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Influence of foliar application of micronutrients on physical and yield attributes of Mrig bahar guava (*Psidium guajava* L.) CV. Sardar

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Abstract
The present investigation entitled "Influence of foliar application of micronutrients on physical and yield attributes of mrig bahar guava (*Psidium guajava* L.) cv. Sardar" was carried out at College of Agriculture, Golegaon under VNMKV, Parbhani, M.S. (India) during year 2020-21. The experiment was laid out in Randomized Block Design having eleven treatments with three replications. The details of treatments were as T_1: Control treatment, T_2: zinc sulphate 1.0%, T_3: copper sulphate 1.0%, T_4: boron 1.0%, T_5: magnesium sulphate 1.0%, T_6: zinc sulphate 1.0% + magnesium sulphate 1.0%, T_7: copper sulphate 1.0% + magnesium sulphate 1.0%, T_8: zinc sulphate 1.0% + boron 1.0%, T_9: copper sulphate 1.0% + boron 1.0%, T_{10}: magnesium sulphate 1% + boron 1.0% and T_{11}: zinc sulphate 1.0% + boron 1.0% + copper sulphate 1.0% + magnesium sulphate 1.0%.The maximum fruit width (6.50cm), fruit weight (240.46 g) and fruit volume (197.93ml) were recorded under T_8 (zinc sulphate 1.0% + boron 1.0%) while highest number of fruits per plant (98.00) with treatment T_{11} (zinc sulphate 1.0% + boron 1.0% + copper sulphate 1.0% + magnesium sulphate 1.0%).The maximum yield per tree (19.75 kg) and yield per hectare (219.43 q/ha) were recorded in T_{11} treatment (zinc sulphate 1.0% + boron 1.0% + copper sulphate 1.0% + magnesium sulphate 1.0%).

Keywords: Guava, Sardar, zinc sulphate, magnesium sulphate, boron, copper sulphate, micronutrients, foliar spray

Introduction
Guava (*Psidium guajava* L.) "Apple of the tropics" and also known as "Poor man's apple" is an important fruit crop of country, not because of large area and production but due to its wider soil-climatic adaptability, hardy to various biotic and abiotic stresses, early maturing and profuse bearing habit, quality fruit with high nutritive value, medicinal properties, consumed both as fresh fruit and post processing in different value added products and considered as multiuse tree due to its usefulness as a fruit, fuel, fodder, timber and it is highly profitable crop.

Guava is one of the fourth most important fruit crop in India after Mango, Banana and Citrus (Ray, 2002) [9]. It is native of tropical America and become a commercially important fruit crop in a several countries.

The required supply of micronutrients not only increases the productivity but there is improvement in the quality of the produce. The application of nutrients through the foliar means is effective nutrient management. The required nutrients can be easily supplied as and when they are needed. This is an effective method for correcting the micronutrients deficiencies. It has been reported that the guava plant can readily absorb mineral nutrients spray or painted on the foliage. Spraying method using the correct strength have been great merit of simplicity and requires about 1 or 2 weeks to produce clear effects.

Foliar application experiments conducted in India showed that guava has given good response to foliar application of different micronutrients. Use of different single and mixed micronutrients like, zinc sulphate, copper sulphate, magnesium sulphate, boron applied through foliar means was found advantageous and the recommendations which have been given by different workers for various micronutrients appears to have intense effect on fruit quality through its influence on size, appearance, colour, soluble solids, sugar, acidity, pectin and vitamin contents. Foliar application of different micronutrients have rise in the growth, yield and quality parameters in guava (Balakrishnan, 2001 and Trivedi *et al.* 2012) [1, 14].

Micronutrients are trace elements required in less quantity but play a vital role in growth, development, yield and quality. The micronutrients are applied by soil and foliar application.

Presently farmers are also aware about use of micronutrients. Nowadays due to rise in demand for quality produce by the consumers the interest of fruit growers in production of high quality fruits is increasing. The information regarding foliar application of micronutrients is scarce for improving the growth, yield and quality of guava fruits under Maharashtra condition. The extension agencies and the farmers are also demand the application of micronutrients technology which will be helpful for quality guava fruit production.

