



# The growth and yield characteristics of guava (*Psidium guajava* L.) cv. Gwalior 27 are affected by the addition of borax and zinc sulphate

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**Abstract**— In 2016–2017, a field study named "Effect of foliar application of borax and zinc sulphate on growth, yield, and quality of guava (*Psidium guajava* L.) cv. Gwalior-27" was conducted at Agrotechnology Park, Krishi Vigyan Kendra, College of Agriculture, Gwalior (M.P.). There were nine treatments in the trial, each with two amounts of zinc sulfate (0.4 and 0.6%) and borax (0.2 and 0.4%). Three replications and factorial randomized block design were used to set up the experiment. In terms of guava growth and yield characteristics, treatment B<sub>2</sub>Z<sub>2</sub> (Borax at 0.4% & Zinc sulfate at 0.6%) was found to be considerably better than the control across various foliar spray nutrient dosages.



**Keywords**— Intraction, borax, zinc sulphate, guava, *Psidium guajava*

## I. INTRODUCTION

One of the most common fruit plants grown in tropical, subtropical, and some dry regions of India is the guava (*Psidium guajava* L.), also known as the apple of the tropics. The fruit is a member of the Myrtaceae family. After banana, mango, citrus, and papaya, it is the fifth most significant fruit in terms of area. It is also the fifth most important fruit in terms of production. This fruit appears to have grown from Mexico to Peru after originating in tropical America.

It produces roughly 25 t/ha and is appropriate for table use. Uttar Pradesh, Maharashtra, Madhya Pradesh, Bihar, West Bengal, Punjab, and Gujarat are India's top guava-producing states. India, Hawaii, Mexico, Cuba, Sri Lanka, Venezuela, Brazil, Thailand, New Zealand, Philippines, Indonesia, Malaysia, Australia, Israel, Pakistan, Bangladesh, and other tropical and subtropical regions are already growing it. According to Bhatia *et al.* (2001),

India is the world's top producer of guava. Berries are a good source of pectin (0.5-1.8%) and vitamin C (210-305 mg/100 g), although they are low in calories (66 Cal/100 g). In addition to having a high tannin content (9–12%), guava leaves also contain 0.3% essential oil (including eugenol) and triterpenoids, which may contribute to their overall therapeutic effect (Chapman, 1964). The physical characteristics of guava fruit may have been enhanced by borax, which also plays a significant role in the metabolism of sugar and acts as a catalyst in the oxidation and reduction processes. This could have increased the yield per tree as suggested by our findings. The high level of auxin in the different regions of the fruit plant maintained by borax may be the reason for heavier fruits with more fruit weight after borax treatment. According to Abd-Allah (2006), borax enhances pollen grain germination, pollen tube elongation, fruit set percentage, and ultimately yield.

For plants, zinc (Zn) is a necessary micronutrient. Numerous enzymatic processes involve it. Zinc is essential for plant growth and development. Additionally, it controls how proteins and carbohydrates are metabolized (Trivedi, N., 2012). High pH soils restrict its availability to plants. It is well recognized that zinc plays a significant part in many different types of enzymes, either as a metal component or as a structural, functional, or regulatory element. One heavy non-metal micronutrient is boron. Plants absorb it as boric acid ( $H_3BO_3$ ). Boron is required for the transfer of sugar, plant reproduction, and pollen grain germination. Its function in active salt absorption and hormone transport has been noted. It plays a significant part in fruit quality as well. In addition to having a significant impact on root growth and cell elongation (pollen tube), boron also affects the construction of cell walls (Meena, 2008 and Rajput, 1986).

## II. METHOD MATERIALS

The current study, "Effect of foliar application of borax and zinc sulphate on growth, yield, and quality of guava (*Psidium guajava* L.) cv. Gwalior-27," was conducted in 2016–2017 at Agrotechnology Park, Krishi Vigyan Kendra, College of Agriculture, Gwalior (M.P.). Seven-year-old guava plants spaced six by six meters apart in a square planting method were used for the experiment. During the experimentation period, all of the plants were subjected to consistent cultural methods in order to evaluate the impacts of different treatments. Three replications of each treatment, each consisting of a single plant, were used in the randomized block design experiment.

