International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
www.chemijournal.com
IJCS 2020; 8(5): 276-278

Received: 10-07-2020
Accepted: 19-08-2020

AD Bhosale
Assistant Professor, Department of Horticulture, College of Agriculture, Khandala tal-Vaijapur, Dist Aurangabad, Maharashtra, India

MB Patil
Officer Incharge, Fruit Research Station, Himayat Bagh, Aurangabad, Maharashtra, India

KA Bhalerao
Department of Horticulture, College of Agriculture, Badnapur, Dist. Jalna, Maharashtra, India

MA Thorat
Assistant Professor, Department of Horticulture, Aditya College of Agriculture, Beed, Maharashtra, India

Corresponding Author:
AD Bhosale
Assistant Professor, Department of Horticulture, College of Agriculture, Khandala tal-Vaijapur, Dist Aurangabad, Maharashtra, India

Studies on effect of foliar application of urea, zinc sulphate and 2,4-D on growth and yield parameters of sweet orange Var. Nucellar (*Citrus sinensis* L. Osbeck)

AD Bhosale, MB Patil, KA Bhalerao and MA Thorat

DOI: https://doi.org/10.22271/chemi.2020.v8.i5d.10309

Abstract
An experiment was conducted to studies on effect of foliar application of urea, zinc sulphate and 2,4-D on growth and yield parameters of sweet orange (*Citrus sinensis* L. Osbeck) Var. Nucellar." was carried out at Sweet Orange Research Station, Badnapur, Dist. Jalna during 2018-19. The experiment was laid out in Randomized Block Design (RBD) with 8 treatments and three replication. Observations were recorded on growth and yield characters of sweet orange. The results were revealed that, The growth and yield parameters like plant height, number of fruits per tree, average weight of fruit, fruit diameter and fruit volume are most effective in T_7 i.e., Urea – 1% + $ZnSO_4$ -0.4% + 2,4-D – 20ppm followed by treatment T_6 i.e., $ZnSO_4$ -0.4% + 2,4-D – 20 ppm.

Keywords: Urea, 2,4-D, fruit weight

Introduction
Citrus is grown throughout the world in tropical and subtropical climate. Sweet orange is considered as most important fruit crop of citrus group with their medicinal value. Sweet orange (*Citrus sinensis* L. Osbeck) belongs to family Rutaceae. Citrus is the third largest fruit crop grown in India after mango and banana. Citrus fruits are one of the commercially most important fruits in the world. Citrus occupies an important place in Indian economy. Commercially, sweet orange, mandarin and acid lime are grown in different agro-climatic regions. Andhra Pradesh, Maharashtra, Karnataka, Punjab, Haryana, and Rajasthan are the main sweet orange growing states. Maximum area under sweet orange in the Andhra Pradesh followed by Maharashtra and Karnataka. Sweet orange is well grown on medium black, red, alluvial river bank loamy soil of Maharashtra state and Goradu soil of Gujrat. Maharashtra is the largest producer of sweet orange in the country and contributes to about 49 per cent of the total production. Maharashtra state produces 0.65 MT sweet orange from an area of 0.11 m ha with the productivity of 6.1 MT/ha. The major sweet orange producing belts in the state are Ahmednagar, Aurangabad, Jalna, Jalgaon, Amravati and Pune (NHM 2013).
Sweet oranges are grown in India an area of 1003 ha with production of 3497.35 metric tones and productivity of 16.7 tones/ha (Anonymous 2017) [2]. While in Maharashtra it is grown in 54.89 ha area with production of 656.89 metric tones and productivity 11.97 metric tones/ha. The long warm to hot dry summers and medium cool winters prevailing in Jalana district suits for best quality sweet orange production. Nucellar cultivar has been under cultivation in this region, but now a days area under Sathgudi mosambi is increasing due to more market demand. Sathgudi fruits have good acid sugar ratio, more juice percentage and thin peel. Moreover, sathgudi fruits are produced in less grades i.e. two or three grades. Nucellar mosambi is an established cultivar of the region having good yield potential and excellent taste of juice. For intance, zinc deficiency often occure due to heavy phosphate application. Mangnese deficiency occurs especially due to over liming, heavy phosphate application and excess of iron, copper and zinc in the soil. Copper deficiency is induced by heavy liming and excessive application of nitrogen and phosphate. The yield of crop could be improved with little quantities of micronutrients applied either singly or in mixtures through soil or foliar application (Malewar, 2005) [10].