2. Materials and Methods

The present investigation was conducted at experimental farm, College of Agriculture, Golegoan Tq. Aundha (Nagnath), Dist. Hingoli under Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani during 2020-2021. The treatments comprised of T_1: Control treatment, T_2: zinc sulphate 1.0%, T_3: copper sulphate 1.0%, T_4: boron 1.0%, T_5: magnesium sulphate 1.0%, T_6: zinc sulphate 1.0% + magnesium sulphate 1.0%, T_7: copper sulphate 1.0% + magnesium sulphate 1.0%, T_8: zinc sulphate 1.0% + boron 1.0%, T_9: copper sulphate 1.0% + boron 1.0%, $T_{10:}$ magnesium sulphate 1% + boron 1.0% and $T_{11:}$ zinc sulphate 1.0% + boron 1.0% + copper sulphate 1.0% + magnesium sulphate 1.0%. The experiment was laid out in Randomized Block Design with three replications.

All cultural operations were carried out as per recommendations and need of the crop. The selected variety i.e. Sardar having uniform growth and vigour were subjected to mrig bahar treatment by withholding the irrigation from April 20 to June 5, 2020. The spraying of different micronutrients as per treatments was done at marble size fruit stage and 15 days after first spray.

3. Results and Discussion

The result noted in the table 1 show that foliar application of micronutrients recorded significant difference.

3.1 Influence of foliar application of micronutrients on physical attributes of guava

Significantly maximum fruit length (6.76 cm) was recorded in the treatment T4 (boron 1.0%), which was statistically at par with the treatment T8 (6.66 cm) while minimum fruit length (4.56 cm) was recorded in control. It seems that foliar sprays of boron increased the length of fruit which might have brought beneficial influences on regulated the cell wall permeability, thereby allowing more mobilization of water. Similar findings were obtained by Shreekant *et al.* (2017) [11] in guava, Yadav *et al.* (2017) [5] in guava and Baranwal *et al.* (2017) [2] in guava.

The foliar application of zinc sulphate (1.0%) + boron (1.0%) i.e. T_8 was reported maximum fruit width (6.50 cm), which was statistically at par with treatments T_4 (6.39 cm), T_{10} (6.38 cm**)**, T_9 (6.28 cm) and T_{11} (6.26 cm). The minimum fruit width (4.54 cm) was recorded in T_1 i.e. control. In present investigation the foliar spray of micronutrients might be improving the internal physiology of developing fruits in relation to the better supply of water, nutrients and other compound important for their growth and development. Similar findings were observed by Shreekant *et al.* (2017) [11] in guava, Yadav *et al.* (2017) [5] in guava and Baranwal *et al.* (2017) [2] in guava.

Among the different micronutrients sprayed, maximum average fruit weight (210.46 g) was recorded in the treatment T_8 (zinc sulphate 1.0% + boron 1.0%) which was significantly superior over the rest of the treatments except the treatments T_4 (206.33 g) and T_{11} was (201.06 g). Significantly minimum average fruit weight (143.73 g) was recorded under control treatment. The highest fruit weight reported in treatment T8 might be due to accumulation of carbohydrates, dry matter in fruits and increase in cell division, cell elongation and sugar metabolism. This rise in average weight of fruit with foliar application of T_8 (zinc sulphate 1.0% + boron 1.0%) is in accordance with the findings of Bhatt *et al.* (2012) [3] in mango, Tanuja *et al.* (2016) [13] in pomegranate, Yadav *et al.* (2017) [5] in guava and Sachin *et al.*(2019) [10] in guava.

The data revealed that the treatment T_8 (zinc sulphate 1.0% + boron 1.0%) recorded significantly maximum fruit volume (197.93 ml) of guava, which was significantly at par with treatments T_4 (192.20 ml) and T_{11} (188.13 ml). The minimum fruit volume (131.26 ml) was observed in control (T_1) treatment. This may be due to boron and zinc have direct role in involvement of cell division, cell elongation and increased volume of intracellular space in mesocarpic cells. The results are in conformity with those reported by Bhatt *et al.* (2012) [3] in mango, Tanuja *et al.* (2016) [13] in pomegranate, Yadav *et al* (2017) [5] in guava and Sachin *et al*. (2019) [10] in guava.

