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Research Note :

EFFECT OF FOLIAR APPLICATION OF ZINC AND BORON ON YIELD AND FRUIT QUALITY OF GUAVA (*Psidium guajava* L.)

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Guava (*Psidium guajava* L.) is one of the most important subtropical fruit crop. It is also called "The apple of tropics". It belongs to the natural order Myrtal and the botanical family Myrtaceae. Guava is a rich source of ascorbic acid and pectin, which ranges from 75 to 260 mg/100 g and pectin ranges between 0.5% to 1.8%, respectively. (Adsule and Kadam, 1). Besides, it is fair source of Vitamin A and contains appreciable quantities of thiamine, riboflavin and niacin. Guava fruit is also utilized to make products like Jelly, Jam, Cheese, Ice-cream and Toffee. Two types of wines-guava juice wine and guava pulp wine are also prepared from guava fruit.

Zinc is the important constituent of several enzymes which regulate various metabolic reaction in the plant, associated water uptake to water relation in the plant. The deficiency symptoms appear in younger leaves starting with interveinal chlorosis leading to a reduction in shoot growth and the shorting of internodes. Zinc is essential for auxin and protein synthesis, seed production and proper maturity. It also increases the fruit size as well as yield. Boron is a constituent of cell membrane and essential for cell division. Acts as a regulator of potassium/calcium ratio in the plant, helps in nitrogen absorption and translocation of sugar in plant. Boron increases nitrogen availability to the plant.

It is therefore, essential to evaluate the effect of zinc and boron and their combination on yield and fruit quality for their commercial application.

The investigation was conducted during 2011-2012 at the experimental orchard of Department of Horticulture, Allahabad School of Agriculture, Sam Higginbottom Institute of Agriculture Technology and Sciences, Allahabad (U.P.). The soil of experimental orchard was sandy loam and site comes under sub-tropical zone. Average rainfall is above 900 mm. Nine treatments viz., T_0 – Control (tap water), T_1 – 0.5 per cent Boric Acid, T_2 – 0.6 per cent Boric Acid, T_3 - 0.5 per cent Zinc Sulphate, T_4 - 0.5 per cent Zinc Sulphate + 0.5 per cent Boric Acid, T_5 - 0.5 per cent Zinc Sulphate + 0.6 per cent Boric Acid, T_6 - 0.6 per cent Zinc Sulphate, T_7 - 0.6 per cent Zinc Sulphate + 0.5 per cent Boric Acid and T_8 - 0.6 per cent Zinc Sulphate + 0.6 per cent Boric Acid were applied on 15th July and 10th September, 2011.

The experiment was laid out in 3x3 Factorial in Randomized Block Design with three replications. Observations were recorded on yield and physico-chemical characters.

Fruit weight was significantly increased by the application of different treatments of micronutrients (Table 1). Maximum fruit weight (162.01 g) was observed with 0.6% zinc sulphate + 0.5% boric acid followed by T_8 (0.6% zinc sulphate + 0.6% boric acid) with 154.11g. Minimum fruit weight (85.55 g) was found in control. The higher fruit weight due to combined application of zinc and boron may be attributed to their stimulatory effect on plant metabolism. These results are in conformity with the results reported by El-Sherif *et. al.* (3), Das *et al.* (2), Singh *et al.* (7) and Rawat *et al*. (6).

The highest polar diameter (7.91 cm) was found in T_7 (0.6% zinc sulphate + 0.5% boric acid) and followed by T_8 with 7.14 cm. The minimum

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diameter (5.15 cm) was recorded in control. The radial diameter was significantly increased by the application of different treatments of zinc and boron. Maximum radial diameter (7.52 cm) was observed with T_7 followed by T_8 with 6.78 cm. The minimum diameter (4.62 cm) was found in control. The higher radial diameter of fruit due to combined application of zinc and boron may be attributed to their stimulatory effect of plant metabolism. (Das *et al.,* 2; Singh *et al.*, 7 and Rawat *et al.,* 6).

The treatment T_7 (0.6% zinc sulphate + 0.5% boric acid) have maximum yield (46.41 kg/plant) and followed by 0.6% zinc sulphate + 0.6% boric acid with 43.42 kg/plant and T_5 with 42.39 kg/plant, respectively. The minimum yield (23.71 kg/plant) was found in control. These results are more or less in conformity with the findings reported by Kundu and Mitra (5), El-Sherif *et al.* (3), Singh *et al.* (7) and Rawat *et al.* (6).

The maximum specific gravity (1.024 g/cc) was found in 0.6% zinc sulphate + 0.5% boric acid followed by T_8 with 1.012 g/cc. The minimum specific gravity (0.892 g/cc) was found in control.

