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Effect of composite micronutrient on growth and yield of sweet orange

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Abstract
The present investigation on effect of composite micronutrient on growth and yield parameters of sweet orange was carried out at AICRP on Fruits, Dr. YSRHU - Citrus Research Station, Tirupati during 2022-23. The field experiment was laid out in Randaomized Block Design (RBD) with 8 treatments and three replications. Observations were recorded on growth and yield characters of sweet orange Cv. Sathgudi. The findings revealed that, treatment T_5 (RDF + soil application of composite micronutrient @ 125 g/plant) significantly increased growth parameters like canopy spread (E-W: 4.38 m & N-S : 4.30 m) and canopy volume (28.29 m^3). Yield parameters like fruit length (7.55 cm), fruit breadth (7.76 cm), fruit weight (170.9 g), number of fruits per plant (201.67), yield per plant (24.61 kg/plant) were significantly increased under treatment T_5 (RDF + soil application of composite micronutrient @ 125 g/plant).

Keywords: Sweet orange, micronutrients, soil application, growth, yield

Introduction
Citrus is an important fruit grown in the tropical and sub - tropical parts of the world. This economically valuable genus belongs to the Rutaceae family. Citrus fruits such as oranges, lemons, limes, grapefruits, tangerines and mandarins are the most widely grown citrus fruits in the world, with production increasing every year with the rise of consumer demand. The hesperidia, leaves and other parts of citrus contain several active secondary metabolites like phenolic acids, alkaloids, flavanoids, carotenoids, limonoids, coumarins and essential oils due to which they possess anti- inflammatory, anti- oxidative, anti- cancer and several other propeties (Xinmiao *et al.* 2015) [10]. Despite the COVID-19 pandemic, the market and consumption trends for the major types of citrus fruit and juice have not changed. This may because of consumer perception that citrus fruits can increase immunity because they are rich in vitamin C.

Among the citrus, sweet orange (*Citrus sinensis*) occupies an area of 234.30 thousand hectares producing 4381.27 thousand MT of fruits. Sweet orange is highly nutrient responsive crop. The productivity of sweet oranges primarily depends on a sufficient supply of plant nutrients. Micronutrients are just as essential as primary and secondary nutrients for crop growth. Micronutrients have a crucial role in balanced fertilization for crop yield stabilization and quality of produce. Though the micronutrients requirement is low, they often make a huge fluctuations in yield and quality of crop produce if there is a deficiency. The primary advantage of soil-applied fertilizers is that they are delivered to the roots, where the plants are designed to absorb nutrients. The roots of higher plants are adapted to absorb nutrients and water from the soil and distribute them throughout the plant via conductive tissues.

The productivity of sweet orange in India is significantly lower than in some of the frontline citrus growing countries like Brazil, USA, Spain and Italy. One of the main reasons for low sweet orange orchard productivity is multiple nutrient deficiencies. Small amount of micronutrient is required as compared to those of primary nutrients, but these are equally important for plant metabolism (Katyal *et al.* 2004) [5]. The multi-micronutrients mixture makes it easier to apply a wide variety of plant nutrients in the precise amount and to meet the individual needs of a crop at different stages of growth, and it is more relevant in site specific nutrient management.

Material and Methods
The experiment was conducted during 2022-23 on 8 years old plants of sweet orange Cv..

Sathgudi planted at the spacing of 6 x 6 m at AICRP on Fruits, Dr. YSRHU - Citrus Research station, Tirupati. Experiment was laid out in a Randomized Block Design (RBD) with three replications and eight treatments i.e., RDF + soil application of composite micronutrient @ 25 g/plant (T_1), RDF + soil application of composite micronutrient @ 50 g/plant (T_2), RDF + soil application of composite micronutrient @ 75 g/plant (T_3), RDF + soil application of composite micronutrient @ 100 g/plant (T_4), RDF + soil application of composite micronutrient @ 125 g/plant (T_5), RDF + soil application of composite micronutrient @ 150 g/plant (T_6), RDF + Market formulation - Agromin soil max @ 40 g/plant (T_7), Control (T_8). Plant height was measured with the help of measuring pole having meter marking from the ground level to the tip of the highest shoot of the plant in each and average was worked out. Scion girth was calculated by measuring the circumference of the trunk with measuring tape. Canopy spread was measured by using a graded flagstaff in opposite paths, namely East-West and North-South directions. Canopy volume was calculated by multiplying 0.5234 with plant height and canopy spread in both the directions (E-W and N-S) and expressed in m^3.

