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Effect of foliar spray of zinc and boron on plant growth, yield and quality of guava (*Psidium guajava* L.) cv. Allahabad safeda under high density planting in Prayagraj region

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Abstract
An experiment was conducted at the central research farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture Technology and Science, Prayagraj during (July-December 2019). A high analysis of variance revealed significant differences among trail studies, suggesting sufficient variability for growth, yield and quality of guava. The results revealed that maximum plant height (295.17 cm), number of branches (8.20), no of leaf per shoot (26.38), no of fruits per plant (194.33), fruits weight (226.10g), fruits yield per plant (49.78 kg/tree), acidity (0.40%), ascorbic acid (192.80 mg/100g), total soluble solid (12.63 0Brix), and sugar (8.15%) were recorded in T_9 ($ZnSO_4$ @ 0.6 % & Boric acid @ 0.5 %) followed by T_8 ($ZnSO_4$ @ 0.6 % & Boric acid@ 0.3 %). The least values were recorded in the control. The present study indicated that combined application of micronutrients enhanced fruit set, minimized fruit drop and overall yield. This has resulted in improved sensory characters in the guava fruit.

Keywords: guava, zinc sulphate, borax, growth, fruit quality

Introduction
Guava (*Psidium guajava* L.) is the member of myrtaceae family and it is one of the most common fruit in India. It claims to be the fourth most important fruit in area and production after mango, banana and citrus. The guava is considered is one of the most delicious fruit and in India it occupies an area of 265 thousand ha, production 4051.3 MT& productivity 15.3 MT/ha. Utter Pradesh is one of the major guava producing states in India with Area of 49.53 thousand ha, total production 928.44 MT and productivity 18.75 MT/ha (Horticulture at a glance- 2018) [2]. Guava has earned the popularity as "Poor man's apple" available in plenty to every person at very low price during the season. It is no inferior to apple for its nutritive values. It is pleasantly sweet and refreshingly acidic in flavour and emits sweet aroma. It is wholly edible along with the skin. Several delicious preserved products like Jam, Jelly, Cheese, Puree, Ice cream, canned fruit and Sharbat are prepared from ripped fruits of guava. Guava juice wine and guava pulp wine are also prepared from guava fruits. The seeds yield 3 to 13% oil, which is rich in essential fatty acid and can be used as salad dressing. In some countries the leaves are used for curing diarrheas and also for dyeing and tanning. Foliar feeding of nutrients to fruit plants has gained much importance in recent years which is quite economical and obviously an ideal way of evading the problems of nutrients availability and supplementing the fertilizers to the soil. Nutrients like nitrogen, phosphorus and potash play a vital role in promoting the plant vigour and productivity, whereas micronutrients like zinc, boron, copper and molybdenum perform a specific role in the growth and development of plant, quality produce and uptake of major nutrients. Keeping in view the importance of application of micronutrients for improving fruit quality.

Materials and Methods
The experimental site is situated at of latitude of 25º 85' north and longitude of 81º 15" East and at an altitude of 78 meters above mean sea level (MSL). The maximum temperature of the location reaches up to 45 ºC and seldom falls as low as 3 ºC. The relative humidity ranged between 20 to 94 percent. The average rainfall in this area is around 850 mm annually. The soil of experimental area had sand 42%, Silt 38%, Clay 20%, pH 7.8 and organic carbon 0.46%. The foliar application of these treatments as per the plan was made at 35 and 70 days after flowering. Physical Parameters of fruits like volume of fruit, specific gravity, fruit length, diameter and pulp thickness etc, were calculated. Chemical parameters of fruit like acidity,

TSS, TSS/ acid ratio, sugar per cent etc were also calculate.

