

## Effect of Organic and Inorganic Fertilization on Growth, Yield Attributes and Yield of Okra (*Abelmoschus esculentus* L. Moench) in Bihar

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### Abstract

An experiment was conducted at Nalanda College of Horticulture, Noorsarai, Nalanda during Kharif 2016 to assess the effect of complementary and sole applications of organic and inorganic fertilizers on the growth and yield of okra. The experiment comprised of seven treatments viz., T<sub>1</sub>-Recommended dose of fertilizers; T<sub>2</sub>-50%NPK through MF\*+50%N through FYM; T<sub>3</sub>-50% N through FYM+50% N through VC; T<sub>4</sub>-1/3 of N each through FYM + VC + Neemcake; T<sub>5</sub>-50% N through FYM + PSB + Azotobactor; T<sub>6</sub>-T<sub>3</sub>+PSB + Azotobactor and T<sub>7</sub>-T<sub>4</sub>+PSB + Azotobactor, with three replications in Randomized Block Design. Results revealed that recommended dose of fertilizer (120:60:40) recorded significantly highest plant (49.9, 127.3 and 169.4 cm) at 30, 60 and 90 days after sowing respectively, over rest of the treatment but found at par with T<sub>2</sub>-50%NPK through MF\*+50%N as FYM at 30 and 90DAS. The number of branch didn't differ significantly, although recorded highest in RDF followed by T<sub>2</sub>-50%NPK through MF\*+50%N through FYM, T<sub>3</sub>-50% N through FYM+50% N through VC. Number of fruits per plant and yield also differed significantly. T<sub>1</sub>-Recommended dose of fertilizer recorded significantly more number of fruits over T<sub>4</sub>, T<sub>5</sub> and T<sub>7</sub>, but found at par with T<sub>2</sub>, T<sub>3</sub> and T<sub>6</sub>. RDF recorded significantly higher yield over rest of the treatment but was at par with 50%NPK through MF\*+50%N through FYM. On the basis result T<sub>2</sub> as 50%NPK through mineral fertilizer+50%N through FYM can be adapted for sustainable crop production.

**Keywords:** Okra, FYM, vermicompost, Neemcake, mineral fertilizer

### Introduction

The use of inorganic fertilizers alone has not been helpful under intensive agriculture because it aggravates soil degradation<sup>[6]</sup> by loss of organic matter which consequently results in soil acidity, nutrient imbalance and low crop yields. Nutrients contained in organic manures are released more slowly and are stored for a longer time in the soil, thereby ensuring a long residual effect<sup>[6]</sup>. Complementary use of organic manure and mineral fertilizers has been proved to be a sound soil fertility management strategy in many countries of the world. High and sustained crop yield could be obtained with judicious and balanced NPK fertilization combined with organic matter amendments<sup>[2,3,4]</sup>. Therefore, need for judicious management of resources and

conservation of soil under intensive cropping has become major areas of agronomic research<sup>[1]</sup>. Hence present study was carried out to compare the effects of complementary and sole applications of organic and inorganic fertilizers on the growth and yield of okra.

### Materials and Methods:

This experiment was conducted at Nalanda College of Horticulture, Noorsarai, Nalanda during *kharif*, 2016, to assess the effect of complementary and sole applications of organic and inorganic fertilizers on the growth and yield of okra. The soil of the experimental plot was clay loam with 7.47 pH and 0.62 % organic carbon, 262 kg, 14.60 kg and 142 kg ha<sup>-1</sup> available N, P and K, respectively. The experiment was laid down in Randomized Block Design with three replications. There were seven treatments viz., T<sub>1</sub>-Recommended

dose of fertilizers (150, 50, 50 kg N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O), T<sub>2</sub>-50%NPK through mineral fertilizer (MF)+50%N through FYM, T<sub>3</sub>-50% N through FYM+50% N through VC, T<sub>4</sub>-1/3 each through FYM+VC+Neemcake, T<sub>5</sub>-50% N through FYM+biofertilizer, T<sub>6</sub>-T<sub>3</sub>+biofertilizer and T<sub>7</sub>-T<sub>4</sub>+biofertilizer, have been taken for study. Recommended agronomical package of practices were followed excluding fertilizer treatments. Organic fertilizers were applied a week before sowing. It was uniformly spread on the plots and lightly incorporated into the soil manually. Thinning was done at 20 days after sowing followed by weeding and earthing up. Irrigation was given as per crop demand. Neem oil was sprayed two times @3ml per litre to protect the crop from yellow vein mosaic viruses. Observations were recorded on plant height, number of branches per plant, green pod length, number of green pods per plant, green pod yield per plot and green pod yield per hectare. The data collected on different aspect of experimentation were analyzed with the help of computer applying analysis of variance technique.

## Results and Discussion

### Plant growth:

Plant height (Table 1) differed significantly due to different fertilizer treatments. Among all the treatments, recommended dose of fertilizer (RDF) recorded highest plant height (49.9, 127.3 and 169.4 cm) at 30, 60 and 90 days after sowing respectively and was significantly tallest over rest of the treatment except T<sub>2</sub> (43.1 and 154.6 cm) at 30 and 90 days after sowing. At 60 days after sowing RDF was recorded significantly tallest plant over all the treatments. It may due to quick supply and availability of nutrients through mineral fertilizers applied in split doses that caused more vegetative growth. The plants treated with NPK fertilizer grew fastest. Plant height of the rest of the manurial treatments which are with or without biofertilizers except T<sub>5</sub>-50% N through FYM+biofertilizer was found at par with T<sub>2</sub>-50%NPK as MF+50%N as FYM. Number of branches didn't differ significantly, although recorded highest in

RDF (4.1, 8.3 and 9.0) at 30, 60 and 90 days after sowing followed by T<sub>2</sub>-50%NPK as MF+50%N as FYM. A positive effect of organic fertilizer on vegetative growth was reported by many workers<sup>[4]</sup>. The lowest number of branches (table 1) reported in T<sub>5</sub>-50% N through FYM+ biofertilizer, it may be due to low availability of nutrients, rendered stunted plant growth and less branching. However, it has also been observed that the number of branches was specific to plant and found variable from plant to plant within plot, irrespective of fertilizer doses.

