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Impact of organic and inorganic sources of nutrients on vegetative growth, yield and quality of Sapota cv. Kalipatti

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Abstract
The present investigation on "Impact of organic and inorganic sources of nutrients on vegetative growth, yield and quality of sapota cv. Kalipatti" was conducted at Horticulture Research Station, Konda Mallepally, Nalgonda District, Telangana. The experiment was laid out in a Randomized Block Design (RBD) with eight treatments and three replications. Based on the results, it was observed that the plant height (5.40 m), girth (48.44 cm), canopy spread – NS (4.95 m) and EW (4.75 m), fruit length (5.31 cm), fruit breadth (5.50 cm), average fruit weight (105.00 g), number of fruits per tree (351.67), yield (51.00 kg / plant) and TSS (24.58 ^{0}Brix) and shelf life (10 days) with treatment T_5: 50% recommended dose of inorganic fertilizers (400: 160: 450 g / plant) + 25% FYM +25% neem cake.

Keywords: INM, Nitrogen, FYM, Castor cake, Neem cake, Green manures

Introduction
Sapota native to southern Mexico, is important tropical fruit crop is grown in all Asian countries. It is an important commercial fruit crop in India grown in the states of Andhra Pradesh, Gujarat, Karnataka, Tamil Nadu, Maharashtra, Odisha, West Bengal and Madhya Pradesh. The total sapota production in India is 1175.90 million tonnes from an area of 97.3 lakhs ha with productivity of 12.1 tonnes per ha. Concept of integrated nutrient management practices in fruit corps has received much attention now a days because of high input costs for labour, fertilizers and pesticides. Integrated Nutrient Management (INM) practices envisage a comprehensive management system to improve the soil health, population of microbes, quality produce and production. Due to high cost of organic manures, the farmers in India are depend on chemical fertilizers like urea, which is the cheap source of nitrogen fertilizer. However, excessive use of nitrogen based fertilizers attracts more pest population and damage to the crops. Improvement of soil organic matter and water retention capacity of arid soils in Telangana state is at most important for fruit crop cultivation. In Telangana, sapota is grown in the districts of Warangal, Rangareddy, Sangareddy, Nalgonda and Khammam. However, little work has been done in Telangana state on the use of fertilizers, organic manures including green manuring cops. Therefore, present studies were undertaken with an objective to find out the suitable organic and inorganic nutrient management practice for better growth, quality and yield in sapota cv. kalipatti.

Materials and methods
The present investigation was conducted at the Horticulture Research Station, Konda Mallepally, Nalgonda District, Telangana, on ten year old sapota cv. Kalipatti. The experiment was laid out in randomized block design (RBD) with eight treatments and three replications,*viz.*,T_1: 100 % RDF (400-160-450 g / plant / annum of 8 years plant and above), T_2: 75 % RDF + 25 % FYM, T_3: 50 % RDF + 25 % FYM + 25 % vermicompost, T_4: 50 % RDF + 25 % FYM + 25 % castor cake, T_5: 50 % RDF + 25 % FYM + 25% neem cake, T_6: 50 % RDF + 25 % vermicompost + 25 % castor cake, T_7: 50 % RDF + 25 % vermicompost + 25 % Neem cake, T_8: 50 % RDF + 25 % FYM + 25 % green manure crop (Sunhemp). The recommended dose of inorganic fertilizers was applied in two split doses (50 % of N & K and 100% P in the month of June and an another 50 % N & K in the month of October) and

Organic fertilizers (FYM, vermicompost, neem cake, castor cake) in the month of June. Green manure crop, sunhemp was sown in the field during June and incorporated in the soil before flowering *i.e.*, 40-45 days after sowing.

The increase in plant height, girth, canopy spread, recorded after harvest of fruits. Data on fruit length, breadth, average fruit weight, number of fruits per tree, yield per tree, total soluble solids, ascorbic acid and shelf life of fruits were recorded as per the standard method.

Result and Discussion

Vegetative growth parameters

Experimental data presented in Table 1 indicated significant differences among the treatments in respect of vegetative growth. Maximum vegetative growth of sapota plant was observed in treatment T_5: 50% recommended dose of inorganic fertilizers (400: 160: 450 g / plant) + 25% FYM +25% neem cake. *i.e.*, plant height (5.40 m), girth (48.44 cm), canopy spread – NS (4.95 m) and EW (4.75 m), The increase in plant height, girth and canopy spread might be attributed to the combined application of organic and inorganic manure to the sapota plants.

Application of inorganic fertilizers with organic manures improved the soil physical properties like water holding capacity, total porosity and hydraulic conductivity of the soil. Increase in vegetative growth parameters could be due to quick availability of organic fertilizers and improvement of soil physical properties enabled the plants for better uptake of nutrients from the soil. These findings are also in agreement with the findings reported by Varu Devashi, (2012) [8], in sapota, Khehra and Bal, (2014) [4] in lemon, Ennab, (2016) [2] in eureka lemon and Meena *et al*. (2019) [5] in sapota.

