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# Foliar Application of Different Combination of Boron and Zinc on Yield, Pulp and Seed Attributes of Winter Season Guava (*Psidium guajava* L.) cv L-49

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**Abstract** The investigation entitled Foliar application of different combinations of boron and zinc on yield, pulp and seed attributes of winter season guava (*Psidium guajava* L.) cv L-49 was carried out during the year 2012-2013. The experiment was conducted with different combinations of zinc and boron at 0.2 and 0.4% respectively, which was sprayed in guava plant cultivar Sardar (L-49). The main objective of the research was to study the effect of boron and zinc on the yield, pulp and seed attributes of guava fruits and to work out the economics of different treatments. The fruit yield (kg/tree), number of fruits per tree, pulp and seed attributes of fruits, pulp thickness, pulp weight , pulp percentage were recorded maximum with foliar spray of Borax 0.4% + Zinc sulfate 0.8%. Seed weight, seed percent and seed/pulp ratio was minimum in treatment $T_8$ (Borax 0.4% + Zinc sulfate 0.8%). Number of seeds per fruit was minimum in $T_6$ (Borax 0.2% + Zinc sulfate 0.8%). It is revealed from the data that highest yield was found with the treatment $T_8$ (Borax 0.4% + Zinc sulfate 0.8%). The foliar application of Borax 0.4% + $ZnSO_4$ 0.8% and it was economically viable treatment. Hence, treatment $T_8$ (Borax 0.4% + Zinc sulfate 0.8%) came out to the best treatment.

**Keywords** *Psidium guajava*, Zinc, Boron, Seed, Pulp.

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## Introduction

Guava (*Psidium guajava* L.), the apple of the tropics, is one of the most popular fruits grown in tropical, sub-tropical and some parts of arid regions of India. The foliar application of nutrients and growth regulators plays a vital role in improving the quality and comparatively more effective for rapid recovery of plants. The foliar feeding of fruit tree has gained much importance in recent years, as nutrients applied through soil are needed in higher quantity because some amount leaches down and some become unavailable to the plant due to complex soil reactions.

Zinc is the important constitute of several enzyme systems which regulate various metabolic reactions associated with water relation in the plant. Zinc is essential for auxin and protein synthesis, seed

production and proper maturity. It also increases fruit size as well as yield. Zinc is essential micronutrient for improving the vegetative growth of guava trees in terms of terminal shoots, shoot diameter and number of leaves per shoot. Boron is a constituent of cell membrane and essential for cell division and sugar translocation. It acts as a regulator of $K^+/Ca^{2+}$ ratio in the plant and helps in nitrogen absorption and translocation of sugar in plant. Hence, application of boron on the guava plant enhances the yield and quality of fruits, therefore, keeping the above facts in view, the present experiment was carried out.

## Materials and Methods

### Selection of variety

Guava variety L-49 also known as Sardar guava was selected for the present study. This variety was evolved through selection from open pollinated seedlings of Allahabad Safedaat Poona in 1927.

### Experimental details

The experiment was laid out in randomized block design with three replications with a unit of one plant in each replication of a treatment.

| Treatments | Details of the treatment |
|---|---|
| $T_0$ | Control |
| $T_1$ | Zinc sulfate 0.4% |
| $T_2$ | Zinc sulfate 0.8% |
| $T_3$ | Borax 0.2% |
| $T_4$ | Borax 0.4% |
| $T_5$ | Borax 0.2% + Zinc sulfate 0.4% |
| $T_6$ | Borax 0.2% + Zinc sulfate 0.8% |
| $T_7$ | Borax 0.4% + Zinc sulfate 0.4% |
| $T_8$ | Borax 0.4% + Zinc sulfate 0.8% |

### Preparation and method of application of nutrient solution

The requirement of spray liquid for spraying a tree was assessed to be two liters. The quantity of boron at the rate of 1 g/L was used to make the solution concentration of 0.1%. Similarly, Zinc sulfate at the rate of 4 g/L and 8 g/L make a solution of 0.4% and 0.8% respectively.

