

**Influence of organic manures and inorganic fertilizers on growth, yield and quality of okra (*Abelmoschus esculentus* L.) cv. TMOH-2366**

**ABSTRACT**

The study was planned to see the influence of different organic manures and inorganic fertilizers on growth, yield and quality of okra which comprised the combination of organic manures (FYM, neem cake, vermicompost) and inorganic fertilizers (viz., Nitrogen, Phosphorus and Potassium). The experiment was laid out in RBD with 9 treatments with 3 replications. Treatments involved were T<sub>0</sub> – 100% RDF + 20 t/ha FYM, T<sub>1</sub> – 100% RDF + 10t vermicompost, T<sub>2</sub> – 100% RDF + 2t neem cake, T<sub>3</sub> – 75% RDF + 25% FYM, T<sub>4</sub> – 75% RDF + 25% vermicompost, T<sub>5</sub> – 50% RDF + 50% neem cake, T<sub>6</sub> – 50% RDF + 50% FYM, T<sub>7</sub> – 50% RDF + 50% vermicompost, T<sub>8</sub> – 50% RDF + 50% neem cake. The results revealed that T<sub>1</sub> (100% through RDF + 10t vermicompost) performed the best in term in days to germination (9.20 DAS), days to emergence (19.87 DAS), days to 50% flowering (49.20 DAS), plant height (75.03 cm), days to first harvest (56 DAS), number of fruits per plant (10), fruit length for marketability (10.71 cm), average fruit weight for 10 capsule (109 g), fruit yield per plant (194.93 g), fruit yield per hectare (116.96 q/ha), total soluble solids (5.80° Brix), ascorbic acid (18.54 mg/100 g), fruit colour (138.33) and B:C ratio (2.81). Therefore, the treatment T<sub>1</sub> (100% through RDF + 10t vermicompost) is the best when compared to all other treatments. As the highest benefit cost ratio, net return and gross return was observed in T<sub>1</sub> (100% RDF + 10t vermicompost) i.e., (2.81), Rs. 226422 and Rs. 350880 which states that it is economically profitable compared to all other treatments.

**Keywords:** growth, yield, quality, vermicompost, neem cake, FYM

**Introduction**

Okra (*Abelmoschus esculentus* L.) also known as lady's finger or bhindi belongs to family Malvaceae having high chromosome number among vegetables (2n= 130). It is native to Africa and grown in tropical and sub-tropical part of the world (Singla et al., 2018). This crop is suitable for the cultivation as a garden crop as well as on long commercially forms. The composition of okra pods per 100g edible

portion (81% of the product as purchased, ends trimmed) is: water 88.6g, energy 144.00 Kj (36 Kcal), protein 2.10g, carbohydrates 8.20g, fat 0.20g,  $\beta$ -carotene 185.00mg, riboflavin 0.08mg, thiamine 0.04mg, niacin 0.60mg, ascorbic acid 47.00mg, the composition of okra leaves per 100g edible portion is: water 81.50g, energy 235.00 Kj (56.00 Kcal), protein 4.40g, fat 0.60g, carbohydrate 11.30g, fibre 2.10g, Ca 532.00mg, P 70.00mg, Fe 0.70mg, ascorbic acid 59.00mg,  $\beta$ -carotene 385.00mg, thiamine 0.25mg, riboflavin 2.80mg (Varmudy V., 2011). Carbohydrates are mainly present in the form of mucilage (Singh P. et al., 2014). That of young fruits consists of long chain molecules with a molecular weight of about 170,000 made up of sugar units and amino acids. The main components are galactose (25%), rhamnose (22%), galacturonic acid (27%) and amino acids (11%). The mucilage is highly soluble in water. The solution in water has an intrinsic viscosity value of about 30%.

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 available form upon decomposition by soil microorganisms. It improves the quality of green pods. Besides, application of organic manures not only produced the highest and sustainable crop yield, but also improved the soil fertility and productivity of land (Sanwal et al., 2007). The most important elements present in inorganic fertilizers are nitrogen, phosphorus, and potassium which influence vegetative and reproductive phase of plant growth.

