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## Impact of nutrient management on yield attributes of organic okra *Abelmoschus esculentus* (L) Moench) in Coimbatore region

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### Abstract

This study aimed to find out best organic manure or manure combination for obtaining the maximum growth from okra, and to standardize the total NPK requirement through organic manures. The study was conducted in the South farm of the School of Agricultural Sciences, Karunya institute of Technology and Sciences, Coimbatore during the *Rabi* season of 2022. The experimental design consisted of ten treatments, including a control T<sub>10</sub> in a Randomized Complete Block Design (RCBD) that was replicated thrice. The combinations of FYM, Vermicompost, Composted poultry manure and groundnut cake were practiced in T<sub>5</sub> to T<sub>9</sub>, and the other four treatments were based on different organic manures, consisted control in (T<sub>10</sub>). Treatment 7 recorded maximum number of fruits plant<sup>-1</sup> (12.33) and maximum weight of fruits plant<sup>-1</sup> (203.55 g), T<sub>6</sub> recorded the maximum length of fruits (11.70 cm), T<sub>10</sub> recorded the maximum girth of fruits (7.2 cm), T<sub>3</sub> recorded the maximum weight of fruit (19.90 g), T<sub>7</sub> recorded the maximum yield at harvest (16 t ha<sup>-1</sup>) during the rabi season of 2022.

**Keywords:** Okra; Organic nutrient management; yield attributes; Poultry manure; Vermicompost; Arka Anamika

### Introduction

*Abelmoschus esculentus* (L.) Moench, sometimes known as okra, is one of India's most important vegetable crops. In addition to these names, it goes by the English and Hindi names lady's finger, quimgombo, gumbo, and bhindi. It is cultivated in the country's warmer tropical and subtropical temperate zones. Compared to other crops, growing vegetables is one of the most lucrative farming activities. Okra farming is one of the business-oriented types of agriculture where a farmer or an agripreneur can make money with little outlay of capital. Because there are no frosts or harsh winters in south India, crops can be cultivated all year round. The issue with okra farming is the extensive use of chemical fertilizers, the intensive application of pesticides, and the sparing use of organic manures. This method of farming pollutes the environment by releasing nitrates into the water, nitrous oxide into the air, which destroys the ozone layer, and pesticides into the harvested crop. Okra cultivation must be done more safely, though (Chikodili, E.P. 2015) [3]. The use of these manures is a viable option for waste management. Common organic manures include the excrement of animals and birds, green manures, compost, etc. Organic manures are crucial for raising the amount of organic carbon and all other vital plant nutrients in the soil as well as for enhancing the soil's ability to exchange cations. The main obstacle, particularly in organic farming, is the lack of high-quality organic manures. However, the excessive and extended use of chemicals has led to environmental pollution as well as health risks for people and the soil. Therefore, farmers are urged to transform their current farms to organic farms. Sustainability in terms of the environment, society, and economy is fundamental to organic farming (Choudhary, K., Sharma, S.R., Jat, R., and Didal, V.K. 2017) [4]. The essential elements include safeguarding soil fertility over the long term by preserving levels of organic matter, promoting soil biological activity, cautious mechanical intervention, nitrogen self-sufficiency through the use of legumes and biological nitrogen fixation, effective recycling of organic materials including crop residues and livestock wastes, and weed, disease, and pest control relying primarily on crop rotations, natural predators, diversity, and organic manuring. It is highly prioritized to maintain the soil's fertility by reintroducing all wastes through various forms of organic manure, hence reducing the time between NPK addition and removal from the soil.

## Materials and Methods

### Study Area Location

The experiment was conducted during *Rabi* (Oct-Jan) season of 2022-23 in the south farm of Karunya Institute of Technology and Sciences, Coimbatore. The experimental site is geographically located in the western agro-climatic zone of Tamil Nadu at 10° 56'N latitude and 76° 44'E longitude at an elevation of 474 m above mean sea level. 3.1.2. The mean annual rainfall of Coimbatore is 504.29 mm distributed over 49 rainy days. The mean annual maximum and minimum temperature are 38°C and 19.41°C respectively. The mean relative humidity is 86 percent and the mean evaporation is 6.2 mm per day. The mean bright sunshine hours per day is 7.1 hours. The weather conditions prevailed during the cropping period from October 2022 to January 2023. During the cropping period, the maximum and minimum temperatures ranged from 27.90°C to 14.50°C respectively. The total rainfall received during the cropping period in 2022-2023 was 492.23 mm. The mean RH ranged from 76% to 90%.

