International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
www.chemijournal.com
IJCS 2021; 9(1): 2371-2373

Received: 02-10-2020
Accepted: 07-12-2020

Mangali Mounika
College of Horticulture, Rajendranagar, Hyderabad, Telangana, India

Dr. T Suresh Kumar
Horticultural Research Station, Konda Mallepally, Nalgonda, Telangana, India

Dr. A Kiran Kumar
College of Horticulture, Rajendranagar, Hyderabad, Telangana, India

Dr. Veena Joshi
College of Horticulture, Mojerla, Telangana, India

Dr. N Sunil
ICAR-Maize Research Station, Rajendranagar, Hyderabad, Telangana, India

Corresponding Author:
Mangali Mounika
College of Horticulture, Rajendranagar, Hyderabad, Telangana, India

Studies on the effect of foliar application of calcium, potassium and silicon on yield of sweet orange (*Citrus sinensis* L.) cv. Sathgudi

Mangali Mounika, Dr. T Suresh Kumar, Dr. A Kiran Kumar, Dr. Veena Joshi and Dr. N sunil

DOI: https://doi.org/10.22271/chemi.2021.v9.i1ag.11583

Abstract
The present investigation "Studies on the effect of foliar application of calcium, potassium and silicon on yield of sweet orange (*Citrus sinensis* L.) Cv. Sathgudi" was conducted at Horticultural Research Station, Konda Mallepally, Nalgonda district, Telangana. The experiment was laid out in a Randomized Block Design (RBD) with thirteen treatments and three replications. Based on the results, it was observed that foliar application of T_4 - potassium silicate 4ml/L increased the fruit weight (244.93 g), length of the fruit (6.68 cm), volume of the fruit (145.00 ml), diameter of the fruit (6.95 cm) and higher fruit yield per tree (60.17 kg). However, peel thickness (mm) and fruit firmness (kg/cm^2) were found non-significant.

Keywords: Foliar spray, potassium silicate, yield, sweet orange, Sathgudi

Introduction
Sweet orange (*Citrus sinensis*. L) is the second important citrus fruit cultivated in the country. Its origin is traced back to China, Northern India and Southern Asia. In India, Telangana, Andhra Pradesh, Maharashtra, Karnataka, Punjab, Haryana and Rajasthan are main sweet orange growing states. The major sweet orange growing districts in Telangana are Nalgonda, Suryapet, Gadwal, Mahabubnagar and RangaReddy. Among the different cultivars of Sweet orange, Sathgudi is the important commercial cultivar and has wide adaptability. The fruit of this variety is medium, sub globose to spherical in shape, with smooth rind of medium thick orange colour. The flesh colour is straw or orange colour, segments are 10-12 and juice with good flavor. Fruit contains considerable amount of vitamin C, dietary fibre (non-starchy polysaccharides) that are essential for normal growth and development. The rind of citrus fruits is rich in pectin and certain essential oils. In sweet orange the chief constituent of the edible portion are sugars (glucose and sucrose), and acids (citric acid). Foliar application of micro nutrients are more successful than soil application. Calcium is known to play an important role in the quality retention of fruits in maintaining the firmness, reducing respiration rate, ethylene evolution and decreasing rots. Potassium nutrition also affects the mineral uptake and their distribution to different plant parts like shoots, leaves, fruits etc. Market qualities, fruit size, soluble solids and yield increases upon foliar application of potassium. Silicon is also known to increase drought tolerance in plants by maintaining plant water balance, photosynthetic activity, erectness of leaves and structure of xylem vessels under high transpiration rates. Therefore, present studies were undertaken with an objective to find out the effect of foliar application of calcium, potassium and silicon on yield of sweet orange cv. Sathgudi.