Fruit length and fruit breadth were measured with the help of vernier calipers. Fruit weight was calculated by an average of five randomly selected fruits from different position of the tree. The average weight was calculated by dividing the total fruit weight by total number of fruits taken and expressed in grams (g). Number of fruits per plant were counted at each harvesting and then sum up. Finally total yield per plant was calculated by following equation:

$$\text{Fruit yield (kg/ tree)} = \frac{\text{Total number of fruits/tree x Average fruit weight (g)}}{1000}$$

Results and Discussion

The data on effect of different levels of micronutrients on growth parameters is presented in Table 1. Plant height, scion girth was not significantly affected by application of different micronutrients. However, maximum plant height (2.37 m) and maximum scion girth (54.77 cm) were recorded in T_5 (RDF + soil application of composite micronutrient @ 125 g/plant) whereas, T_8 (RDF only) recorded minimum plant height (2.37 m) and T_2 (RDF + soil application of composite micronutrient @ 50 g/plant) recorded minimum scion girth (49.55 cm). Maximum canopy spread (E-W: 4.38 m & N-S: 4.30 m) and canopy volume (28.29 m^3) were recorded in T_5 (RDF + soil application of composite micronutrient @ 125 g/plant) compared to T_8 (control).

These findings are in line with earlier reports of Nandita *et al.* (2020) [6], Chaurasia *et al.* (2021) [2], Bastakoti *et al.* (2022) [1], Pawar *et al.* (2022) [7] in sweet orange, who have shown that application of micronutrients in combinations had significant effect on plant spread, canopy volume. This maximum increase in growth attributes might be due to the favourable influence of application of micronutrients were essential in metabolizing biological activities like photosynthesis and this caused a healthy green flush in the trees and boost water and nutrient intake, causing swelling pressures lead to the weakening of cell walls, favouring better plant development, resulting in increased height and number of branches per plant, and eventually greater canopy volume.

The perusal of data presented in Table 2 states that significantly maximum fruit length (7.55 cm), fruit breadth (7.76 cm), fruit weight (170.9 g), number of fruits per tree (280.06), yield per tree (35.17 kg/tree) were recorded by T_5 (RDF + soil application of composite micronutrient @ 125 g/plant). T_8 (RDF only) recorded minimum fruit length (6.98 cm), fruit breadth (7.10 cm), fruit weight (130.8 g), number of fruits per tree (192.10), yield per tree (20.17 kg/tree).

The above findings are in conformity with the results of Ram and Bose *et al.* (2000) [8], Reetika *et al.* (2018) [9] in mandarin, Jenny *et al.* (2019) [4], Farooq *et al.* (2023) [3] in sweet orange who reported that combined application of micronutrients had significant effect on yield and yield contributing characters. The reason behind improvement in fruit yield and yield contributing characters may be due to micronutrients *viz.*, zinc, iron, copper, manganese, boron plays an important role in photosynthesis, development of reproductive stage, aids in regulating plant growth hormones and reactions involving cell division and growth, reduces the fruit drop due to their role in retardation of abscission layer formation in pedicels at the point of fruit attachments, which ultimately increases number of fruits per plant and helps for increasing the yield.

