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Growth and Yield of Pea (*Pisum sativum* L.) cv. Azad P-1 as Influenced by NADEP Composts Prepared by Using Different Raw Materials

Vipin Kumar[1*], Arvind Kumar[1], M.K. Singh[1], Mukesh Kumar[1] and Uttam Kumar[2]

[1]SVP University of Agriculture and Technology, Meerut (UP), India
[2]National Dairy Research Institute (NDRI), ICAR, Karnal, Haryana, India
**Corresponding author*

A B S T R A C T

The present investigation "Growth and Yield of Pea (*Pisum sativum* L.) cv. Azad P-1 as Influenced by NADEP Composts'' comprised of eleven treatments consisting the different levels of NPK, and different type NADEP compost prepared by different raw materials. During the experimentation, growth character and yield characters were recorded. The germination of pea cv. Azad P-1, Seeds became faster with T6 [20:40:50 kg/ha of NPK + 10 t NADEP (1)] treatment and there after the flowering, fruiting also increased progressively in the same treatment. The T1 [(10:20:25 kg/ha of NPK + 10 t NADEP (1)] treatment exhibited the maximum yield/ha followed by T6. A comparative study of the present findings led to the conclusion that sowing of pea with the application of NADEP (1) compost @ 10 t/ha and NPK @ 10:25:25kg/ha was found most effective to best growth of pea crop under western plain zone of UP.

Keywords

Pisum sativum, Growth and yield, NADEP compost, NPK.

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Introduction

Pea (*Pisum sativum* L.) is one of the important vegetables in the world and ranks among the top 10 vegetable crops (Ref./ in the world?). Pea is commonly used in human diet throughout the world and it is rich in protein (21-25 %), carbohydrates, vitamin A and C, Ca, phosphorous and has high levels of amino acids lysin and trypophan (Bhat *et al.*, 2013). Its cultivation maintains soil fertility through biological nitrogen fixation in association with symbiotic rhizobium prevalent in its root nodules and thus play a vital role in fostering sustainable agriculture (Negi *et al.*, 2006). Therefore, apart from meeting its own requirement of nitrogen, peas are known to leave behind residual nitrogen in soil 50-60 kg/ha (Kanwar *et al.*, 1990).

Chemical fertilizers are needed to get good crop yields but their abuse and overuse can be harmful for the environment and their cost cannot make economic and profitable agricultural products (Bobade *et al.*, 1992). The increased use of chemicals under intensive cultivation has not only contaminated the ground and surface water but has also distributed the harmony existing among the soil, plant and microbial population (Bahadur *et al.*, 2006). Biofertilizers or compost on the other hand are cost-effective and renewable source of plant nutrients to supplement the parts of chemical fertilizers. Biofertilizers are known to play an important role in increasing availability of nitrogen and phosphorus besides improving biological fixation of atmospheric nitrogen and enhance phosphorus availability to crop (Bhat *et al.,* 2013). A judicious use of organic manures and biofertilizers may be effective not only sustaining crop productivity and in soil health, but also in supplementing chemical fertilizers of crop (Jaipal *et al.,* 2011).

Incorporation of organic fertilizers into soil causes a large and rapid increase in the soil microbial biomass (Ghoshal and Singh, 1995; Heinze *et al.,* 2010), which forms only a small fraction of soil organic matter. However the soil microbial biomass plays an important role in nutrient cycling and plant nutrition, due to its fast turnover (Jenkinson and Ladd, 1981). For this reason, some studies have found a close relationship between the soil microbial biomass and crop yields under greenhouse conditions (Chen *et al.,* 2000) as well as under field conditions (Insam *et al.,* 1991; Goyal *et al.,* 1992; Khan and Joergensen, 2006; Mandal *et al.,* 2007). However, this relationship has not always been observed (Nilsson *et al.,* 2005).