### Experimental details

Three times each treatment was duplicated in a field experiment that was set up using a randomized block design. The following treatments were used for the field tests that were carried out during the research, T1 - NPK @ 40-50-30 kg ha<sup>-1</sup> through fertilizer alone, T2 - FYM @ 25 t ha<sup>-1</sup> alone, T3 - Vermicompost equivalent to N in 25 t FYM, T4 - Composted poultry manure equivalent to N in 25 t FYM, T5 - FYM+ Vermicompost + Composted poultry manure equivalent to supply 1/3<sup>rd</sup> N each available in 25 t of FYM, T6 - 25 t FYM + groundnut cake equivalent to 40 kg fertilizer N applied as fermented solution at 10 and 30 DAS equally, T7 - Vermicompost equivalent to N in 25 t FYM + groundnut cake equivalent to 40 kg fertilizer N applied as fermented solution at 10 and 30 DAS, T8 - Composted poultry manure equivalent to N in 25 t FYM + groundnut cake equivalent to 40 kg fertilizer N applied as fermented solution at 10 and 30 DAS, T9 - FYM + Vermicompost + Composted poultry manure equivalent to supply 1/3<sup>rd</sup> N each available in 25 t FYM + groundnut cake equivalent to 40 kg fertilizer N applied as fermented solution at 10 and 30 DAS, T10 - Package of Practices: 25 t FYM + NPK 40-50-30 kg ha<sup>-1</sup> through fertilizers.

### Statistical Analysis

The data collected on various characters studied during the experiment were subjected to statistical analysis in randomized block design following the method of Gomez and Gomez (1984) [5]. Critical difference was worked out at the five percent probability level wherever the treatments were significant. The treatments differences that were non-significant at 5 per cent denoted as NS.

## Results and Discussion

### Effect of nutrient management practices on yield parameters of Okra.

#### No. of fruits plant<sup>-1</sup>

Results shown in table 1 indicated that number of fruits plant<sup>-1</sup> was significantly influenced by the treatments, maximum the number of fruits plant<sup>-1</sup> (12.33) was observed in T<sub>7</sub> (Vermicompost equivalent to N in 25 t FYM + groundnut cake equivalent to 40 kg fertilizer N applied as fermented

solution at 10 and 30 DAS) and was at par with T<sub>10</sub>. These treatments were significantly superior over T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub>, T<sub>5</sub>, T<sub>6</sub>, T<sub>8</sub> and T<sub>9</sub>. The lowest number of fruits plant<sup>-1</sup> (7.50) was found in T<sub>2</sub> and was at par with T<sub>4</sub>, T<sub>5</sub>, T<sub>6</sub> and T<sub>9</sub>. The beneficial effects of vermicompost on growth yield and quality of vegetable crop have been reported by Ahirwar, C.S. & Hussain, A. (2015).

#### Total weight of fruits plant<sup>-1</sup>

The total weight of fruits plant<sup>-1</sup> was significantly influenced by the treatments, maximum the weight of fruits plant<sup>-1</sup> (203.55 g) was observed in T<sub>7</sub> (Vermicompost equivalent to N in 25 t FYM + groundnut cake equivalent to 40 kg fertilizer N applied as fermented solution at 10 and 30 DAS) and was at par with T<sub>3</sub>. These treatments were significantly superior over T<sub>1</sub>, T<sub>2</sub>, T<sub>4</sub>, T<sub>5</sub>, T<sub>6</sub>, T<sub>8</sub>, T<sub>9</sub> and T<sub>10</sub>. The lowest weight of fruits plant<sup>-1</sup> (83.25g) was found in T<sub>2</sub> and was at par with T<sub>6</sub>. The influence of vermicompost and groundnut cake on promoting better yield parameters is evident in the experiment. Similar result has been reported by Olle, (2016) [6].