Use of organic manures and inorganic fertilizers in okra has been reported to show rapid increased in plant height, improved soil physical, chemical and biological properties along with conserving moisture holding capacity of soil and thus resulting in enhanced crop productivity along with maintaining the quality of crop produce and significantly higher values of fresh pod length and fresh pod weight of okra under normal plant population.

#### **Material and Method**

A field experiment was conducted at Horticulture Research Farm, Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during the year 2022. The sowing of experimental material was done on February 9, 2022.

The experiment material consists of TMOH-2366 variety of okra. The experiment was laid out in randomized block design (RBD) with three replications and nine treatments. Treatments involved were T<sub>0</sub> – 100% RDF + 20 t/ha FYM, T<sub>1</sub> – 100% RDF + 10t vermicompost, T<sub>2</sub> – 100% RDF + 2t neem cake, T<sub>3</sub> – 75% RDF + 25% FYM, T<sub>4</sub> – 75% RDF + 25% vermicompost, T<sub>5</sub> – 50% RDF + 50% neem cake, T<sub>6</sub> – 50% RDF + 50% FYM, T<sub>7</sub> – 50% RDF + 50% vermicompost, T<sub>8</sub> – 50% RDF + 50% neem cake. The land was brought to a fine tilth through ploughing and tillage. Irrigation channels and bunds were prepared according to layout. The seeds were soaked overnight and sown in the field directly. Light irrigation was given just after sowing of seeds.

Organic manures were applied one week before sowing. The plot size was 1m x 1m with 45cm x 30cm spacing rows and plants. Five plants were randomly selected for recording observations on growth, yield and quality attributing parameters. Full dose of phosphorus, potassium and half dose of nitrogen as per treatments were applied just before sowing. The remaining half dose of nitrogen was applied twenty-five days after sowing.

### **Result and Discussion**

The application of (T<sub>1</sub>) 100% RDF + 10t Vermicompost was found beneficial in terms of days to germination, days to emergence, days to 50% flowering, plant height (cm), days to first harvest, number of fruits per plant, fruit length for marketability (cm), average fruit weight (g), fruit yield per plant (g), fruit yield per hectare (q/ha), total soluble solids (° Brix), ascorbic acid (mg/100g) and fruit colour. Application of nutrients through combinations of organic manures and inorganic fertilizers were proved beneficial in increasing growth, yield as well as quality of okra (Table 1, 2 and 3).

### **Growth parameters**

The statistical data on growth parameters in different treatments was recorded (Table 1). In the experiment the results revealed that the minimum days to germination (cotyledons) was found in T<sub>1</sub> (100% RDF + 10t Vermicompost) which is 9.40 DAS whereas maximum days to germination was found in T<sub>0</sub> (100% RDF + 20t FYM) which is 11.73 DAS. The minimum days to emergence (true leaf) was found in T<sub>1</sub> (100% RDF + 10t Vermicompost) which is 19.87 DAS whereas maximum days to germination was found in T<sub>0</sub> (100% RDF + 20t FYM) which is 22.20 DAS. The minimum days to 50% flowering was found in T<sub>1</sub> (100% RDF + 10t Vermicompost) which is 49.20 DAS whereas the maximum days to 50% flowering was found in T<sub>0</sub> (100% RDF + 20t FYM) which is 52.93 DAS. The maximum plant height was found in T<sub>1</sub> (100% RDF + 10t Vermicompost) which was 13.59 cm, 23.65 cm, 56.61 cm, 75.03 cm in 30, 45, 60 DAS and at final harvest whereas the minimum plant height was found in T<sub>0</sub> (100% RDF + 20t FYM) which was 10.29 cm, 20.21 cm, 43.29 cm and 60.75 cm in 30, 45, 60 DAS and at final harvest. The minimum days to first harvest was found in T<sub>1</sub> (100% RDF + 10t Vermicompost) which is 56 DAS whereas the maximum days to first harvest was found in T<sub>0</sub> (100% RDF + 20t FYM) which is 60.33 DAS.