Materials and Methods

The present investigation entitled "Response of vermi-compost on growth and yield of pea (*Pisum sativum* L.) cv. Azad P-1'' was carried out during 2013- 2014 at Horticultural Research Centre, of Sardar Vallabhbhai Patel University of Agricultural & Technology, Meerut to standardize the optimum dose and formulation of NADEP compost for obtaining best growth, flowering and production of yield. The experiment comprised of eleven treatments consisting of different type of NADEP compost made from different waste materials (Table 1) in combination with two levels of NPK, and the combination of was laid out in randomized block design with three replication. The treatments are as,

T1: 10:20:25 kg/ha of NPK + 10 t NADEP (1)
T2: 10:20:25 kg/ha of NPK + 10 t NADEP (2)
T3: 10:20:25 kg/ha of NPK + 10 t NADEP (3)
T4: 10:20:25 kg/ha of NPK + 10 t NADEP (4)
T5: 10:20:25 kg/ha of NPK + 10 t NADEP (5)
T6: 20:40:50 kg/ha of NPK + 10 t NADEP (1)
T7: 20:40:50 kg/ha of NPK + 10 t NADEP (2)
T8: 20:40:50 kg/ha of NPK + 10 t NADEP (3)
T9: 20:40:50 kg/ha of NPK + 10 t NADEP (4)
T10: 20:40:50 kg/ha of NPK + 10 t NADEP (5)
T11: 20:40:50 kg/ha of NPK Through chemical fertilizers (Control)

Basal application of ½ dose of N in the form of urea, full dose of P in the form of single super phosphate (S.S.P.) and K in the form of murate of potash, and NADEP compost as per the nutrient status was given with broad cast method. Rest half dose of N was applied 30 days after germination. During the experimentation, Five plants under each treatment combination were randomly selected and tagged for recording the observation on growth and yield characters (whenever required).

Results and Discussion

Growth of Pea

The germination of pea cv. Azad P-1, Seeds became faster (11 days) with T6 [20:40:50 kg/ha of NPK + 10 t NADEP (1)] treatment and there after the flowering, fruiting also increased progressively in the same treatment. Optimum dose of Phosphorus and potassium had significant effect on vine length while their interaction indicated non-significant differences among the treatment means. The result indicates that the vine length significantly increased with the increasing rate of phosphorus and potassium up to 69kg P_2O_5 and 100 kg K_2O ha^{-1} respectively (Akhtar *et al.*, 2003). The performance of pea with respect to germination and nodulation was influenced by the temperature, rainfall, humidity etc. Lopes *et al.*, (1996) reported that an increase in levels of vermicompost up to 10 t/ha significantly increased nodulation and dry matter yield of cowpea over rest of the treatments.

Levels of NADEP compost also had significant effect on days to flowering and fruiting. Minimum days taken to flowering (44.00) and fruiting (63.7) were recorded in T6 (20:40:50 kg/ha of NPK + 10 t NADEP (1)) followed by 44.3 days and 65.3 for flowering and fruiting respectively, were taken by T210:20:25 kg/ha of NPK + 10 t NADEP (2) and maximum (45.7) days to flowering and fruiting (68.7) were taken by T11 (20:40:50 kg/ha of NPK (Control). The deficiency of major nutrients stunted the plant growth, resulting the maximum days taken to flowering. Very optimum dose of NPK reduce the days taken to flowering up to a certain limit and vice versa. Similar results were coated by Naeem *et al.*, (2002) for chilli.

Maximum number of branches (22.0) and length of plant (77.00) were also found with the T6 [20:40:50 kg/ha of NPK + 10 t NADEP (1)] whereas these were minimum 14.7, and 55.7 for number of branches and length of plan respectively in the controlled treatment T11 (20:40:50 kg/ha of NPK). El-Beheldi *et al.*, (1985), Abdel-Ghaffar and Mohamed (1992) found that the growth parameters (number of branches and length of plant etc.) of pea cultivars was significantly affected by number of nodulation /plant, which is increased by inoculation treatments through organic compost.

