

Impact of Foliar Feeding of Borax, Zinc sulphate and their Intraction on Post harvest losses and economy of Guava (*Psidium guajava* L.) Cv. Gwalior 27

Abstract

A field experiment entitled “Effect of foliar application of borax and zinc sulphate on growth, yield and quality of guava (*Psidium guajava* L.) cv. Gwalior-27” was carried out at Agrotechnology Park, Krishi Vigyan Kendra, College of Agriculture, Gwalior (M.P.) during 2016-2017. The experiment was consisting of 9 treatments having two levels of each Borax (0.2 per cent and 0.4 per cent) and Zinc sulphate (0.4 and 0.6 per cent). The experiment was laid out in Factorial randomized block design with three replications. Among different doses of foliar spray of nutrients, Zinc sulphate @ 0.6 (T₅) were found significantly superior over control with respect physiological loss in weight (g) and shelf life of guava. While the minimum spoilage % was recorded with treatment B₂Z₂ (Borax@ 0.4% + ZnSO₄@ 0.6%) at 5th, 10th and 15th day of storage respectively.

Keywords: Zinc sulphate, Borax, Guava, Post harvest losses.

Introduction:

The most widespread but significant fruit crop in India is the guava. After mango, banana, and citrus, it ranked fourth in terms of acreage and output. It belongs to the *Psidium* genus, which has more than 150 species. Due to its hardiness and tolerance to a wider range of environments, *Psidium guajava* L. was more economically utilized. Even with little care, it is effectively cultivated in a variety of soil types and climatic environments. Attention must be paid to organised fruit production if we are to harvest field produce of higher quality. It is important to emphasise certain procedures and approaches for improving the fruit's post-harvest quality. It is believed that Mrigbahar is the best time to purchase high-quality guava fruits because fruit flies are no longer an issue. The guava tree blooms three times a year, in February, June-July, and October, in eastern and southern India. The corresponding bahars are known by the names "Ambe," "Mrig," and "Hasta" bahar. Among these three bahars, "Mrigbahar" fruits, which are better in quality, flavour, and vitamin C content, ripen in the winter, from November to January. Plants can get micronutrient applications by foliar and soil applications. Micronutrient application to the foliage is more efficient than application to the soil. According to Keram et al. (2014) [1], one of the eight required trace elements or micronutrients for agricultural plants' typical, healthy development and reproduction is zinc. However, there is little research on the use of micronutrients to increase fruit size and overall fruit quality in India and other countries.

In recent years, it has become increasingly clear how important micronutrients are to increasing the output and improving the quality of fruit harvests (Anonymous 2013) [2]. In light of this, a study was conducted to evaluate the potential effects of micronutrients on the guava fruit's development, yield, and sensory characteristics.

The need for micronutrients (zinc, boron, iron, copper, chloride, molybdenum, and manganese) is minimal and is only partially satisfied by soil, chemical fertilisers, and other sources. Intensified agricultural practises, uneven fertiliser applications, particularly NPK, restricted use of organic manures, nutrient depletion, and a lack of replenishment are the main causes of micronutrient deficiencies. According to Jeyakumar and Balamohan (2013) [3], boron, iron, and mo deficiencies are the most common deficiencies affecting horticultural crops. Additionally, these micronutrients aid in the absorption of significant nutrients and are actively involved in all aspects of plant metabolism, including respiration, photosynthesis, chlorophyll formation, enzyme activity, hormone synthesis, nitrogen fixation and reduction, among others (Das, 2003) [4]. However, micronutrients can significantly boost horticultural crop productivity, enhance product quality, and lengthen the life of horticulture food after harvest (Raja, 2009). [5]. By catalysing the effects of micronutrients, macronutrients are swiftly absorbed and used by plant tissue (Phillips, 2004)[6].