Material and Methods

The experiment was conducted during 2018-19, on uniform 8 years old plants of Var. Nucellar mosambi planted at the spacing of 6x6m at the Sweet Orange Research Station, Badnapur, district Jalna of Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani. Station is situated at 409 m above mean sea level at 19.87°N latitude and 75.72°E longitudes with an altitude of 523 meters. The average rainfall of the station is about 650 mm received mostly during June to September. The mean minimum and maximum temperature during the last five years were 15.25 0C and 43.85 0C and the mean relative humidity ranges from 30 to 90 percent and rainfall in the year 2018 is 437 mm. Experiment was laid out in a Randomized Block Design (RBD) with three replication and eight treatments these are Urea – 1% (T_1), $ZnSO_4$ – 0.4% (T_2), 2,4-D – 20 ppm (T_3), Urea – 1% + $ZnSO_4$ – 0.4% (T_4), Urea – 1% + 2,4-D – 20 ppm (T_5), $ZnSO_4$ -0.4% + 2,4-D – 20 ppm (T_6), Urea – 1% + $ZnSO_4$ -0.4% + 2,4-D – 20ppm (T_7), Control (T_8). The height of plant was measured with the help of measuring bamboo having meter marking from the ground level to the tip of the highest shoot of the plant in each replication and average was worked out and was expressed in meter. The total number of fruits was harvested from the tree and total number of fruits counted. The weight of fruits was recorded with the help of electric balance. The size of fruit was measured in terms of length and breadth in cm with the help of Vernier caliper. Volume of the fruit was measured by displacement method.

Results and Discussion

The data present in table, among various treatments, Maximum plant height was observed in T_7 (4.31) foliar application of Urea -1% + $ZnSO_4$ -0.4% + 2,4-D-20ppm which was significantly superior over the control T_8 (4.32) which was significantly at par with T_6 (4.46) foliar application of $ZnSO_4$ – 0.4% +2,4-D -20ppm T_7 was statistically significant with all over the treatment. Our result also conformed Babu *et al.*, (2007) [3] in kagzi lime and kinnow respectively, to the increase the vegetative growth of the plant. El-Otmani *et al.* (2002) [6] reported that foliar applied urea represents an effective and most efficient method as a source of nitrogen in sustainable citrus production system encouraging vegetative growth. El-Kobbia *et al.* (2011) [5] recorded that the foliar sprays of urea at pea or marble stage significantly increased vegetative growth. The maximum number of fruits per tree was observed in T_7 (327.33) i.e., foliar application of Urea -1% + $ZnSO_4$ -0.4% + 2,4-D-20ppm which was significantly superior over the control T_8 (211.33) which was significantly at par with T_6 (281.33) i.e., foliar application of $ZnSO_4$ – 0.4% +2,4-D -20ppm T_7 was statistically significant with all over the treatment. Gurjar and Rana (2014) [7] reported the highest number of fruits per tree in kinnow (279.4) was obtained with the foliar application of 0.5 per cent $ZnSO_4$ + 10 ppm 2, 4-D resulted and minimum number of fruits (238.6) under control. Sharma *et al.*, (1974) [13] also observed a significant increase in number of fruits per tree by spraying urea in combination with zinc. Haque *et al.*, (2000) [8] concluded that Spraying of micronutrients (Cu, Zn and B) alone and their combinations significantly increased the number of fruits per plant, total fruit and yield of mandarin Orange. Jat and Kacha (2014) [9] reported that the highest number of fruits per plant (489.69) was observed in the treatment 0.6 % Zinc in guava. Maximum average weight of fruit was observed in T_7 (313.50) i.e., foliar application of Urea -1% + $ZnSO_4$ -0.4% + 2,4-D-20ppm which was significantly superior over the control T_8 (216.47) which was significantly at par with T_6 (293.84) i.e., foliar application of $ZnSO_4$ – 0.4% +2,4-D -20ppm T_7 was statistically significant with all over the treatment. Stern *et al.* (2007) [14] held the same view, they observed 8-13 per cent increase in fruit dimeter due to auxin application. This could be attributed to the formation of phloem and secondary xylem which they deemed to be directly related to fruit size. Increase in fruit weight, fruit size and juice content was observed as maximum in 2,4-D (20 ppm) treatment (Nirmaljit Kaur *et al.* 2000) [12]. Maximum diameter of fruit was observed in T_7 (9.68cm) i.e., foliar application of Urea -1% + $ZnSO_4$ -0.4% + 2,4-D-20ppm which was significantly superior over the control T_8 (7.32) which was significantly at par with T_6 (9.63cm) i.e., foliar application of $ZnSO_4$ – 0.4% +2,4-D -20ppm. T_7 was statistically significant with all over the treatment. Haque *et al.*, 2000 [8] concluded that Spraying of micronutrients (Cu, Zn and B) alone and their combinations significantly increased the fruit diameter and yield of mandarin orange. Meena *et al.*, (2014) [11] found that maximum fruit diameter (4.46 cm) at harvest with foliar spray of 0.8 % Zinc Sulphate and 0.4 % Zinc Sulphate treatment in aonla. The maximum fruit volume was recorded in T_7 (295.77ml) i.e., foliar application of Urea -1% + $ZnSO_4$ -0.4% + 2,4-D-20ppm which was significantly superior over the control T_8 (224.91 ml) which was significantly at par with T_6 (287.74ml) i.e., foliar application of $ZnSO_4$ – 0.4% +2,4-D -20ppm. T_7 was statistically significant with all over the treatment. Bhambota *et al.*, (1962) [4] noted that the application of Zinc (0.6%) + Iron (0.4%) significantly increased the number of fruits, mean weight of fruit, diameter and volume of each fruit of citrus plant. Ali *et al.*, (2014) [1] reported that Fruit diameter, fruit volume was maximum in treatment Zn + Cu + Mn + B in peach. Jat *et al.*, (2014) [9] reported that the volume of fruit (125.44 ml), fruit weight (153.89 g) increased under the treatment 0.6 % Zn in guava fruits.

