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Organic farming in sweet orange cv. sathgudi under Telangana conditions

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Abstract
The experiment "Organic farming in sweet orange cv. sathgudi under Telangana conditions" was conducted at Horticultural Research Station, Konda Mallepally in a Randomized Block Design with twelve treatments and three replications. Among the treatments, the highest plant height (5.13 m), plant girth (53.24 cm), canopy spread, North – South (4.96 m), number of fruits per tree (266.67), average fruit weight (169.60 g), yield (48.41 kg / tree) and Juice (49.51 per cent) was recorded in treatment T6 - Application of 25% FYM + 25% vermicompost + 25% poultry manure + 25% castor cake (12.50 kg FYM +12.50 kg vermicompost + 12.50 kg poultry manure +12.50 kg castor cake).

Keywords: Organic farming, FYM, castor cake, vermicompost, sweet orange

Introduction
In India, organic farming is an ancient practice in agriculture and continued till the concept of green revolution came in the year 1965. The green revolution in India was to ensure national food security, more precisely its self reliance in food grain production i.e,. Rice and Wheat. Today, India has become the world's second largest producer of the both rice and wheat and the largest exporter of rice. Green revolution in India is associated with adoption of high yielding hybrid varieties, fertilizers, pesticides, use of farm implements and irrigation facilities. The Food & Agriculture organization (FAO, 2018) [3] states that India is self sufficient in terms of wheat & rice production. However, in the process of green revolution, measures initiated by the government increased the production of cereals and pulses leading to the self sufficiency of food in the country. However, continuous use of fertilizers, pesticides, monocropping, caused the land to become infertile and polluted the soil, air and ground water. Human and live stock diseases increased exponentially due to pollution of potable drinking water and air. Various studies conducted in Kerala confirmed the presence of endosulphan (pesticide) in water and soil. Due to adverse effects of endosulphan on human health and environment, Government of India banned this highly toxic organochlorine pesticide. The extent of damage caused by the use of fertilizers, pesticides (organophosphates organochlorines, synthetic pyrethroids) increased the health problems in human beings. An irreversible damage caused by the use of chemical fertilizers to the ecosystem needs a thorough study. In India, besides cereals, horticultural crops (fruits, vegetables, spices) are very important part of human diet due to presence of higher quantities of vitamins and minerals and recommended as a protective food by nutrition experts. Harmful effects of chemicals & fertilizers on soil and human health is a major concern in present era. Therefore, an integrated approach is required for maintaining the good soil health by excluding the modern day farm inputs. To meet the food quality parameters, organic farming is the need of the hour which mainly relies on animal manures, green manures, crop residues and other farm generated inputs. The end result of the organic farming is a more favorable soil microclimate for microbes and healthy plant development. This in turn results in improved plant growth and residue free quality produce. However, in consumer point of view organic produce are usually more expensive due to limited availability in fewer areas. Various reports from farmers and NGO's involved in organic production of farm produce argue that organic produce are more expensive due to high inputs costs and lower yields. Keeping this in view, present studies were undertaken in sweet orange to evolve a best organic input based system for quality produce with lower cost.

Materials & Methods
The present studies on "Organic farming in sweet orange cv Sathgudi under Telangana conditions" was carried out at existing sweet orange orchard at the Horticultural Research Station, Konda Mallepally.

This orchard was raised specially to conduct the organic studies as the per the norms of National Programme for Organic Production (NPOP). The said land was barren for the last 20 years and no crop was cultivated in the orchard. The experiment was laid out in a Randomized Block Design with twelve treatments and three replications. The observations on plant height, girth, canopy spread, number of fruits per tree, average fruit weight, yield, juice, TSS, acidity and ascorbic acid content in fruits were recorded. The data collected for the observations were subjected to statistical analysis.

In the present studies, all the organic manures are applied at the rate of 50 kg per tree i.e., T1 - Application of 100% FYM (50 kg FYM), T2 - Application of 100% vermicompost (50 kg vermicompost), T3 - Application of 50% FYM + 50% Neem cake (25 kg FYM + 25 kg neem cake), T4 - Application of 50% FYM + 25% vermicompost + 25% neem cake (25 kg FYM + 12.50 kg vermicompost + 12.50 kg neem cake), T5 - Application of 50% poultry manure + 50% neem cake (25 kg poultry manure + 25 kg neem cake), T6 - Application of 25% FYM + 25% vermicompost + 25% poultry manure + 25% castor cake (12.50 kg FYM +12.50 kg vermicompost + 12.50 kg poultry manure +12.50 kg castor cake), T7 - Application of 50% FYM + 50% green manure crop, sunhemp (25 kg FYM + 25 kg green manure crop, sunhemp), T8 - Application of 25% FYM + 25% vermicompost + 25% poultry manure + 25% neem cake (12.50 kg FYM + 12.50 kg vermicompost + 12.50 kg poultry manure + 12.50 kg neem cake), T9 - Application of 50% FYM + 25% vermicompost + 25% castor cake (25 kg FYM + 12.50 kg vermicompost + 12.50 kg castor cake), T10 - Application of 20% FYM + 20% vermicompost + 20% poultry manure + 20% castor cake + 20% neem cake (10 kg FYM + 10 kg vermicompost + 10 poultry manure + 10 kg castor cake + 10 kg neem), T11 - Application of 50% FYM + 50% vermicompost (25kg FYM + 25 kg vermicompost), T12 - Application of 20% FYM + 20% vermicompost + 20% castor cake + 20% neem cake + 20% green manure crop, sunhemp (10 kg FYM + 10 kg vermicompost + 10 kg castor cake + 10 kg neem cake + 10 kg green manure crop, sunhemp).