Method and material:

The 2016–2017 growing season was the focus 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." The current study was carried out at the Krishi Vigyan Kendra, College of Agriculture, Agrotechnology Park, Gwalior (M.P.). Guava variety "Gwalior 27" is 7 years old and was planted using a square planting scheme, 6 m apart. Throughout the trial period, all the plants were treated to the same cultural procedures in order to evaluate the impacts of various treatments. A unit of one plant was used in each of the three replications of each treatment in the experiment's Randomised Block Design layout. The treatments included two separate chemicals, namely Borax and Zinc Sulphate, in two different concentrations. Controlled amounts of ordinary distilled water were sprayed on the plants. By dissolving the necessary quantity of zinc sulphate and boric acid in the necessary quantity of water, the stock solution of various concentrations of zinc sulphate (neutralised with hydrated lime) and borax was created. Fruits were picked when their skins became a pale yellow. For various observations, randomly chosen branches from each treatment were tagged in all directions of the tree. Observations recorded to be physiological loss in weight, Shelf life of fruits and spoilage %. The data so obtained were analysed statically.

Table 1. List of treatments used for the study

Treatments	Details of the treatment
T₁ (B ₀ Z ₀)	Control (Water spray)
T₂ (B ₁)	Borax (0.2%)
T₃ (B ₂)	Borax (0.4%)
T₄ (Z ₁)	ZnSO ₄ (0.4%)
T₅ (Z ₂)	ZnSO ₄ (0.6%)
T₆ (B ₁ Z ₁)	Borax (0.2%) + ZnSO ₄ (0.4%)
T₇ (B ₁ Z ₂)	Borax (0.2%) + ZnSO ₄ (0.6%)
T₈ (B ₂ Z ₁)	Borax (0.4%) + ZnSO ₄ (0.4%)
T₉ (B ₂ Z ₂)	Borax (0.4%) + ZnSO ₄ (0.6%)

Result and Discussion:

The PLW% is presented in Table 2 and the minimum physiological loss in weight was recorded 4.90 per cent at 4 days with foliar application of Zinc sulphate @ 0.6 (T₅). The maximum physiological loss in weight was recorded 7.10 per cent at 4 days under control (T₁). The maximum shelf life of fruit recorded 5.2 days with foliar spray of Zinc sulphate @ 0.6% (T₅) significantly superior to other treatments followed by T₃ and T₇. The minimum fruit storage stability is recorded 2.00 days under control (T₁).

The minimum weight loss in the fruits produced by the application of these treatments could be attributed to slower rate of respiration and transpiration from these fruits with reduced enzymatic activities and slower the biochemical changes occurring in the fruits obtained from the trees receiving these treatments. Kumar et al. (2017) [7, 8, 9] reported that, reduction in weight loss of guava fruits with foliar application of borax. The minimum PLW and prolonged shelf life of was observed due to foliar application of zinc sulphate (Goswami et al. 2012) [8]

Table 2.: Effect of foliar application of Borax, Zinc sulphate and their interaction on Physiological loss in weight (%) and Shelf life of guava.

Treatment	Physiological loss in weight (%)	Shelf life of fruit
T ₁ -control	7.10	2.00
T ₂ -Borax (0.2%)	5.70	3.20
T ₃ -Borax(0.4%)	5.30	4.00
T ₄ -Zinc sulphate (0.4%)	5.10	3.50
T ₅ -Zinc sulphate(0.6%)	4.90	5.20
T ₆ -(Borax @0.2%+ZnSo4@0.4%)	6.00	3.00
T ₇ -(Borax @0.2%+ZnSo4@0.6%)	5.80	3.60
T ₈ -(Borax @0.4%+ZnSo4@0.4%)	5.60	3.40
T ₉ -(Borax @0.4%+ZnSo4@0.6%)	5.50	3.30

S.E_m±	0.077	0.120
CD at 5%	0.239	0.371

The data pertaining to effect of spray of Borax, Zinc sulphate and their interaction on the fruit spoilage percentage are given in table 3.