#### Length of fruits (cm)

The results indicated that length of fruits was significantly influenced by the treatments, maximum length of fruits (11.70 cm) was observed in T<sub>6</sub> (25 t FYM + groundnut cake equivalent to 40 kg fertilizer N applied as fermented solution at 10 and 30 DAS equally). The lowest length of fruits (8.40 cm) was found in T<sub>4</sub> and was at par with T<sub>2</sub>, T<sub>3</sub>, T<sub>5</sub>, T<sub>8</sub>, T<sub>9</sub> and T<sub>10</sub>. The combination of FYM and groundnut cake induced better fruit length of bhendi. The beneficial effects of FYM on growth and yield of different crops are reported by Patidar & Mali, (2004) [7].

#### Girth of fruits (cm)

The girth of fruits was significantly influenced by the treatments, maximum girth of fruits (7.2 cm) was observed in T<sub>10</sub> (Package of Practices: 25 t FYM + NPK 40-50-30 kg/ha through fertilizers) and was at par with T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub>, T<sub>5</sub>, T<sub>7</sub>, T<sub>8</sub> and T<sub>9</sub>. These treatments were significantly superior over T<sub>6</sub>. The lowest girth of fruits (4.9 cm) was found in T<sub>6</sub> and was at par with T<sub>2</sub>. The favorable effect of the combination of FYM and NPK fertilizer (T<sub>10</sub>) promoting better fruit girth is evident in this experiment.

#### Average fruit weight (g)

Average fruit weight was significantly influenced by the treatments, maximum the weight of fruit (19.90 g) was observed in T<sub>3</sub> (Vermicompost equivalent to N in 25 t FYM) and was at par with T<sub>5</sub>. These treatments were significantly superior over T<sub>1</sub>, T<sub>2</sub>, T<sub>4</sub>, T<sub>5</sub>, T<sub>6</sub>, T<sub>8</sub>, T<sub>9</sub> and T<sub>10</sub>. The lowest weight of fruit (11.10 g) was found in T<sub>2</sub> and T<sub>6</sub> was at par with T<sub>1</sub> and T<sub>6</sub>. Application of vermicompost equivalent to nitrogen in 25t FYM has benefited higher average fruit weight. Similar results have been recorded by Swetha, (2015).

#### Yield (t ha<sup>-1</sup>)

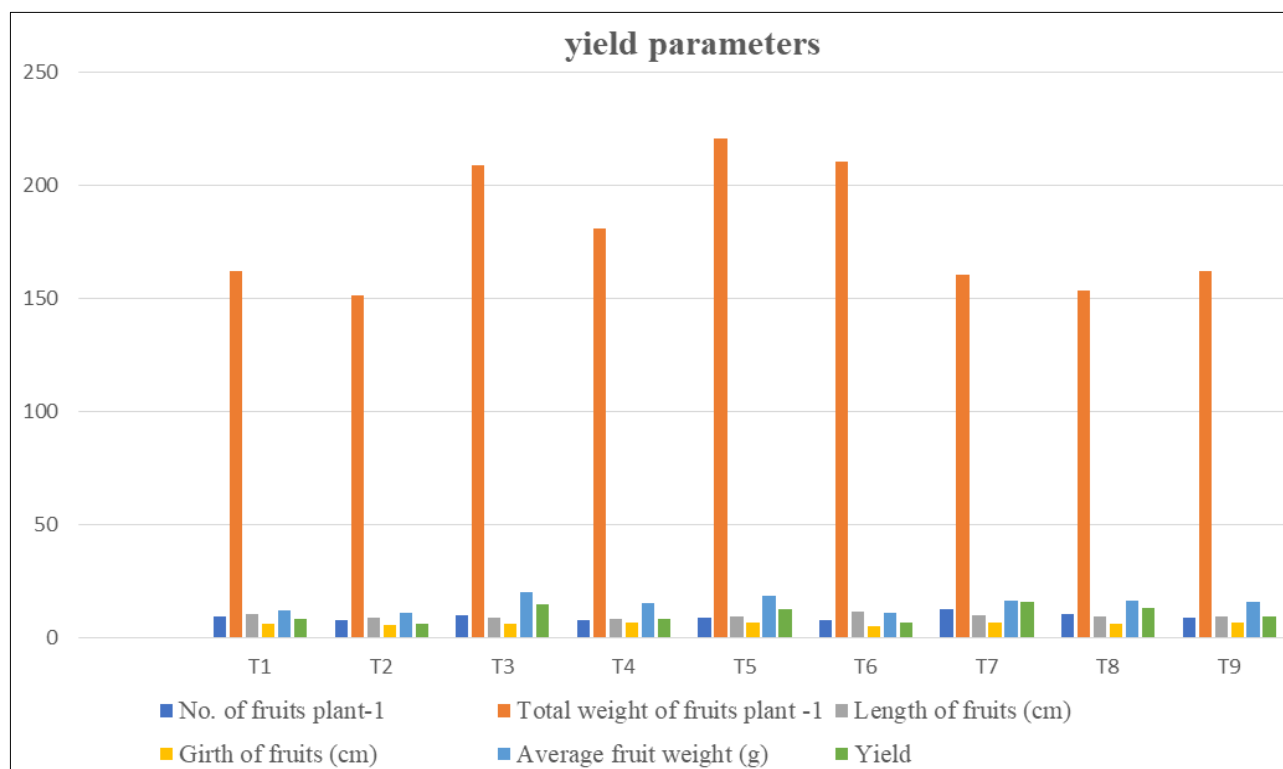
The total yield was significantly influenced by the treatments, maximum yield at harvest (16 t ha<sup>-1</sup>) was observed in T<sub>7</sub> (Vermicompost equivalent to N in 25 t FYM + groundnut cake equivalent to 40 kg fertilizer N applied as fermented solution at 10 and 30 DAS) and was at par with T<sub>3</sub>. These treatments were significantly superior over T<sub>1</sub>, T<sub>2</sub>, T<sub>4</sub>, T<sub>5</sub>, T<sub>6</sub>, T<sub>8</sub>, T<sub>9</sub> and T<sub>10</sub>. The lowest yield at harvest (6.2 t ha<sup>-1</sup>) was