Total soluble solids (TSS) was found maximum (15.40%) in T_7 followed by T_8 (0.6% zinc sulphate + 0.6% boric acid) with 13.61%. The minimum TSS (9.62%) was found in T_0. The higher total soluble solids might be due to the efficient translocation of photosynthates to the fruit by regulation of boron. The results are similar to the findings of Rawat *et al*. (6).

The treatment T_7 and T_8 have highest acidity (0.550%) followed by T_5 (0.5% zinc sulphate + 0.6% boric acid) with 0.546%. The control had minimum acidity (0.378%). Acidity percentage of guava fruit might have been augmented due to higher synthesis of nucleic acids, on account of maximum availability of plant metabolism. El-Sherif *et al.* (3) have also reported similar results.

The maximum ascorbic acid was recorded in T_7 with 221.51 mg/100 g fruit pulp followed by T_8 with 205.68 mg/100 g fruit pulp and T_5 (0.5% zinc sulphate + 0.6% boric acid) with 187.78 mg/100 g fruit pulp, respectively. The minimum ascorbic acid (123.01 mg/100 g fruit pulp) was in control. Augmentation of ascorbic acid percentage of guava fruit might have been due to higher synthesis of nucleic acid, on account of maximum availability of plant metabolism. El-Sherif *et al.* (3), Jaiprakash *et al.* (4) and Singh *et al.* (9) have also reported similar results.

The highest total sugar (8.66%) in T_7 (0.6% zinc sulphate + 0.5% boric acid) was followed by T_8 (0.6% zinc sulphate + 0.6% boric acid) with 8.29%. The minimum sugar found (5.81%) in T_0. The treatment T_5 (0.5% zinc sulphate + 0.6% boric acid) have higher reducing sugar (5.02%) was followed by T_7 (0.6% zinc sulphate + 0.5% boric acid) with 4.90%. Minimum reducing sugar was found in control with 2.99%. The maximum non-reducing sugar (3.76%) was found in T_7 was followed by T_8 with 3.47% and minimum non-reducing sugar (2.71%) was found in T_2 (0.0% zinc sulphate + 0.6% boric acid). The higher percentage of total sugar, reducing sugar and non–reducing sugar might be due to efficient translocation photosynthates to the fruits by regulation of boric acid. These results are in conformity with the findings of Singh and Brahmachari (8), Das *et al.* (2) and El-Sherif *et al*. (5). The highest sugar-acid ratio was found in T_7 (0.6% zinc sulphate + 0.5% boric acid) with 15.76 followed by T_4 (0.5% zinc sulphate + 0.5% boric acid) with 15.48. Minimum ratio was recorded in T_5 (0.5% zinc sulphate + 0.6% boric acid) with 14.41.

CONCLUSION

From the present investigation it may be concluded that the combined foliar application of zinc sulphate @ 0.6 per cent and boric acid @ 0.5 per cent before fruit set and after fruit set resulted in higher yield (46.41 kg/tree), fruit weight (162.01 g), radial diameter (7.52 cm), polar diameter (7.91 cm), specific gravity (1.024 g/cc), TSS (15.40%), acidity (0.550%), ascorbic acid (221.51 mg/100 g fruit pulp), total sugar (8.66%), non-reducing sugar (3.76%) and sugar-acid ratio (15.76).

Table 1: Effect of foliar application of Zinc and Boron on different parameters of guava.

Treatment	Fruit weight (g)	Polar diameter (cm)	Radial diameter (cm)	Yield (kg/ plant)	Specific gravity (g/cc)	TSS (%)	Acidity (%)	Ascorbic acid (mg /100g pulp)	Total sugar (%)	Reducing sugar (%)	Non-reducing sugar (%)	Sugar-acid ratio
T_0	85.55	5.15	4.62	23.71	0.892	9.62	0.378	123.01	5.81	2.99	2.82	15.38
T_1	91.37	5.31	5.22	27.23	0.914	10.58	0.439	134.55	6.42	3.53	2.89	14.62
T_2	92.40	5.60	5.42	29.77	0.928	11.25	0.452	140.43	6.81	4.10	2.71	15.07
T_3	101.46	5.98	5.49	35.49	0.940	11.53	0.460	163.59	7.12	4.25	2.87	15.46
T_4	115.55	6.04	5.51	38.56	0.965	11.79	0.476	176.92	7.37	4.47	2.90	15.48
T_5	126.53	6.87	6.50	42.39	0.975	12.79	0.546	187.78	7.87	5.02	2.86	14.41
T_6	121.69	6.24	5.73	40.48	0.970	12.11	0.526	184.42	7.66	4.79	2.87	14.55
T_7	162.01	7.91	7.52	46.41	1.024	15.40	0.550	221.51	8.66	4.90	3.76	15.76
T_8	154.11	7.14	6.78	43.42	1.012	13.61	0.550	205.68	8.29	4.82	3.47	15.07
C.D. (P=0.05)	1.15	0.05	0.05	1.77	0.008	0.26	0.006	1.92	0.08	0.07	0.09	0.26

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