The minimum spoilage % were observed (3.68%) and (3.23%) on the 5th day of storage, (11.43%) and (11.12%) on the 10th day of storage, (20.96%) and (20.56%) on the 15th day storage were observed with treatments B₂(Borax @ 0.4%) and Z₂ (zinc sulphate @ 0.6%) respectively. however maximum decay per cent was recorded in the control.

The minimum spoilage %(4.11%), (11.11%)and (20.77%) was recorded with treatment B₂Z₂ (Borax@ 0.4% + ZnSo₄@ 0.6%) at 5th, 10th and 15th day of storage respectively, However, the maximum spoilage % (7.72%), (16.89%)and (28.44%) was recorded under control at 5th, 10th and 15th day of storage, respectively.

Table 3.: Effect of foliar application of Borax, Zinc sulphate and their intraction on fruit spoilage % of guava.

Treatments	Decay (%)		
	At 5 th day	At 10 th day	At 15 th day
Borax (H₃BO₃)			
B ₀	5.74	14.65	24.64
B ₁	4.92	12.37	22.46
B ₂	3.68	11.43	20.96
S.E _m ±	0.360	0.540	0.435
CD at 5%	1.04	1.52	1.23
ZnSO₄			
Z ₀	5.77	14.78	23.47
Z ₁	4.52	13.34	22.14
Z ₂	3.23	11.12	20.56
S.E _m ±	0.360	0.540	0.435
CD at 5%	1.04	1.52	1.23
B₀ Z₀	7.72	16.89	28.44
B₁ Z₁	5.33	12.68	24.34
B₁ Z₂	5.50	12.34	22.23
B₂ Z₁	4.44	13.23	22.33
B₂ Z₂	4.11	11.11	20.77
S.E _m ±	0.17	0.24	0.45
CD at 5%	0.55	0.62	1.25

A critical examination of data presented in the table 4revealed that various treatments of Borax and Zinc sulphate increased the net return and B:C ratio. Maximum net returns (Rs 2, 43,280/ ha) was recorded in B₂Z₂ (Borax @ 0.4% & ZnSo₄@ 0.6 %) and the minimum (Rs 192674/ ha) in

control. Whereas, minimum B: C ratio(1:8.00) was recorded with B₀Z₀ (Borax @ 0.2 % @ & no ZnSo₄), while maximum (1:9.97) was in B₂Z₂ (Borax @ 0.4% & ZnSo₄ @ 0.6 %). The net income and B:C ratio was calculated taking sale price of fruits @ 20/kg.

Table 4.: Economics of the different treatments (per ha.)

Treatments	Common expenditure/ (ha)	Treat. Cost (Rs)	Total Expenditure / ha	Gross Income/ ha	Net Income/ ha	B:C Ratio
T ₁	25000	0	25000.00	220200.00	192674.00	1:8.00
T ₂	25000	1500	26500.00	223600.00	197100.00	1:8.44
T ₃	25000	2155	27155.00	245000.00	217845.00	1:9.02
T ₄	25000	2526	25726.00	210600.00	185600.00	1:8.42
T ₅	25000	3830	28830.00	233400.00	204570.00	1:8.10
T ₆	25000	5621	30621.00	254800.00	224179.00	1:8.32
T ₇	25000	5100	30001.00	240600.00	210599.00	1:8.02
T ₈	25000	5801	28600.00	256400.00	227800.00	1:8.97
T ₉	25000	5675	27120.00	270400.00	243280.00	1:9.97

Conclusion:

The minimum physiological loss in weight and maximum shelf life of fruit recorded with foliar spray of Zinc sulphate @ 0.6% (T₅) significantly superior to other treatments. The minimum spoilage % were observed on the 5th day of storage, 10th day of storage, and the 15th day storage were observed with treatments B₂(Borax @ 0.4%) and Z₂ (zinc sulphate @ 0.6%) respectively. In the interaction effect of Borax and Zinc sulphate, the treatment B₂Z₂ (Borax @ 0.4% & Zinc sulphate @ 0.6 %) were found to be the best treatments for almost Maximum net returns and maximum B: C ratio.

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