Materials and Methods
The present investigation was conducted at Horticultural Research Station, Konda Mallepally, Nalgonda District, Telangana, on fifteen year old sweet orange cv. Sathgudi. The experiment was laid out in randomized block design (RBD) with thirteen treatments and three replications. T_1 - 1.0% KNO_3 (Potassium nitrate), T_2 - 1.5% KNO_3 (Potassium nitrate), T_3 - 2.0% KNO_3 (Potassium nitrate), T_4 - 4 ml/L K_2SiO_3 (Potassium silicate), T_5 - 6 ml/L K_2SiO_3 (Potassium silicate), T_6 - 8 ml/L K_2SiO_3 (Potassium silicate), T_7 - 1.0% $Ca(NO_3)_2$ (Calcium nitrate),

T_8 - 1.5% $Ca(NO_3)_2$ (Calcium nitrate), T_9 - 2.0% $Ca(NO_3)_2$ (Calcium nitrate), T_{10} - 1.0% $CaCl_2$ (Calcium chloride), T_{11} - 1.5% $CaCl_2$ (Calcium chloride), T_{12} - 2.0% $CaCl_2$ (Calcium chloride), T_{13} - control. The spraying intervals are first spray at Before bloom stage (one month before flowering), second spray after fruit set, third spray after a month of second spray were sprayed. After harvesting of fruits data on fruit weight, length of the fruit, volume of the fruit, diameter of the fruit, peel thickness, fruit firmness, number of fruits/tree, yield per tree were recorded as per the standard method.

Results and Discussion

Experimental data presented in Table 1 indicated significant differences among the treatments in respect of yield parameters of sweet orange like fruit weight, length of the fruit, volume of the fruit, diameter of the fruit, number of fruits per tree, yield per tree. The maximum fruit weight (244.93g), length of the fruit (6.68 cm), volume of the fruit (145.00 ml), diameter of the fruit (6.95 cm) and higher fruit yield per tree (60.17 kg) were recorded with T_4 - 4 ml/L K_2SiO_3. (Potassium silicate)

The increase in yield might be due to combined effect of potassium and silicon. Enhanced photosynthesis by potassium which leads to supply of more carbohydrates and Mobility of assimilates to the developing fruits which acted as strong metabolic sink, consequently increases the fruit weight. Silicon plays an important role in increasing plant growth and enhancing fruit crops to biotic and abiotic stresses, nutrient and water uptake, photosynthesis, plant pigments synthesis and cell division. The other possible reason for enhancement of fruit volume might be due to cell division, and expansion. Potassium silicate application increased the photosynthetic activity due to higher photosynthetic activity resulted in more translocation of metabolites and there by cell division so that diameter of the fruit and size of the fruit have been increased. Potassium is known for development of fruit, movement of sugars and indirectly photosynthesis. Silicon enhanced the leaf water potential, under water stress conditions, reduced the incidence of micronutrients and metal toxicity, enhanced tolerance against various abiotic and biotic stress, heavy metal toxicity and water stress. However peel thickness and fruit firmness were non-significant. Alvarez and Dantoff (2001) [1], also reported that silicon application increased the plant growth and yield significantly. Ma *et al*. (2004) [5], also reported that silicon application enhances the resistance against biotic and abiotic stresses in plants.

These results are also in confirming with the results obtained by Lalithya *et al*. (2013) [4], in sapota, Thippeshappa *et al*. (2014) [7], in sapota, Ibrahim *et al*. (2014) [2], in valencia orange, Khawaga *et al*. (2014) [3], in Washington navel orange, Mukunda *et al*. (2014) [6], in acid lime, Vijay *et al*. (2016) [8], in sweet orange.