Time of application

All the above organic manures were applied in 2 equal split doses i.e., 50% in the month of June and another 50% in the month of October. However, sun hemp a green manure crop was sown in the field during June and incorporated in the soil before flowing i.e., 40 – 45 days after sowing.

Results & Discussion

The results indicated significant difference in the vegetative growth parameters between treatments with soil application of organic manures on sweet orange cv. Sathgudi and the data are furnished in table 1. Among the treatments the highest plant height (5.13 m), plant girth (53.24 cm) and canopy spread, North – South (4.96 m) was recorded in T6 - Application of 25% FYM + 25% vermicompost + 25% poultry manure + 25% castor cake (12.50 kg FYM +12.50 kg vermicompost + 12.50 kg poultry manure +12.50 kg castor cake)

Yield and quality attributes in sweet orange cv. Sathgudi varied significantly among the treatments and the data are furnished in Table 2. The highest number of fruits per tree (266.67), average fruit weight (169.60 g), yield (48.41 kg / tree) and Juice (49.51 per cent) was recorded T6 - Application of 25% FYM + 25% vermicompost + 25% poultry manure + 25% castor cake (12.50 kg FYM +12.50 kg vermicompost + 12.50 kg poultry manure +12.50 kg castor cake). Application of organic manures (FYM, vermicompost, poultry manure, castor cake) slowly released nitrogen over the period of the experiment which increased the vegetative growth, yield and quality attributes. Ferguson (1990) [2] also reported in citrus that organic manures is often considered as a sustainable agricultural practice, if used appropriately, promises to offer rich dividends on a long term basis. Obreza and Ozores Hampton (2000) [6] also reported that organic manure application to citrus gardens improved soil physical, chemical and biological properties, but the main benefit appear to be the increased nutrient availability. Ghosh *et al.* (2014) [4] also reported in sweet orange cv. Mosambi that vermicompost (20 kg / tree) resulted in maximum plant growth total soluble solids and vitamin C content in fruits. He also reported that application of FYM @ 40 kg / tree produced fruits with maximum total sugar content. Islam *et al*. (2017) [5] reported in sweet orange cv. Bari Malta 1 that application of 10 kg cow dung and 1 kg mustard oil cake or 10 kg poultry manure along with recommended dose of fertilizers showed better plant growth like height, canopy spread and highest TSS content in the fruits. The increase in yield characters in the experiment might be attributed to the mobility of photosynthates from source to sink is a continuous process and all the organic sources applied also act as a food material to the soil microbes. Soil microbes in turn improved the physiological condition of the soil. Dheware *et al.* (2020) [1] also reported that in guava cv. Allahabad safeda, organic source (vermicompost & FYM) along with biofertilizer (*Azospirillum* & *PSB*) increased the yield & quality of fruits.

Table 1: Impact of organic farming on vegetative growth parameters in sweet orange cv. sathgudi

Treatment	Plant height (m)	Plant girth (cm)	Canopy spread	
			North – South (m)	East -West (m)
T1	3.83	41.85	4.02	4.04
T2	4.21	50.70	4.37	4.30
T3	4.55	49.87	4.48	4.35
T4	3.61	43.04	3.66	3.76
T5	4.99	45.96	4.57	4.45
T6	5.13	53.24	4.96	4.88
T7	3.79	46.74	4.27	4.35
T8	3.32	44.55	4.38	4.32
T9	4.45	48.83	4.38	4.65
T10	4.55	50.01	4.21	4.29
T11	4.28	46.58	4.30	4.15
T12	4.73	49.23	4.41	4.55
CD (0.05)	0.45	5.40	0.55	N.S.
SE (m)	0.15	1.83	0.18	0.20

Table 2: Impact of organic farming on yield and quality parameters in sweet orange cv. sathgudi

Treatment	Number of fruits / tree	Average fruit weight (g)	Yield (kg / tree)	Juice (%)	TSS (^{0}B)	Acidity (%)	Ascorbic acid (mg per 100 ml)
T1	231.67	161.71	31.70	42.53	9.11	0.74	72.86
T2	234.00	157.57	39.60	43.00	9.12	0.79	72.26
T3	243.00	159.23	35.69	40.69	9.16	0.80	72.53
T4	237.33	147.44	35.22	42.10	9.38	0.73	71.51
T5	240.33	149.75	38.21	43.88	9.04	0.84	70.42
T6	266.67	169.60	48.41	49.51	9.39	0.78	68.39
T7	233.33	149.71	35.01	42.50	9.05	0.76	66.42
T8	235.00	157.03	33.83	40.09	9.05	0.77	67.71
T9	235.67	151.86	34.73	34.77	9.13	0.74	67.90
T10	226.33	155.39	35.96	42.73	9.22	0.82	71.12
T11	223.00	147.34	36.30	43.76	9.03	0.81	71.77
T12	223.33	155.70	35.93	42.80	9.09	0.81	71.12
CD (0.05)	21.43	10.42	5.36	4.00	N.S.	N.S.	N.S.
SE (m)	7.26	3.53	1.81	1.35	0.09	0.02	1.82

Conclusion

The results indicated that the application of 25% FYM + 25% vermicompost + 25% poultry manure + 25% castor cake (12.50 kg FYM + 12.50 kg vermicompost + 12.50 kg poultry manure +12.50 kg castor cake) in 2 equal split doses i.e., 50% in the month of June and another 50% in the month of October was most effective in enhancing vegetative growth, yield and quality attributes in sweet orange cv. sathgudi under Telangana conditions.

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