Treatments	Details of the treatment
Control	Control (Water spray)
B <sub>1</sub>	Borax (0.2%)
B <sub>2</sub>	Borax (0.4%)
Z <sub>1</sub>	ZnSO <sub>4</sub> (0.4%)
Z <sub>2</sub>	ZnSO <sub>4</sub> (0.6%)
B <sub>1</sub> Z <sub>1</sub>	Borax (0.2%) + ZnSO <sub>4</sub> (0.4%)
B <sub>1</sub> Z <sub>2</sub>	Borax (0.2%) + ZnSO <sub>4</sub> (0.6%)
B <sub>2</sub> Z <sub>1</sub>	Borax (0.4%) + ZnSO <sub>4</sub> (0.4%)
B <sub>2</sub> Z <sub>2</sub>	Borax (0.4%) + Znso <sub>4</sub> (0.6%)

**Solution preparation:** The necessary amounts of zinc sulfate and boric acid were dissolved in the necessary amount of water to create the stock solution of various concentrations of zinc sulphate (neutralized with hydratedlime) and borax.

**Observations Recorded:** In accordance with normal methods, observations on a variety of plant characteristics,

such as growth and yield attributes of fruits of various treatments used, were calculated. As recommended by Panse and Sukhatme (1985), a factorial randomized block design was used to statistically examine the data gathered on various crop characteristics.

## III. RESULTS

The interaction effect of borax and ZnSO<sub>4</sub> significantly improved the vegetative parameters of the guava plant. The maximum tertiary shoot length (8.08 cm), were recorded under B<sub>2</sub>Z<sub>2</sub> (Borax @ 0.4% & ZnSo<sub>4</sub> @ 0.6%), followed by B<sub>1</sub>Z<sub>2</sub> (Borax @ 0.2% & ZnSo<sub>4</sub> @ 0.6%), whereas the minimum tertiary shoot length (3.70 cm) was recorded under control B<sub>0</sub>Z<sub>0</sub>. The maximum shoot diameter (0.38 cm) was recorded under B<sub>2</sub>Z<sub>2</sub> (Borax at 0.4% & ZnSO<sub>4</sub> at 0.6%), while the minimum shoot diameter (0.31 cm) was recorded under B<sub>2</sub>Z<sub>0</sub> (Borax at 0.4% & no ZnSO<sub>4</sub>). The mean maximum number of leaves per shoot (26.30) was recorded under B<sub>2</sub>Z<sub>2</sub> (Borax @ 0.4% & ZnSO<sub>4</sub> @ 0.6%), followed by B<sub>2</sub>Z<sub>1</sub> (Borax @ 0.4% & ZnSO<sub>4</sub> @ 0.4%), while the minimum number of leaves per shoot (15.65) was under the control (B<sub>0</sub>Z<sub>0</sub>). These findings are in line with earlier reports of Lal and Sen (2000) and Kumawat et al. (2012), who have shown that application of micronutrients alone or in combinations had a significant effect on plant height, plant spread, shoot length, and leaf area in guava plants. The foliar sprays of chemicals, viz., B and Zn, might have induced the synthesis of chlorophyll.

The combined sprays of borax and Zinc sulphate showed great improvement in yield-attributing characters of guava. The maximum number of fruit (322.5) was obtained under B<sub>2</sub>Z<sub>2</sub> (Borax at 0.4% & ZnSO<sub>4</sub> at 0.6%), while the minimum yield was obtained with control. similar result also found by Meena et al. (2005) and Shukla et al. (2011) The higher fruit weight (147.83 g), fruit yield per tree (48.71 kg) and fruit yield per hectare (135.29 q), polar diameter (7.33 cm), pulp weight (297.00 g) and minimum seed weight ( 1.69 g )were noted under B<sub>2</sub>Z<sub>2</sub> (Borax @ 0.4% & ZnSo<sub>4</sub>@ 0.6 %), The maximum radial diameter (6.83 cm) was recorded under the treatment B<sub>1</sub>Z<sub>2</sub> (Borax @ 0.2% & ZnSo<sub>4</sub>@ 0.6% ) and the maximum pulp weight ( 297.00 g) was recorded under the treatment B<sub>2</sub>Z<sub>1</sub> (Borax @ 0.4% & ZnSo<sub>4</sub>@ 0.4% ) , Whereas, the minimum number of fruit (289), fruit weight (128.67 g), fruit yield per tree (37.92 kg), fruit yield per hectare (105.31q), maximum seed weight (3.63 g ) and minimum pulp weight (150 g) noticed under control. Minimum polar diameter (5.51 cm) was recorded under the treatment B<sub>1</sub>Z<sub>0</sub> (borax at 0.2% & control). The minimum radial diameter (5.8 cm) was recorded under the treatment B<sub>0</sub> Z<sub>1</sub> (control

& ZnSO<sub>4</sub> at 0.4%). Trivedi *et al.* (2012) evaluated the quality of guava. effect of zinc (Zn) and boron (B) on the yield and fruit

Table 1: Interaction effect of Boron and Zinc sulphate on tertiary shoot length, shoot diameter, number of leaves, number of fruits per plant, fruit weight of guava.