### Observations recorded

The observations were recorded on fruit yield (kg/tree), number of fruits per tree and on pulp and seed attributes of fruits such as pulp thickness (cm), pulp weight (g), pulp percent, number of seeds per fruit, seed weight (g), seed percent, seed/pulp ratio.

### Statistical analysis

The statistical analysis of the data obtained in the different set of experiment was calculated as suggested by Panse and Sukhatme [1].

## Results and Discussion

### Yield characters

It is evident from the data presented in Table 1 that different treatments had significant effect on yield per tree. The maximum fruit yield (57.84 kg per tree and 241.84 fruits per tree) was achieved by foliar spray of Borax 0.4% + $ZnSO_4$ 0.8% folowed by T (Borax 0.4% + $ZnSO_4$ 0.4%) and $T_6$ (Borax 0.2% + Zinc sulfate 0.8%). These results are in conformity with the findingsby earlier reporters [2—7]. The results revealed that the combination of boron and zinc produced an additive effect on the yield. Increased fruit yield was obtained due to combined application of higher concentration of both the nutrients (Zn and B). It is believed that boron brings about inactivation of superfluous growth hormone by formation of complex compound. The importance of this element in improving the physiological activities of plant is well established but it is not clear whether it influences directly or indirectly.

### Pulp and seed attributes of fruit

The results obtained in present investigation revealed from Table 1 that various paramenters, i.e. pulp thickness, pulp weight, pulp percent , number of seeds per fruit, seed weight seed percentage and seed pulp ratio were significantly affected by application of

**Table 1.** Effect of different levels of boron and zinc on yield, pulp and seed attributes of winter season guava cv L-49.

| Treat-ments | Yield per tree (kg) | No. of fruits per tree | Pulp thickness (cm) | Pulp weight (g) | Pulp percent | No. of seeds per fruit | Seed weight (g) | Seed percent | Seed/ pulp ratio |
|---|---|---|---|---|---|---|---|---|---|
| $T_0$ | 26.60 | 172.00 | 1.30 | 150.81 | 97.63 | 310.02 | 3.65 | 2.360 | 0.024 |
| $T_1$ | 29.83 | 183.50 | 1.47 | 160.45 | 98.63 | 239.39 | 2.22 | 1.363 | 0.013 |
| $T_2$ | 34.09 | 196.83 | 1.53 | 171.39 | 98.88 | 234.32 | 1.94 | 1.110 | 0.011 |
| $T_3$ | 35.46 | 191.17 | 1.50 | 183.38 | 98.94 | 291.68 | 1.95 | 1.050 | 0.010 |
| $T_4$ | 42.14 | 204.33 | 1.60 | 204.54 | 99.14 | 295.43 | 1.76 | 0.850 | 0.008 |
| $T_5$ | 41.24 | 214.71 | 1.52 | 190.27 | 99.01 | 233.41 | 1.90 | 0.980 | 0.009 |
| $T_6$ | 47.59 | 221.81 | 1.55 | 212.60 | 99.12 | 230.16 | 1.87 | 0.870 | 0.008 |
| $T_7$ | 52.74 | 230.11 | 1.63 | 227.59 | 99.24 | 235.84 | 1.74 | 0.750 | 0.007 |
| $T_8$ | 57.84 | 241.84 | 1.67 | 237.48 | 99.28 | 232.11 | 1.70 | 0.710 | 0.007 |
| SEm± | 0.76 | 3.47 | 0.04 | 3.90 | 0.06 | 3.80 | 0.03 | 0.043 | 0.0008 |
| CD at 5% | 2.28 | 10.40 | 0.12 | 11.71 | 0.20 | 11.40 | 0.09 | 0.131 | 0.0025 |

different chemicals. Pulp weight was significantly increased with different treatments.