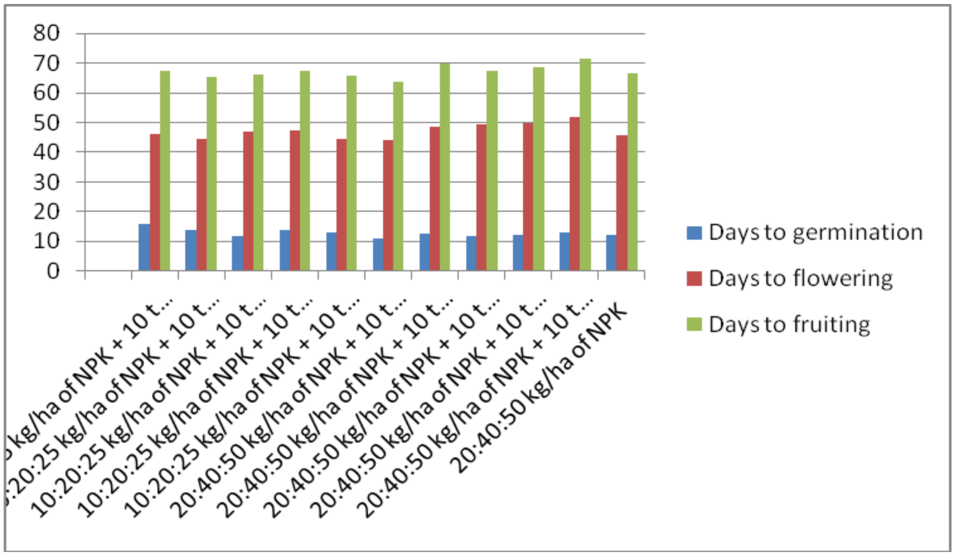
Data recorded on yield characters are presented on table 2 data indicate that, NADEP-compost levels also influenced the number of pods per plant. The highest pod number (10.00) was obtained with T6 (20:40:50 kg/ha of NPK + 10 t NADEP (1)) treatment under the present study and it was minimum (6.5) in controlled treatment T11 (20:40:50 kg/ha of NPK). The plants treated with different combinations of NPK and NADEP compost results in to higher length of pods. Similar results were reported by Nadeem *et al.*, (2003) and Parsad *et al.*, (2005).

Table.1 Nutrients composition of compost obtained from different types NADEP composting

Sl. No	Treatments	N (%)	P_2O_5 (%)	K_2O (%)	pH	EC (ms)
N_1	1500 kg. Dung + 420 kg. Dry cuttings of Parthenium + 1400 kg. Soil + 2000 lit. Water	2.18	0.41	1.42	8.56	0.355
N_2	1300 kg. Dung + 720 kg. green cuttings of parthenium+ 1200 kg. Soil + 1800 lit. Water	2.37	0.53	1.79	9.04	0.480
N_3	1500 kg. Dung + 420 kg. Dry cuttings of Bhang + 1400 kg. Soil + 2000 lit. Water	1.24	0.23	1.24	8.56	0.387
N_4	1300 kg. Dung + 720 kg. green cuttings of Bhang + 1200 kg. Soil + 1800 lit. Water	1.69	0.10	1.08	8.00	0.402
N_5	1500 kg. Dung + 420 kg. Waste material (Crop residue, leaves etc.) + 1400 kg. Soil + 2000 lit. Water	2.10	0.42	1.89	8.69	0.410

Table.2 Effect of NADEP-compost on yield characters of Pea (*Pisum sativam* L.)