### Yield attributes and yield:

The highest number of fruits (Table 2) was found in RDF (7.0 and 18.8) at 60 and 90 days after sowing, which was significantly higher over T<sub>5</sub> -50% N through FYM+PSB+Azotobactor (having 3.9 fruits per plant) and found at par with rest of the manurial treatments at 60 days after sowing. While, at 90 days after sowing RDF become significant over T<sub>3</sub>-50% N as FYM+50% N as VC, T<sub>4</sub>-1/3 of N each through FYM+VC+NC, T<sub>5</sub>-50% N through FYM+ biofertilizers and T<sub>7</sub>-T<sub>4</sub>+biofertilizers but found at par with T<sub>2</sub>-50%NPK as MF+50%N as FYM and T<sub>6</sub>-T<sub>3</sub>+biofertilizers. Fruit length found non significant due to fertilizer treatments but, RDF recorded longest fruit 16.9 cm followed by T<sub>6</sub>-T<sub>3</sub>+biofertilizers (16.8 cm), T<sub>4</sub>-1/3 of N each through FYM+VC+NC (16.6cm) and T<sub>2</sub>-50%NPK as MF+50%N as FYM with 16.3 cm. Average weight of fruits differed significantly due to different treatments. RDF recorded significantly highest weight over rest of the manurial treatments (table 2) but T<sub>2</sub>-50%NPK as MF+50%N as FYM was found at par with RDF. The number of fruit per plot and yield also reported highest in RDF (1034 number of fruits and 244 q ha<sup>-1</sup>) respectively. RDF reported significantly highest number of fruits but found at par with T<sub>2</sub>-50%NPK as MF+50%N as FYM and T<sub>6</sub>-T<sub>3</sub>+biofertilizer, and rest of the manurial treatments were reported non-significant. It may be due to application of organic manure that released nutrient slowly and caused reduction in plant growth. RDF reported significantly highest

yield 244.3 q ha<sup>-1</sup> over rest of the manurial treatments but T<sub>2</sub>-50%NPK as MF+50%N as FYM with 211.4 q ha<sup>-1</sup> reported at par with RDF. The reason for increased fruit weight and fruit yield in T<sub>2</sub>-50%NPK as MF+50%N as FYM could be attributed to solubilisation effect of plant nutrients by the addition of FYM leading to increased uptake of NPK<sup>[5]</sup>. Further, FYM would have helped the soil to improve the nutrients status and water holding capacity. The significance of organic manuring in sustainable agriculture is well established<sup>[7]</sup>.

**Conclusion**

**Table 1 Plant height and number of branches as influenced by the application of organic and inorganic fertilizer sources**

Treatments	Plant height			No of branches		
	30 DAS	60DAS	90DAS	30DAS	60DAS	90DAS
T <sub>1</sub> -Recommended dose of fertilizer	49.9	127.3	169.4	4.1	8.3	9.0
T <sub>2</sub> -50%NPK as MF+50%N as FYM	43.1	116.6	154.6	3.7	7.9	8.0
T <sub>3</sub> -50% N as FYM+50% N as VC	36.6	107.5	133.2	3.5	7.3	8.2
T <sub>4</sub> -1/3 of N each through FYM+VC+NC	36.5	106.5	132.9	3.4	6.2	7.3
T <sub>5</sub> -50% N through FYM+ biofertilizer	34.2	102.4	131.9	3.7	6.0	7.5
T <sub>6</sub> -T3+biofertilizer	37.5	104.3	148.5	3.3	6.7	7.8
T <sub>7</sub> -T4+biofertilizer	35.4	105.3	131.1	3.7	6.2	7.5
SEm±	3.4	3.3	8.6	0.4	1.1	1.0
C D at 5%	7.5	7.1	18.7	NS	NS	NS

FYM;Farm yard manure, VC; Vermicompost, NC; Neemcake, MF; Mineral fertilizer

**Table 2. Yield attributes and yield as influenced by the application of organic and inorganic fertilizer sources**

Treatments	No. of fruit per plant		Fruit length (cm)	Average weight of 10 fruits (kg)	No. of fruit per plot	Yield q ha <sup>-1</sup>
	60DAS	90DAS				
T <sub>1</sub> -Recommended dose of fertilizer	7.0	18.8	16.9	0.354	1034.0	244.3
T <sub>2</sub> -50%NPK as MF+50%N as FYM	6.1	17.7	16.3	0.325	975.3	211.4
T <sub>3</sub> -50% N as FYM+50% N as VC	5.7	15.1	16.1	0.310	832.3	173.4
T <sub>4</sub> -1/3 of N each through FYM+VC+NC	5.5	13.9	16.6	0.308	766.3	157.4
T <sub>5</sub> -50% N through FYM+ biofertilizer	3.9	10.4	15.7	0.274	572.0	105.1
T <sub>6</sub> -T3+biofertilizer	6.2	16.5	16.8	0.301	905.7	179.9
T <sub>7</sub> -T4+biofertilizer	3.9	13.5	16.0	0.307	744.3	152.2
SEm±	0.9	1.7	0.9	0.023	91.4	24.6
C D at 5%	1.9	3.6	NS	0.051	199.3	53.5

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