Increase in pulp weight may be attributed to the strengthening of middle lamella and consequently cell wall, which later may have increased the free passage of solutes to the fruits. Zinc is essential for auxin and protein synthesis, seed production and proper maturity of fruits, while boron has a key role in cell division and elongation and there by increases pulp weight. The higher pulp weight due to combined application of higher concentrations of zinc and boron may be attributed to their stimulatory effect on plant metabolism.

The maximum pulp thickness (1.67 cm), pulp weight (237.48 g), pulp percent (99.28%) and minimum seed pulp ratio (0.007) were recorded with foliar spray of Borax 0.4% + $ZnSO_4$ 0.8% followed by $T_7$ (Borax 0.4% + $ZnSO_4$ 0.4%). These results are in accordance with the findings of Singh et al. [2]. Increased vegetative growth due to residual effects of higher concentration of auxins in plant which resulted in high leaf to fruit ratio there by contribution accumulation of higher amount of photosynthates which increased finally pulp weight, pulp thickness, pulp percentage and minimized seed : pulp ratio.

The reduced number of seeds (230.16) and seed weight (1.70 g) were reported $ZnSO_4$ 0.8% + Borax 0.2% and $ZnSO_4$ 0.8% + Borax 0.4%respectively. Minimum number of seeds per fruit was recorded with $T_8$ (Borax 0.4% + $ZnSO_4$ 0.8%) . The reduced number of seeds is recorded with higher concentra-

**Table 2.** Effect of different levels of boron and zinc on economics of winter season guava cv L-49.

| Treat-ments | | Treatment cost (Rs) | Total expenditure (Rs) | Gross income (Rs) | Net income (Rs) | Cost : benefit ratio |
|---|---|---|---|---|---|---|
| $T_0$ | -Control | 0.0 | 34500.0 | 162293.51 | 127793.51 | 1 : 3.70 |
| $T_1$ | -Zinc sulfate @ 0.4% | 2757.46 | 37257.46 | 182000.58 | 144743.12 | 1 : 3.88 |
| $T_2$ | -Zinc sulfate @ 0.8% | 2815.18 | 37315.18 | 207991.95 | 170676.77 | 1 : 4.57 |
| $T_3$ | -Borax @ 0.2% | 2737.4 | 37237.4 | 216350.67 | 179113.27 | 1 : 4.81 |
| $T_4$ | -Borax @ 0.4% | 2774.8 | 37274.8 | 257107.09 | 219832.29 | 1 : 5.89 |
| $T_5$ | -Borax @ 0.2% + Zinc sulfate @ 0.4% | 2794.86 | 37294.86 | 251615.96 | 214321.1 | 1 : 5.74 |
| $T_6$ | -Borax @ 0.2% + Zinc sulfate @ 0.8% | 2852.58 | 37352.58 | 290358.96 | 253006.38 | 1 : 6.77 |
| $T_7$ | -Borax @ 0.4% + Zinc sulfate @ 0.4% | 2832.26 | 37332.26 | 321780.45 | 284448.19 | 1 : 7.61 |
| $T_8$ | -Borax @ 0.4% + Zinc sulfate @ 0.8% | 2889.98 | 37389.98 | 352896.87 | 315506.89 | 1 : 8.43 |

tion of micronutrients and their combinations might be due to their dominating role in accumulation of more flesh in the fruit.

From the above study, it can be concluded that treatment $T_8$ (Borax 0.4% + $ZnSO_4$ 0.8%) was most effective treatment in enhancement of yield and pulp and seed attributes of guava cv L-49.

Economics of cultivation

A critical examination of data presented in Table 2 reveals that boron and zinc increased the net returns and B : C ratio. The maximum B : C ratio (8.43 : 1) was also recorded with $T_8$ (Borax 0.4% + Zinc sulfate 0.8%). On the basis of economic analysis , Borax 0.4% + Zinc sulfate 0.8% was found to be economically viable treatment.

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