Original Research Article

Studies on the effect of foliar spray of micronutrients on physical parameters of guava (*Psidium guajava L.*) cv. Allahabad Safeada

Abstract

A field experiment was conducted on Horticulture Research Farm –II of Department of Horticulture, School of Agricultural Sciences and Technology, Babasaheb Bhimrao Ambedkar University, Lucknow, India, during the academic year of 2019-20. to study the effect of micronutrient spray on the physical parameters of guava cv. Allahabad Safeda on 10 - year- old guava plants that fruit set (68.80 %) fruit retention (65.89%) fruit length (7.59 cm), fruit width (6.75 cm), fruit weight (136.8 g.) fruit volume (148.13cm^3), specific gravity(0.92), fruit yield per plant (42.20kg/plant), and yield (q/ha) were obtained maximum with the foliar spray of zinc sulphate T_3 (0.4%) and borax T_9 (0.4%) respectively.

Keyword- Guava, micronutrients, physical parameters, *Psidium guajava*

Introduction

"The superfruit guava (*Psidium guajava L.*), also known as the "Apple of the Tropics" is one of the most popular fruits cultivated in India's tropical, sub-tropical, and dry areas. About 150 species of tiny shrubs and trees belong to the genus Psidium, which belongs to the Myrtaceae family" (Kumar et al, 2013). "About 20 species have edible fruits of which the most commonly cultivated is the common guava (*Psidium guajava L.*) was introduced in India in the 17th century by Portuguese from Latin America (Singh *et al*, 2000) and has originated in tropical America perhaps from Mexico". "Guava is widely grown all over the country in the kitchen garden, near the well and tube well premises, and also on a commercial scale" (Bal *et al*,. 2004). "Guava fruits are also used for the preparation of jam, jelly, RTS, nectar, etc. The guava bear flowers and fruits on current season growing twinges and highly cross-pollinated crop and pollination occurs through honey bees and andirons insect. The guava fruit developed from the inferior ovary exhibited a double sigmoid growth curve, fruit with many seed berry, the fruit takes nearly 4-5 month from dark green to yellowish-green" (Shukla *et al*,. 2019). "Nutritional deficiencies in fruit crops significantly hamper the physiological process of plants thus reducing yield and producing inferior fruit, and making the plant vulnerable to a number of biotic and abiotic stresses. Micronutrients have received greater

attention for crop production nowadays, because of their widespread deficiency in soil due to intensive cropping production and insufficient use of organic manure compared to high mineral fertilization for fruit crop production" (Sayan Sau *et al*,2018). "It formed an outstanding source of antioxidants such as vitamin C (260mg/100gm), carotenoids, and polyphenols. The fruit comprises three to fourfold higher amounts of vitamin C as a single orange. Vitamin C is essential for immune system stimulation, connective tissue formation as well as to reduce the incidence of degenerative diseases such as arthritis, arteriosclerosis, and cancer. In addition, antioxidants are known to retard aging as well as prevent or delay oxidative damage of lipids, proteins, and nucleic acids caused by reactive oxygen species" (Bhatia *et al.*, 2001). "It has also an important role in fruit quality. Boron has an effect on the cell wall structure and also has a major effect on cell elongation. Zinc is involved in many enzymatic reactions in the growth and development of plants. It is also involved in regulating protein and carbohydrate metabolism. Copper plays a very important role in plant growth and nutrition, as well as in cell wall deposition. It increases fruit weight and yields also. Foliar application of nutrients enhances the efficient use along with the quick response" (Yadav, et al, 2017). "The experiment was undertaken to study the effect of foliar application of mineral nutrients viz., boron (B), zinc (Zn), and copper(Cu) sprayed at different growth stages viz., at fruit set and at two weeks after fruit set of guava (*Psidium guajava* L.). An increase in the plant canopy and minimum seed index was in Zn (0.4%) sprayed at the fruit set. Fruit size, sugar: acid. Increased yield in Zn (0.4%) and pectin enhances with B (0.3%) was found at two weeks after the fruit set, respectively. Minimum physiological loss in weight of fruits was with Cu (0.4%) sprayed at two weeks after fruit set" (Yadav, *et al*, 2017).