Sl No	Treatment	Days to germination	Days to flowering	Days to fruiting	No. of branches	Length of plant	No. of pod/ plant	No. of seed per plant	Length of pod	Wt. of pod	Yield ton/ha
1	10:20:25 kg/ha of NPK + 10 t NADEP (1)	16.0	46.3	67.3	19.0	67.3	9.0	6.3	5.2	6.0	11.8
2	10:20:25 kg/ha of NPK + 10 t NADEP (2)	14.0	44.3	65.3	15.0	67.0	8.7	6.0	5.2	5.4	10.5
3	10:20:25 kg/ha of NPK + 10 t NADEP (3)	11.7	47.0	66.0	15.0	62.3	9.7	4.3	4.4	5.4	10.6
4	10:20:25 kg/ha of NPK + 10 t NADEP (4)	14.0	47.3	67.3	15.3	64.7	6.0	6.3	4.5	5.7	11.0
5	10:20:25 kg/ha of NPK + 10 t NADEP (5)	13.0	44.3	65.7	21.7	69.3	8.7	7.7	5.1	5.7	11.0
6	20:40:50 kg/ha of NPK + 10 t NADEP (1)	11.0	44.0	63.7	22.0	77.0	10.0	7.0	5.1	6.4	12.0
7	20:40:50 kg/ha of NPK + 10 t NADEP (2)	12.7	48.7	69.7	15.3	70.0	9.3	6.0	4.1	6.0	11.6
8	20:40:50 kg/ha of NPK + 10 t NADEP (3)	12.0	49.3	67.3	15.3	70.7	7.7	6.0	3.8	5.7	11.3
9	20:40:50 kg/ha of NPK + 10 t NADEP (4)	12.3	49.7	68.7	16.3	72.7	8.0	4.7	4.2	5.8	11.6
10	20:40:50 kg/ha of NPK + 10 t NADEP (5)	13.0	52.0	71.3	15.3	56.0	6.7	4.3	4.4	5.0	10.6
11	20:40:50 kg/ha of NPK	12.3	45.7	66.7	14.7	55.7	6.5	4.2	4.0	4.8	9.8
	CD (1%)	**1.266**	**3.307**	**3.507**	**1.781**	**3.761**	**1.72**	**1.412**	**0.944**	**0.459**	**1.299**
	CD (5%)	**0.928**	**2.425**	**2.571**	**1.306**	**2.758**	**1.261**	**1.036**	**0.692**	**0.351**	**0.952**
	SE (m)	**0.315**	**0.882**	**0.872**	**0.443**	**0.935**	**0.428**	**0.351**	**0.235**	**0.569**	**0.469**
	SE (d)	**0.445**	**1.163**	**1.233**	**0.626**	**1.322**	**0.605**	**0.496**	**0.332**	**1.215**	**0.625**
	CV	**4.221**	**3.02**	**2.247**	**4.534**	**2.418**	**9.018**	**10.45**	**8.853**	**3.661**	**5.076**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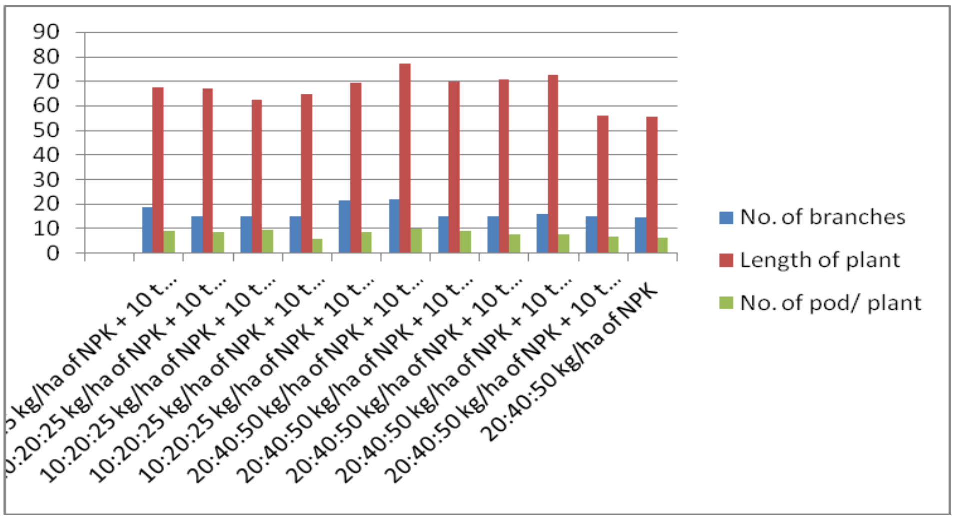
Days to flowering
Days to fruiting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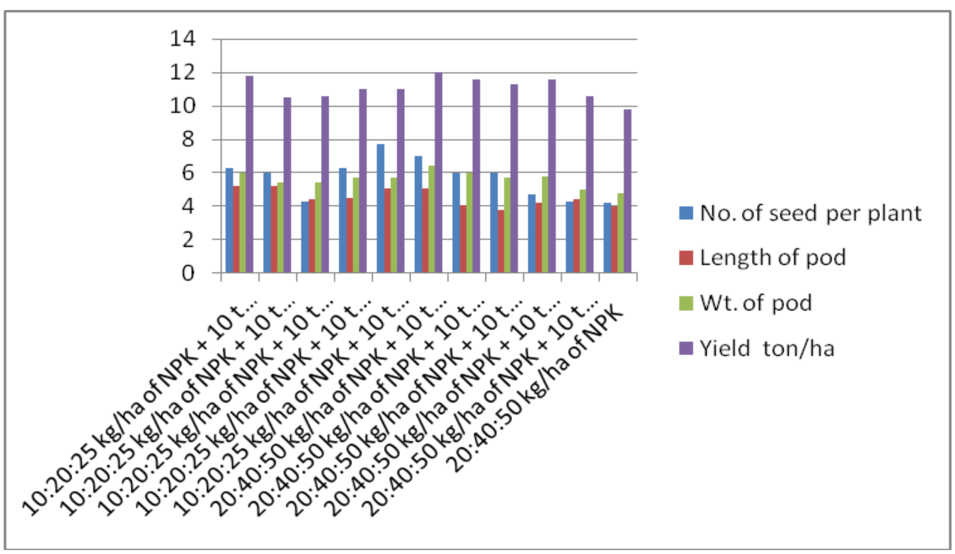
20:40:50 kg/ha of NPK
No. of branches
Length of plant
No. of pod/ plant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20:40:50 kg/ha of NPK + 10 t...
20:40:50 kg/ha of NPK
No. of seed per plant
Length of pod
Wt. of pod
Yield ton/ha