Table 1: Studies on the effect of foliar application of calcium, potassium and silicon on yield of sweet orange cv. Sathgudi

Treatments	Fruit weight (g)	Fruit length (cm)	Fruit volume (ml)	Fruit diameter (cm)	Peel thickness (mm)	Fruit firmness (kg/cm^2)	Number of fruits/tree	Yield per tree (kg)
T_1 - 1.0% KNO_3	237.62	5.94	139.00	5.34	3.31	11.00	250.00	59.40
T_2 - 1.5% KNO_3	235.51	6.33	137.00	5.46	3.36	10.66	241.66	56.91
T_3 - 2.0% KNO_3	233.33	5.46	135.66	5.48	3.29	11.33	234.66	54.75
T_4 - 4 ml/L K_2SiO_3	244.93	6.68	145.00	6.95	2.81	11.66	245.66	60.17
T_5 - 6 ml/L K_2SiO_3	242.70	6.62	143.00	6.50	3.22	11.33	242.00	58.73
T_6 - 8 ml/L K_2SiO_3	241.07	6.48	142.33	6.40	3.29	11.66	239.00	57.62
T_7 - 1.0% $Ca(NO_3)_2$	231.99	5.46	134.00	5.51	3.66	11.33	238.33	55.29
T_8 - 1.5% $Ca(NO_3)_2$	229.00	5.53	129.00	5.41	3.74	10.66	233.66	53.51
T_9 - 2.0% $Ca(NO_3)_2$	227.00	5.28	130.66	5.37	3.53	11.33	226.33	51.36
T_{10} - 1.0% $CaCl_2$	225.33	5.38	131.00	5.34	3.84	10.33	236.00	53.18
T_{11} - 1.5% $CaCl_2$	222.66	5.27	130.00	5.87	3.12	12.33	229.66	51.17
T_{12} -2.0% $CaCl_2$	216.70	5.34	126.00	6.35	2.97	10.66	227.33	49.16
T_{13} - Control	206.66	5.27	104.66	4.89	3.93	12.70	207.33	42.84
S.Em±	2.48	0.37	2.98	0.40	0.25	0.79	2.88	1.01
CD	7.29	1.10	8.76	1.17	N/A	N/A	8.47	2.97

Conclusion

Based on the experimental results, it can be concluded that to increase the yield of sweet orange cv. Sathgudi, spraying of potassium silicate K_2SiO_3 @ 4 ml/L (first spray at before bloom stage (one month before flowering), second spray after fruit set, third spray after a month of second spray) at recommended time intervals is beneficial.

References

1. Alvaraz J, Dantoff E. The economic potential of silicon for integrated management and thus sustainable rice production. Crop prot 2001;20:53-48.
2. Ibrahim HIM, AI-Wasfy MM. Promotive impact of using silicon and selenium with potassium and boran on fruiting of Valencia orange tree grown under Minia region conditions. World Rural Observations 2014;6(2):28-36.
3. Khawaga EI, AS Mansour AGM. Promoting productivity of Washington Navel orange tree by using some crop seed sprout extracts, silicon and glutathione. Middle East J Of Applied Sciences 2014;4(3):779-785.
4. Lalithya KA, Hipparagi K, Thippeshappa G, Vishnuvardhana. Effect of silicon and micro nutrients on growth and yield attributes of sapota cv. Kalipatti under hill zone. Crop Res 2013;46(1, 2, 3):146-149.
5. Ma JF. Role of silicon in enhancing the resistance of plants to biotic and abiotic stresses. Soil Scr. Plant Nutr 2004;50:11-18.
6. Mukunda L, Sivarama KT, Yuvaraj KM, Lakshmi TN, Sarada G, Sankar T, Gopi V. Effect of Growth Regulators and Chemicals on Fruit Yield and Quality of Hasta Bahar Flowering in Acid Lime (*Citrus aurantifolia* Swingle) cv. Balaji. Research and reviews journal of agriculture and allied sciences. RRJAAS 2014;3(3).
7. Thippeshappa GN, Ravi CS, Ramesha YS. Influence of soil and foliar application of silicon on vegetative characters, fruit yield and nutrient content of sapota leaf. Research on crops 2014;15(3):626.

8. Vijay RPS, Dalal, Beniwal BS, Hemant S. Impact of foliar application of potassium and its spray schedule on yield and quality of sweet orange (*Citrus sinensis*) cv. Jaffa. Journal of Applied and Natural Science 2016;8(4):1893-1898.