Materials and Methods

The experiment was conducted at Horticulture Research Farm –II of Department of Horticulture, School of Agricultural Sciences and Technology, Babasaheb Bhimrao Ambedkar University, Lucknow, India, during the academic year of 2019-20. The plants having uniform vigor, size with the age of 12 years old were selected for the study. The experimental site has a sub-tropical climate. The soil of the orchard is clay loam which is well-drained and well aerated. The soil texture was quite loose suited for the development of the plant root system. Nutrient application and other orchard management practices were followed as per recommended package and practices for guava. Manure and fertilizer were applied in each treatment before flowering in the month of July for taking winter season crop. The first spraying of micronutrients was done before flowering (first week of August) and

second after fruit set (second week of September) during 2019-20 The experiment consisted of 22 treatment combinations of 3 micronutrients viz., zinc, copper, and boron at 0.2%, 0.3%, and 0.4% and is a combination of two and three except spray of plain tap water as control. Aqueous solutions of zinc, copper, boron, and tap water were sprayed at the time of full bloom on rainy season crops (Ambe Bahar). The experiment was laid out in Randomized Block Design (RBD) with 3 replications of all the treatments. Micronutrient sprays were done at the full bloom stage in the early morning with the help of a foot sprayer @ six liters per tree to ensure the maximum absorption of nutrients through the leaves. Zinc (as Zinc sulfate - $ZnSO_4$), Copper (as Copper sulfate - $CuSO_4$), Boron (as Boric acid - H_3BO_3) with concentrations of 0.2% (2000 ppm) 0.3% (3000 ppm) 0.4% (4000 ppm), Control-Spray of tap water.

Experimental Treatments and Measurements: Treatment combinations are T_1- Zinc sulphate (0.2%) ,T_2- Zinc sulphate (0.3 %), T_3- Zinc sulphate (0.4 %), T_4- Copper sulphate (0.2 %), T_5- Copper sulphate (0.3%), T_6 -Copper sulphate (0.4 %), T_7 -Boric acid (0.2 %), T_8- Boric acid (0.3%), T_9 -Boric acid (0.4 %), T_{10} -Zinc sulphate + copper sulphate (0.2 %), T_{11} -Zinc sulphate + copper sulphate (0.3 %), T_{12} Zinc sulphate + copper sulphate 90.4 %), T_{13}- Zinc sulphate + boric acid(0.2 %), T_{14} -Zinc sulphate + boric acid(0.3 %), T_{15} -Zinc sulphate + boric acid(0.4 %), T_{16} Copper sulphate + boric acid(0.2 %), T_{17}- Copper sulphate + boric acid(0.3 %), T_{18} -Copper sulphate + boric acid (0.4 %), T_{19} Zinc sulphate + copper sulphate + boric acid(0.2 %), T_{20}- Zinc sulphate + copper sulphate+ boric acid(0.3 %), T_{21}- Zinc sulphate + copper sulphate+ boric acid(0.4 %), T_{22}- Control spray of tap water.

Measurement of Physical Properties of Fruit: To determine fruit morphological characteristics like fruit size (length and width), fruit weight, fruit volume, and fruit retention. Twenty fruits were selected randomly from replicates. The specific gravity was calculated by dividing the weight of the fruit by its volume. Fruit firmness of guava was determined by a screw-type Penetrometer and the reading was expressed in kg/cm^2.

Statistical Analysis: The experimental data for two successive years 2019 and 2020 was subjected to statistical analysis. The critical differences (C.D.) at a 5% level of probability were worked out for comparing treatment means. They were analyzed according to the procedure of analysis for Randomized Block Design (RBD) given by Cochran and Cox (1992).

RESULTS AND DISCUSSION

A perusal of data in a table-1 that foliar spray of micronutrients proved significantly effective in improving the percentage of fruit set. The maximum fruit set (68.80 percent) was found with the foliar application of borax (0.4%) in T_9 followed by 66.70 percent in T_3 with foliar application of zinc sulfate (0.4%) in T_3. The plant under control showed a minimum fruit set (54.80%) in T_{22}. The application of various treatments significantly influenced the percentage of fruit retention over the control (T_{22}). The Maximum fruit retention % was found in spray of borax(0.2%) in T_7 (65.89%) followed by spray of Borax (0.4%) in T_9 (65.80%). The minimum fruit retention (57%) was found in control (T_{22}). Similar results were also observed by **Ali *et al.* (1993) and Prasad *et al.* (2005).** In comparison to the control, foliar micronutrient spray improves fruit size (length and breadth). With foliar feeding of copper sulfate 0.4 percent (T_5) and borax 0.4 percent (T_9), the greatest fruit size was reported in terms of fruit length (7.59cm) and fruit width (6.75cm). Increased size due to borax spraying, which delivers boron to the plant, may have controlled cell wall permeability, enabling more water mobilization in the fruit, resulting in higher fruit size. These results are in close conformity with the findings of **Prasad *et al.*, Pal *et a1*,.(2008)** in guava. All of the micronutrients considerably increased the weight of the fruit when compared to the control. The maximum fruit weight (136.8 g.) was achieved with foliar sprays of borax 0.4 percent (T_9) and zinc sulphate 0.4 percent (T_3), while the minimum fruit weight was achieved with the control. Increased fruit weight appears to have an indirect impact in hastening cell division and cell elongation, as well as increasing fruit size. **Trivedi *et al.*, (2012)** observed similar findings in guava. The results show that different treatments enhanced the fruit volume substantially above the control. The treatment T_9 produced the largest fruit volume (148.13 cm^3) (borax 0.4 percent). This may be attributed to the role of borax in cell division, cell growth, and increased intercellular space in monocarpic cells, which results in increased fruit weight and size. Similar results were also obtained by **Pal *et al,*.(2008)** in guava. The maximum specific gravity (0.92) was found with foliar spray of borax 0.4 percent (T_9). The minimum specific gravity (0.90) was found in the control. The results are similar to the findings of **Trivedi *et al,*. (2012)** in guava. The maximum yield (42.20 kg/tree) was recorded with borax 0.4 percent (T_9) followed by zinc sulphate + copper sulphate 0.3 percent (T_{11}). These micronutrients improve the fruit length, width, and weight which ultimately increased the yield. These results are in close conformity with the findings of **Prasad *et al,*. (2005), Trivedi *et al,*. (2012)** in guava.