Yield of pea

An increasing trend in number of seed per pod was observed in pea with increasing levels of NADEP compost, and the maximum being under (20:40:50 kg/ha of NPK + 10 t NADEP (5) level whereas it was minimum (4.2) in controlled treatment T11 (20:40:50 kg/ha of NPK). Length of pod (5.2) was found maximum in T1 (20:40:50 kg/ha of NPK + 10 t NADEP (5) followed by T6 (5.1) and minimum (4.0) was in T11 (20:40:50 kg/ha of NPK). Weight of pod was found maximum (6.4) in T6 [20:40:50 kg/ha of NPK + 10 t NADEP (1)] and minimum (4.8) in T11 (20:40:50 kg/ha of NPK). Proper nutrients promote vigorous growth of the plant which ultimately increase the size of pod as well as seed which confirms the observation of Waseem *et al.,* (2008).

NADEP compost doses significantly increased the yield per hectare over control. Having produced the maximum yield per hectare (12.0) found under T6 (20:40:50 kg/ha of NPK + 10 t NADEP (1) treatment followed by obtained the top rank. A comparative study of the present findings led to the conclusion that sowing of pea with the application of NADEP compost @ (20:40:50 kg/ha of NPK + 10 t NADEP (1) kg/ha was found most effective to best growth of pea crop under North west plain zones of Uttar Pardesh. Vimla and Natrajan (2000) reported a combination of organic and organic fertilizers at the optimum dose significantly increased the yield and yield attributing characters. Jaipaul *et al.,* (2011) and Mishra *et al.,* (2010) had reported the similar findings in their experiments.

The organic source applied to the soil through biofertilizers have influenced the soil nutrient availability through better microbial activities in fixing atmospheric N and releasing the nutrients from the soil and help in the process of absorption of ample nutrients and its utilization by the plants due to influence on yield.

The above results showed that the pure chemical could not result in highest yield and quality. The integration of biofertilizers along with chemicals in an appropriate dose not only has a positive effect on the yield attributes of pea and gives highest net returns but also Increasing soil fertility status and ecofriendly as well (Bhattarai *et al.,* 2003).

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