observed in T<sub>2</sub> and was at par with T<sub>1</sub>, T<sub>4</sub> and T<sub>6</sub>. Total yield (16 t ha<sup>-1</sup>) was the highest in T<sub>7</sub> (Vermicompost equivalent to N in 25 t FYM + groundnut cake equivalent to 40 kg fertilizer N applied as fermented solution at 10 and 30 DAS) and the effect of combination of vermicompost and groundnut cake is well evident in this trial on providing yield

parameter and yield of bhendi. Second best treatment giving better yield was T<sub>3</sub> (Vermicompost equivalent to N in 25 t FYM). The effect of vermicompost on increasing the yield of bhendi is evident in this trial. The beneficial effect of vermicompost boosting the growth and yield parameter is evident from the trials of Sahare and Mahapatra, (2015) [8].

**Table 1:** Effect of nutrient management practices on yield parameters

Treatment	Yield Parameters					
	No. of fruits plant <sup>-1</sup>	Total weight of fruits plant - 1 (g)	Length of fruits (cm)	Girth of fruits (cm)	Average fruit weight (g)	Yield (t ha <sup>-1</sup> )
T1	9.45	113.4	10.50	6.1	12.00	8.4
T2	7.50	83.25	9.00	5.7	11.10	6.2
T3	9.96	198.20	8.60	6.2	19.90	14.7
T4	7.73	116.41	8.40	6.7	15.06	8.2
T5	8.89	164.73	9.40	6.5	18.53	12.3
T6	7.96	88.34	11.70	4.9	11.10	6.9
T7	12.33	203.55	10.00	6.8	16.50	16
T8	10.65	173.59	9.30	6.3	16.30	13
T9	8.61	134.31	9.37	6.4	15.60	9.3
T10	11.34	175.77	9.50	7.2	15.50	14
S.E. (m±)	0.516	8.385	0.515	0.351	0.775	0.646
CD (p=0.05)	1.544	25.107	1.541	1.050	2.321	1.934



**Fig 1:** Effect of nutrient management practices on yield parameters

## Conclusion

Through this study we can conclude that application of organic manures helped to enhance the crop growth and development, and also improved the soil structure and texture and nutrient status of soil. In this study all the treatments were performed well for the above- mentioned parameters. Especially when we apply (T<sub>7</sub>) Vermicompost equivalent to N in 25 t FYM + groundnut cake equivalent to 40 kg fertilizer N applied as fermented solution at 10 and 30 DAS was found to be effective in enhancing the crop growth, weight, length, girth and yield of crop when compared to other treatments. Overall, we can conclude that using of organic manures over

chemical fertilizers will be always advantageous for crop and to the environment also.

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