36.20	49.73
T10	14.40	16.86	31.26	46.05
SEm ±	0.9	0.71	1.26	1.65
CD(P=0.05)	2.59	2.04	3.62	4.75



**Fig. 2 :** Graphical representation of effect of different treatments on yields

### Author's contribution

Conceptualization of research work and designing of experiments (K Paarthiban); Execution of field/ lab experiments and data collection (Nautiyal Diksha); Analysis of data and interpretation (Manisha ); Preparation of manuscript (Nautiyal Diksha).

### CONCLUSION

On the basis of field experiment conducted on Effect of synthetic fertilizers with different levels of soluble synthetic fertilizers on growth and yield of field pea crop in Dehradun concluded that treatment T5(N:P:K Soluble @5% +SSP@ 5%), was found superior among the other treatments on growth and yield of field pea. Treatment T5 the combination of both basal application & foliar application of synthetic fertilizers were obtaining higher seed yield 18.69q/ha and straw yield 25.05q/ha. As per the economics feasibility performance is concerned treatment T5.

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