The data indicated that the treatment T_{11} (zinc sulphate 1.0% + boron 1.0% + copper sulphate 1.0% + magnesium sulphate 1.0%) recorded maximum number of fruits (98.00) per tree of guava, which was significantly superior over control and rest of the treatments. The next best treatment was T_9 (93.46), which was statistically at par with the treatment T_8 (92.40). The minimum number of fruits per tree (67.66) of guava was observed under control (T_1) treatment. Similar findings were observed by Rajkumar *et al.* (2014) [8] in guava, Giriraj and Kacha (2014) [6] in guava, Gaur *et al.*, (2014) [5] in guava and Suman *et al.* (2016) [12] in guava.

Table 1: Influence of foliar application of micronutrients on physical and yield attributes of guava

Treatments	Fruit length (cm)	Fruit width (cm)	Average fruit weight (g)	Fruit volume (ml)	Number of fruits per tree	Yield per tree (kg)	Yield per hectare (q/ha)
T_1 water spray (Control)	4.56	4.54	143.73	131.26	67.66	9.72	108.08
T_2 zinc sulphate 1.0%	5.78	5.62	174.13	161.93	86.73	15.11	167.89
T_3 copper sulphate 1.0%	5.25	4.99	171.06	158.6	70.66	12.08	134.21
T_4 boron 1.0%	6.76	6.39	206.33	192.20	86.00	17.72	196.95
T_5 magnesium sulphate 1.0%	5.48	5.23	176.33	162.93	68.00	12.00	133.32
T_6 zinc sulphate 1.0% + magnesium sulphate 1.0%	5.37	5.14	166.60	152.46	68.20	11.37	126.33
T_7 copper sulphate 1.0% + magnesium sulphate 1.0%	5.37	5.25	167.13	153.33	89.13	14.95	166.12
T_8 zinc sulphate 1.0% + boron 1.0%	6.66	6.50	210.46	197.93	92.4	19.47	216.38
T_9 copper sulphate 1.0% + boron 1.0%	6.55	6.28	192.86	179.4	93.46	17.94	199.37
T_{10} magnesium sulphate 1.0% + boron 1.0%	6.48	6.38	191.73	177.06	75.2	14.41	160.10
T_{11} zinc sulphate 1.0% + boron 1.0% + copper	6.52	6.26	201.06	188.13	98.00	19.75	219.43

sulphate 1.0% + magnesium sulphate 1.0%							
SE (m) ±	0.12	0.15	5.25	5.79	0.55	0.51	5.77
C.D. at 5%	0.35	0.44	15.52	17.11	1.63	1.53	17.05

3.2 Influence of foliar application of micronutrients on yield attributes of guava

The data revealed that significantly highest yield per tree (19.75 kg) was recorded by foliar application of zinc suphate 1.0% + boron 1.0% + copper sulphate 1.0% + magnesium sulphate 1.0% (T11), as compared to control and was statistically at par with treatment T8 (19.47 kg), as compared to control and lowest yield per tree (9.72 kg) was observed in control. The growth in yield per tree was obviously due to promotion of starch formation which is followed by rapid transportation of carbohydrates in plants activated by micronutrients like boron which help in maximum fruit set percentage and fruit retention. Similar results were also found by Gurjar *et al*. (2015) [7] in mango and Sachin *et al*. (2019) [10] in guava.

The highest yield per hectare (219.43 q/ha) [which was (111.35 q) more as compared to control (T_1)] was recorded with the treatment T_{11} (zinc sulphate 1.0% + boron 1.0% + copper sulphate 1.0% + magnesium sulphate 1.0%) and it was statistically at par with T_8 (zinc sulphate 1.0% + boron 1.0%) which was (108.29 q) more as compared to control (T_1). Although, the lowest yield per hectare (108.08 q/ha) was observed in control (T_1) treatment. The results revealed that the fruit yield was increased due to combine application of zinc and boron. It was believed that boron brings about inactivation of superfluous growth hormone by formation of complex compound. These activities improve length and width of fruit which is ultimately increases the yield of the fruit. Similar results were also observed by Chander *et al.* (2017) [4] in guava and Sachin *et al*. (2019) [10] in guava.

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