The effect of moisture content and maturity on hardseededness results in the germination days. The use of vermicompost and inorganic fertilizers results in early germination as reported by El Balla, M.M., Saidahmed, A., & Makkawi, M. (2011). The main cause of change in seedling emergence, their survival and vigour of the seedlings (Gadakh et al., 1990). Earliness is assured by days taken for 50 per cent flowering obtained with application of vermicompost + Azospirillum + PSB may be due to solubilization effect of plant nutrient by addition of FYM and vermicompost leading to increased uptake

of NPK (Sendur kumaran,1996). Similar findings reported by Subbiah (1982) in chilli. Application of organic and inorganic fertilizers T<sub>0</sub> (100:50:50 NPK + FYM @ 20t/ha (control)) which resulted in poor performance. It might be due to the increase in the nutrient availability and preponderance of different groups of microorganisms in soil, which created a favourable condition for proper vegetative growth in general and increased plant height in particular. The highest dose of nitrogen might have enhanced cell division and formation of more tissues resulting in luxuriant vegetative growth and thereby increasing plant height Meyer and Anderson (2003). Barani and Anburani (2004) also supported with similar findings that application of NPK along with vermicompost recorded maximum plant height. Time of harvest of pods, seed moisture content, fertilizer, growth regulators are some of the methods that proposed that have effect on okra seedhardness. It was reported the percentage of hardseedness increased significantly in all cultivars with the increase in the maturity of seed. This may be due to the deposition of hard cuticle or impermeable cell layer of the seed coat during the later stages of seed development (El Balla et al. 2011).

<b>Table.1</b> <b>Influence of</b> <b>organic</b> <b>manures and</b> <b>inorganic</b> <b>fertilizers on</b> <b>growth of</b> <b>okra.</b> <b>Treatment</b>	<b>Days to</b>	<b>Days to</b>	<b>Days to 50%</b>	<b>Plant height</b>	<b>Days to first</b>			
	<b>germination</b>	<b>emergence</b>	<b>flowering</b>	<b>(cm)</b>	<b>harvest</b>			
	<b>(DAS)</b>	<b>(DAS)</b>	<b>(DAS)</b>					
	<b>30 DAS</b>	<b>45 DAS</b>	<b>60 DAS</b>		<b>Final harvest</b>			
<b>T<sub>0</sub>-100%</b> <b>RDF + 20</b> <b>t/ha FYM</b>	11.73	22.20	52.93	10.29	20.21	43.29	60.75	60.33
<b>T<sub>1</sub>-100%</b> <b>RDF + 10t</b> <b>vermicom</b> <b>post</b>	9.20	19.87	49.20	13.59	23.65	56.61	75.03	56.00
<b>T<sub>2</sub>-100%</b> <b>RDF + 2t</b> <b>neem cake</b>	11.00	21.07	50.93	10.93	21.06	51.68	68.99	58.73
<b>T<sub>3</sub>-100%</b> <b>RDF +</b> <b>25% FYM</b>	10.33	20.53	50.47	11.76	21.71	53.61	71.85	58.13
<b>T<sub>4</sub>-75%</b> <b>RDF +</b> <b>25%</b> <b>vermicom</b> <b>post</b>	10.13	20.33	50.13	12.62	22.58	54.43	72.37	57.53
<b>T<sub>5</sub>-50%</b> <b>RDF +</b> <b>50% neem</b> <b>cake</b>	11.20	21.47	52.00	10.90	20.97	49.16	67.92	59.13
<b>T<sub>6</sub>-50%</b> <b>RDF +</b> <b>50% FYM</b>	10.80	20.73	50.67	11.31	21.51	51.87	70.48	58.33
<b>T<sub>7</sub>-50%</b> <b>RDF +</b> <b>50%</b> <b>vermicom</b> <b>post</b>	9.40	20.07	49.67	13.01	23.03	55.25	73.24	57.00
<b>T<sub>8</sub>-50%</b> <b>RDF</b> <b>+50%</b> <b>neem cake</b>	11.40	21.73	52.00	10.45	20.52	47.22	67.27	59.60

<b>S.Ed (<math>\pm</math>)</b>	0.29	0.19	0.29	0.20	0.23	1.37	1.37	0.35
<b>CD at 5%</b>	0.61	0.40	0.62	0.42	0.48	2.90	2.91	0.75