B X Z	tertiary shoot length (cm)	shoot diameter (cm)	number of leaves	number of fruits per plant	fruit weight(g)
B <sub>1</sub> Z <sub>1</sub>	5.94	0.34	19.50	66.35	135.17
B <sub>1</sub> Z <sub>2</sub>	7.01	0.35	22.33	68.16	141.33
B <sub>2</sub> Z <sub>1</sub>	6.49	0.33	24.50	68.20	143.00
B <sub>2</sub> Z <sub>2</sub>	8.08	0.38	26.30	70.00	147.83
S.Em.±	0.058	0.009	0.202	1.635	3.255
CD at 5% level	NS	0.028	NS	NS	NS

Table 2: Intraction Effect of foliar spray of Borax and zinc sulphate on fruit yield per tree, yield per hectare, polar diameter, radial diameter, pulp weight and seed weight of guava

B X Z	fruit yield per tree (kg)	yield per hectare (q)	polar diameter (cm)	radial diameter (cm)	pulp weight (g)	seed weight (g)
B <sub>1</sub> Z <sub>1</sub>	42.03	116.73	6.30	6.12	172.00	2.01
B <sub>1</sub> Z <sub>2</sub>	45.90	127.43	6.36	6.83	171.00	1.92
B <sub>2</sub> Z <sub>1</sub>	46.18	128.24	6.43	6.69	297.00	1.75
B <sub>2</sub> Z <sub>2</sub>	48.71	135.29	7.33	6.27	240.00	1.69
S.Em.±	1.213	3.367	0.204	0.208	0.577	0.104
CD at 5% level	NS	NS	NS	NS	NS	NS

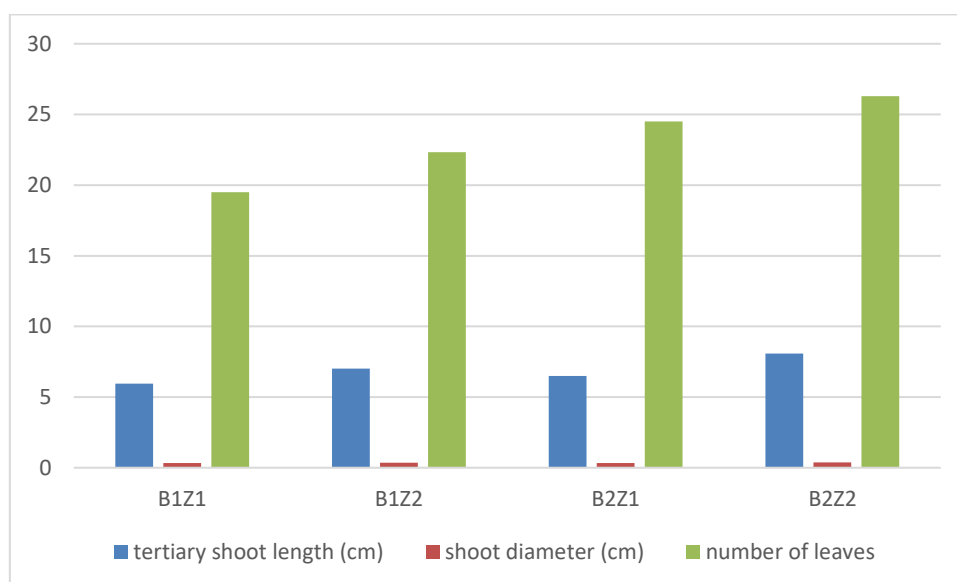


Fig a: Intraction Effect of foliar spray of Borax and zinc sulphate on tertiary shoot length (cm), shoot diameter (cm), and Number of leaves, of Guava.