Table 1: Effect of composite micronutrient on growth parameters of sweet orange

Treatments	Plant height (m)	Scion girth (cm)	Canopy spread (m)		Canopy volume (m^3)
			E-W	N-S	
T_1	2.63	52.99	3.77	3.86	20.44
T_2	2.57	49.55	3.44	3.79	17.99
T_3	2.61	52.10	3.88	3.91	20.78
T_4	2.68	53.21	3.97	3.84	21.66
T_5	2.82	54.77	4.38	4.30	28.29
T_6	2.64	51.44	3.83	3.89	20.59
T_7	2.57	50.22	3.88	4.05	21.03
T_8	2.37	50.55	3.78	3.84	18.05
SE m ±	0.09	1.88	0.13	0.10	1.79
CD @ 5%	NS	NS	0.4	0.31	5.44

Table 2: Effect of composite micronutrient on yield parameters of sweet orange

Treatments	Fruit length (cm)	Fruit breadth (cm)	Fruit weight (g)	Number of fruits per tree	Yield per tree (kg/tree)
T_1	7.09	7.23	134.6	214.55	25.06
T_2	7.15	7.38	150.1	261.55	30.80
T_3	7.23	7.31	137.8	228.77	28.78
T_4	7.15	7.54	146.8	210.00	24.70
T_5	7.55	7.76	170.9	280.06	35.17
T_6	7.21	7.24	141.3	218.67	26.86
T_7	7.17	7.28	133.6	198.88	21.33
T_8	6.98	7.10	130.8	192.10	20.17
SE m ±	0.09	0.10	6.91	7.54	1.34
CD @ 5%	0.29	0.32	20.9	22.26	3.96

Conclusion

On the basis of results obtained in the present investigation, it is concluded that application of RDF with soil application of composite micronutrient @ 125 g/plant proved to be the most effective treatment resulted in significant improvement in growth parameters like canopy spread, canopy volume. Yield and yield contributing characters were also significantly increased with application of RDF with soil application of composite micronutrient @ 125 g/plant.

References

1. Bastakoti S, Nepal S, Sharma D, Shrestha AK. Effect of foliar application of micronutrients on growth, fruit retention and yield parameters of acid lime (*Citrus aurantifolia* Swingle). Cogent Food & Agriculture. 2022;8(1):2112421.
2. Chaurasia S, Singh D, Prasad VM. Effect of macro and micronutrients on establishment of sweet Orange (*Citrus sinensis*) cv. Mosambi. Biological Forum – An International Journal. 2021;13(3a):0975-1130.
3. Farooq M, Khan AS, Shaheen T, Hussain M, Almas AU, Anwar R, *et al*. Exogenous application of macro and micronutrients improves plant growth, productivity and quality of Pineapple sweet orange. Pakistan Journal of Botany. 2023;55 (4):1305-12.
4. Jenny Z, Elizabeth S, Debashis M. Influence of foliar micronutrients on growth, yield and quality of Khasi mandarin (*Citrus reticulata* Blanco) in Mizoram. Research on crops. 2019;20(2):322-27.
5. Katyal JC. Role of micronutrients in ensuring optimum use of macronutrients. International symposium on micronutrients, New Delhi, India. 2004, 3-17.
6. Nandita K, Kundu M, Rakshit R, Nahakpam S. Effects of foliar application of micronutrients on growth, yield and quality of sweet orange (*Citrus sinensis* Osbeck). Bangladesh Journal of Botany. 2022;51(1):57-63.
7. Pawar PS, Rukadikar MV, Bhite BR. Studies on use of micronutrients in sweet orange (*Citrus sinensis* Osbeck) cv. Mosambi. The Pharma Innovation Journal. 2022;11(6):601-03.
8. Ram RA, Bose TK. Effect of foliar application of magnesium and micronutrients on growth, yield and fruit quality of mandarin orange. Indian Journal of Horticulture. 2000;57(3):215-20.
9. Reetika GS, Rana GS, Rana MK, Prince, Kant K. Effect of foliar application of macro and micronutrients on fruit drop and yield of Kinnow mandarin. International Journal of Pure and Applied Bioscience. 2018;6(2):1163-69.
10. Xinmiao L, Zhao S, Ning Z, Zeng H, Shu Y, Tao O, *et al*. Chemistry Central Journal. 2015;9:1-14.