Table 1: Impact of organic and inorganic sources of nutrients on vegetative growth of sapota cv. Kalipatti

Treatments	Plant height (m)	Plant girth (cm)	Canopy Spread (m)	
			(NS)	(EW)
T_1 -100 % RDF (400-160-450 g / plant)	5.27	47.88	4.41	4.05
T_2 - 75 % RDF+ 25 % FYM	5.06	47.61	4.45	4.08
T_3 - 50 % RDF + 25 % FYM + 25 % vermicompost	4.96	46.96	4.17	4.47
T_4 - 50 % RDF + 25 % FYM + 25 % castor cake T4	5.04	46.83	4.42	4.23
T_5 -50 % RDF + 25 % FYM + 25% neem cake	5.40	48.44	4.95	4.75
T_6- 50 % RDF + 25 % vermicompost + 25 % caster cake	5.06	47.31	4.06	4.38
T_7 - 50 % RDF + 25 % vermicompost + 25 % Neem cake	5.01	45.23	4.14	4.33
T_8 - 50 % RDF + 25 % FYM + 25 % green manure (Sunhemp).	5.07	47.07	4.03	4.19
CD (0.05)	0.14	1.6	0.39	0.36
SE (m)	0.04	0.52	0.12	0.12

Fruit yield and quality parameters

The data presented in Table 2 show that the number of fruit length, fruit breadth, fruits per tree, average fruit weight (g) and yield (kg/tree) was significantly influenced by different treatments. The maximum fruit length (5.31 m), fruit breadth (5.50 m), number of fruits per tree (351.67 fruits / tree), average fruit weight (105.00 g), fruit yield (51.00 kg / plant), TSS (24.58 ^{0}Brix), shelf life (10 days) and minimum ascorbic acid content (0.19 mg / 100 g) were recorded with the treatment T_5: 50% recommended dose of inorganic fertilizers (400: 160: 450 g / plant) + 25% FYM +25% neem cake. The increase in fruit yield and quality parameters might be attributed to the organic manures improved the efficiency of the fertilizers which might be accelerated the mobility of photosynthates from strong source to sink. Organic fertilizers play important role in translocation of carbohydrates by enhancing the plants to produce the required enzymes in the physiological process which in turn improved the fruit quality. Bhosale *et al*. (2018) [1] also reported that application of 50 % RDF (500: 250: 250 NPK g / tree) + 50 % vermicompost enhanced the vegetative, reproductive growth and yield attributes. These results are also in confirming with the results obtained by Patel and Naik, (2010) [7] in Sapota, Mehul Patel *et al*. (2017) [6] in sapota and Gaurav *et al*. (2017) [3] in sweet orange.

Table 2: Impact of organic and inorganic sources of nutrients on yield and quality of sapota cv. Kalipatti

Treatments	Fruit length (cm)	Fruit breadth (cm)	Average fruit weight (g)	No. fruits / tree	Yield (kg / tree)	TSS (^{0}Brix)	Ascorbic acid (mg / 100 g)	Shelf life (days)
T_1 -100 % RDF (400-160-450 g / plant)	4.90	5.06	93.00	316.67	37.67	22.07	0.23	7.00
T_2 - 75 % RDF+ 25 % FYM	4.83	4.83	95.33	312.33	39.00	20.29	0.20	8.00
T_3 - 50 % RDF + 25 % FYM + 25 % vermicompost	4.72	4.73	93.00	323.33	38.33	21.45	0.20	8.00
T_4 - 50 % RDF + 25 % FYM + 25 % castor cake T4	4.88	4.68	98.00	333.33	45.33	22.66	0.21	8.00
T_5 -50 % RDF + 25 % FYM + 25% neem cake	5.31	5.50	105.00	351.67	51.00	24.58	0.19	10.00
T_6- 50 % RDF + 25 % vermicompost + 25 % caster cake	5.00	4.96	88.00	319.33	37.67	22.06	0.20	9.00
T_7 - 50 % RDF + 25 % vermicompost + 25 % Neem cake	4.96	5.02	91.33	305.33	44.67	21.10	0.21	9.00
T_8 - 50 % RDF + 25 % FYM + 25 % green manure (Sunhemp).	4.99	4.91	93.00	318.33	35.00	21.72	0.20	8.00
CD (0.05)	0.30	0.28	4.97	18.71	6.49	2.26	N.S.	1.32
SE (m)	0.09	0.09	1.62	6.11	2.12	0.73	0.01	0.43

Conclusion

Based on the experimental results, it can be concluded that, to increase vegetative growth, yield and quality of sapota cv. kalipatti under Telangana conditions, application of 50 % recommended dose of inorganic fertilizers (400: 160: 450 g / plant) + 25% FYM +25% neem cake were applied in two split doses (50 % of N & K and 100% P in the month of June and an another 50 % N & K in the month of October) and organic fertilizers (FYM and neem cake) in the month of June.

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