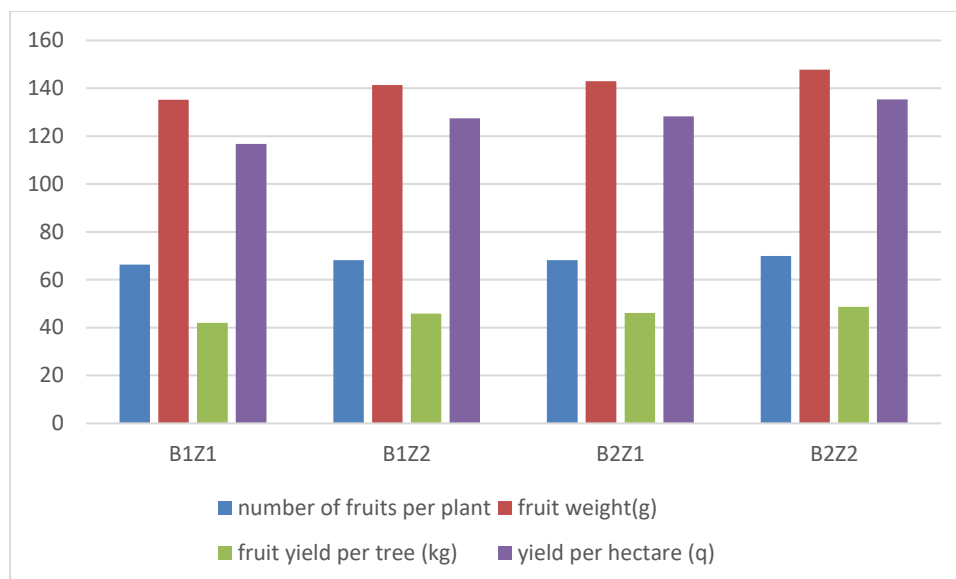


Fig. b: Interaction Effect of foliar spray of Borax and zinc sulphate on Number of fruits per plant, fruit weight (g), fruit yield per tree(kg), fruit yield per tree (kg) and yield per hectare (q) of Guava.

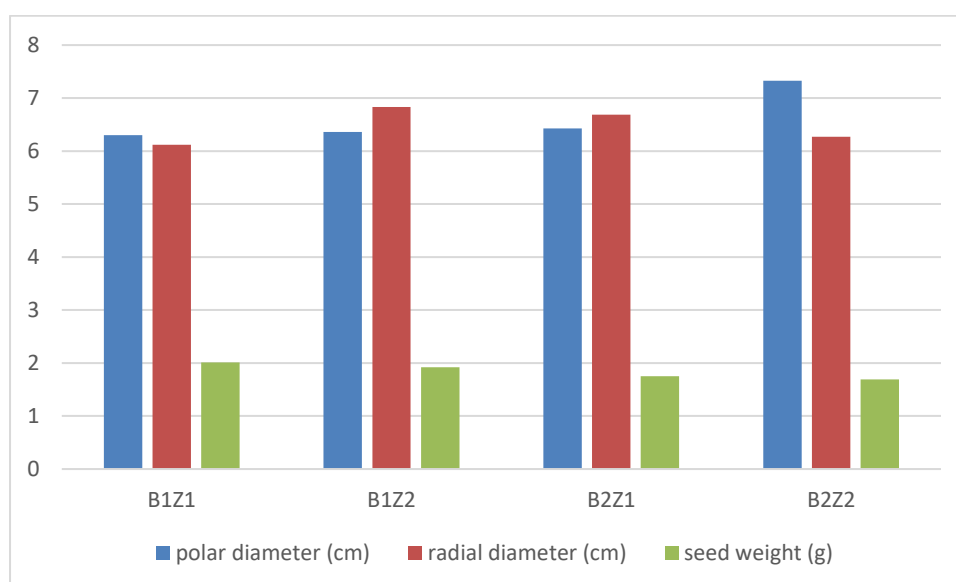


Fig. c: Interaction Effect of foliar spray of Borax and zinc sulphate on polar diameter (cm), radial diameter (cm) and seed weight (g) of Guava.

#### IV. CONCLUSIONS

According to the findings of the current study, "Effect of foliar application of Borax and Zinc sulphate on growth, yield, and quality of Guava (*Psidium guajava* L.) cv. Gwalior-27," foliar spraying borax and zinc sulphate together greatly improved fruit growth parameters and yield attributes. The treatment B<sub>2</sub>Z<sub>2</sub> (borax at 0.4% & zinc sulphate @ 0.6%) was shown to be the best for nearly all growth metrics and fruit yield features in the interaction impact of borax and zinc sulfate.

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