Table 1: Effect of foliar application of urea, zinc sulphate and 2,4-D on Different growth and yield attributes of Sweet Orange fruits.

T. No.	Treatment details	Plant height (m)	Number of fruits per tree	Average weight of fruit (g)	Average diameter of fruit (cm)	Fruit volume (ml)
T1	Urea – 1%	4.38	263.33	233.83	7.87	234.82
T2	$ZnSO_4$ – 0.4%	4.92	249.66	254.57	8.32	261.03
T3	2,4-D – 20 ppm	4.21	277.33	243.82	7.75	246.51
T4	Urea – 1% + $ZnSO_4$ – 0.4%	4.28	269.33	279.74	8.43	276.44
T5	Urea – 1% + 2,4-D – 20 ppm	4.22	279.66	265.93	8.41	272.22
T6	$ZnSO_4$ -0.4% + 2,4-D – 20 ppm	4.46	281.33	293.84	9.63	287.74
T7	Urea – 1% + $ZnSO_4$ -0.4% + 2,4-D – 20ppm	4.31	327.33	313.50	9.68	295.77
T8	Control	4.32	211.33	216.47	7.32	224.91
SE ± C.D.at 5%		0.15	9.50	12.42	0.24	9.64
		0.46	28. 70	37.50	0.75	29.11

References

1. Ali A, Perveen S, Shah SM, Zhang Z, Wahid F, Shah M *et al*. Effect of foliar application of micronutrients on fruit quality of peach. American Journal of plant Sciences. 2014; 5:1258-1264.
2. Anonymous. Area and production of various fruit crops for the year 2016-17. Horticulture Statistics At a glance 2017. Horticulture Statistics Division Department of agriculture, Cooperation & Farmers Welfare Ministry of Agriculture & Farmers Welfare Government of India, 2017.
3. Babu KD, Dubey AK, Yadav DS. Effect of micronutrients on enhancing the productivity and quality of Kinnow mandarin. Indian Journal of Horticulture. 2007; 64(3):353-356.
4. Bhambota JR, Azad KC, Kanwar JS, Dhingra DR. Study of the effect of sprays with micronutrients of the chlorosis of citrus Hortic. Adv. 1962; 6:168-172.
5. El-Kobbia AM, Kassem HA, Marzouk HA, Abo-Elmagd M. Enhancing cropping of Navel orange by different agrochemicals foliar sprays. Emir. J Food Agric. 2011; 23(1):95-102.
6. El-Otmani MA, Oubahou FZ, Taibi CJ, Lovatt M, Tagliavini M, Toselli L *et al*. Efficacy of foliar urea as an N source in sustainable citrus production system. Acta Hort. 2002; 594:711-617.
7. Gurjar PS, Rana GS. Influence of foliar application of nutrients and growth regulator on fruit drop, yield and fruit size and quality in Kinnow mandarin. Indian Journal of Horticulture. 2014; 71(1):109-111.
8. Haque R, Roy A, Pramanic M. Response of foliar application of Mg, Zn, Cu and B on improvement of growth, yield and trial quality of Mandarin orange in Darjeeling Hills of West Bengal. Hortic. J. 2000; 13(2):15-20.
9. Jat G, Kacha HL. Response of guava to foliar application of urea and zinc on fruit set, yield and quality. Journal Agrisearch. 2014; 1(2):86-91.
10. Malewar GU. Micronutrient stresses in soil and crops: Serious sickness and clinical approaches for sustainable agriculture. J Indian Soc. Soil Sci. 2005; 53(4):484- 489.
11. Meena D, Tiwari R, Singh OP. Effect of nutrient Spray on growth, fruit yield and quality of aonla. Annals of Plant and Soil Research. 2014; 16(3):242-245.
12. Nirmajit Kaur, Monga PK, Thind SK, Thatai Vij VK, Kaur N. Effect of growth regulators on periodical fruit drop in Kinnow mandarin. Haryana J Hort, Sci. 2000; 29:39-41.
13. Sharma BB, Singh R, Sharma HC. Response of sweet orange (*Citrus sinensis* Osbeck) plant to zinc, urea and DBCD. Indian J Hort. 1974; 31:38-44.
14. Stern RA, Flaishman M, Ben-Arie R. The effect of Synthetic auxins on fruit development, quality & final fruit size in ‘Canino apricot’ (*Prunus armeniaca* L.). J Hort. Sci. Biotechnol. 2007; 82(2):335-340.