Table1: Effect of foliar application of micronutrients on physical parameters of winter season guava (*Psidium guajava L*)

Treatments	Fruit set(%)	Fruit retension (%)	Fruit length(cm)	Fruit width (cm)	Fruit weight (g.)	Fruit volume(cm^3)	Specific gravity	Fruit Yield (kg/plant)
Zn (0.2%)	64.85	55.50	5.60	5.90	125.54	142.60	0.93	39.30
Zn (0.3%)	64.23	55.36	5.88	5.96	123.45	140.20	0.91	41.00
Zn (0.4%)	66.70	61.50	6.36	6.25	132.50	144.60	0.92	41.55
Cu (0.2%)	64.66	56.23	6.30	5.93	126.06	141.21	0.91	40.12
Cu (0.3%)	63.25	55.36	7.59	5.92	130.60	140.31	0.91	41.25
Cu (0.4%)	62.87	56.23	6.75	5.89	130.07	142.21	0.92	39.98
B (0.2%)	65.91	65.89	7.10	6.10	127.42	141.71	0.93	40.30
B (0.3%)	65.38	55.23	5.67	6.00	131.81	141.70	0.92	33.65
B (0.4%)	68.80	65.80	7.10	6.75	137.70	148.70	0.93	42.30
Zn+Cu (0.2%)	65.00	54.36	5.25	5.96	118.23	144.36	0.91	39.21
Zn+Cu (0.3%)	65.27	56.36	5.36	5.98	111.27	136.21	0.91	41.36
Zn+Cu (0.4%)	65.36	56.14	5.66	6.12	131.23	135.23	0.92	40.36
Zn+B (0.2%)	64.69	60.36	5.45	6.13	131.32	132.65	0.92	40.98
Zn+B (0.3%)	64.65	60.95	5.64	6.10	117.43	140.23	0.91	41.21
Zn+B (0.4%)	64.32	57.95	5.85	5.80	121.64	141.25	0.92	40.32
Cu+B(0.2%)	60.36	59.36	5.13	5.94	120.94	142.65	0.92	40.65
Cu+B (0.3%)	62.45	58.23	5.24	5.96	117.03	141.65	0.92	41.32
Cu+B (0.4%)	62.54	61.21	5.46	6.10	120.61	142.85	0.91	40.22
Zn+Cu+B(0.2%)	64.25	63.21	5.34	5.99	113.16	142.58	0.91	41.32
Zn+Cu+B(0.3%)	63.45	60.35	5.61	5.89	128.13	143.54	0.92	41.81
Zn+Cu+B(0.4%)	64.00	60.34	5.78	5.94	130.36	143.21	0.91	41.50
Control	54.80	57.00	4.89	5.20	115.27	128.60	0.90	27.50
S Em.	1.65	1.30	0.033	0.19	0.480	1.75	0.00	1.35
CD at 5%	5.10	4.03	0.059	0.59	0.874	5.39	NS	4.17

CONCLUSION

According to the present investigation, the physical characters of guava fruit with respect to fruit length, fruit width, fruit weight, fruit volume(cm^3), etc were obtained maximum with the foliar spray of zinc sulphate T_3 (0.4%) and borax T_9(0.4%) respectively. Therefore, it may be

concluded that foliar spray of zinc sulphate (0.4%) and borax (0.4%) can be recommended to the guava growers for obtaining a better quality of winter season guava fruits.

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