Table 1: Details of different composition of micronutrient

Sl. No.	Notation	Treatment Details
1	T_0	control
2	T_1	0.4% Zinc sulphate
3	T_2	0.6% Zinc sulphate
4	T_3	0.3% Borax
5	T_4	0.5% Borax
6	T_5	0.4% Zinc sulphate + 0.3% Borax
7	T_6	0.4% Zinc sulphate + 0.5 % Borax
8	T_7	0.6% Zinc sulphate + 0.3% Borax
9	T_8	0.6% Zinc sulphate + 0.5% Borax

Result and Discussion

Table-2 and Fig-1 show the yield and yield attributing characters *viz*., was significantly influenced by zinc and boron. Maximum plant height (295.17 cm), number of branches (8.2), number of leaves per shoot (26.38), and minimum fruit drop (74.33), similar result also found by Bhardwaj *et al.* (2019) [2] maximum number of fruit per plant (194.33), were recorded by the application of the treatment T_8 similar result also found by Abdollahi *et al.* (2010) [1] followed by treatments comprising of T_7. Kumar *et al.* (2010) [4] where plant height (283.0 cm), number of branches (7.6), number of leaves per shoot (24.82), minimum fruit drop (40.42), maximum number of fruit per plant (182.67), then minimum days for 50% flower appearance (39) was recorded by the application of the treatment T_8 followed by treatments comprising of T_2 similar result also found by Meena *et al.* (2005) [5], and Shukla *et al.* (2011) [6]. The maximum fruit weight (226.10 g) similar result also found by Trivedi *et al.* (2012) [8], fruit yield per plant (49.78 kg/tree) similar result also found by Singh *et al.* (2004) [7], polar diameter of fruit (7.18), specific gravity (1.04 g/cc), total acidity % (0.40%) similar result also found by Singh *et al.* (1989), ascorbic acid (192.80 mg/ 100 g) similar result also found by El-sherif *et al.* (2000), and total soluble solid (12.63%) were recorded by the application of the treatment T_8 followed by treatments comprising of T_7 fruit weight (220.35 g), fruit yield per plant (48.46 kg/tree), polar diameter of fruit (7.03), specific gravity (1.02 g/cc), total acidity % (0.34%), ascorbic acid (189.39 mg/ 100 g), and total soluble solid (12.12%).

Table 2: Effect of foliar spray of zinc and boron on plant growth of guava under high density planting

Notations	Plant height	Number of branches per tree	Number of leafs per shoot	Time taken 50% flowering	Fruit drop	Number of fruit / plant	Fruit weight (g)	Fruit yield (kg/tree)	Polar diameter of fruit (cm)	Specific gravity (g/cc)	Acidity (%)	Total soluble solid (%)	Ascorbic acid
T_0 (Control)	257.07	6.4	16.18	47.00	56.38	142.67	150.82	25.50	5.70	0.94	0.40	9.27	140.42
T_1 (0.4% Zinc Sulphate)	280.83	7.4	17.36	42.67	45.81	166.33	178.15	38.85	6.30	1.01	0.28	11.56	167.44
T_2 (0.6% Zinc Sulphate)	278.67	7.47	18.99	40.33	43.82	176.33	204.98	43.04	7.03	1.00	0.28	12.0	181.58
T_3 (0.3% Borax)	279.09	7.13	20.55	43.33	46.05	154.67	190.01	32.50	5.97	0.99	0.33	10.65	161.94
T_4 (0.5% Borax)	273.23	7.5	22.51	41.33	44.49	163.00	196.76	40.81	6.73	1.00	0.27	11.58	177.75
T_5 (0.4% Zinc Sulphate + 0.3% Borax)	271.8	7.5	22.85	43.67	43.97	172.0	202.27	38.53	6.66	1.0	0.29	11.51	172.01
T_6 (0.4% Zinc Sulphate + 0.5 % Borax)	285.13	7.2	22.95	44.0	47.65	158.33	167.26	30.61	6.29	0.99	0.34	11.45	153.17
T_7 (0.6% Zinc Sulphate + 0.3% Borax)	283.00	7.6	24.82	41.00	40.42	182.67	220.35	48.46	6.97	1.02	0.23	12.12	189.39
T_8 (0.6% Zinc Sulphate + 0.5% Borax)	295.17	8.2	26.38	39.0	39.56	194.33	226.10	49.78	7.18	1.04	0.20	12.63	192.80
F-test	S	S	S	S	S	S	S	S	S	S	S	S	S
S. Ed(±)	2.88	0.10	0.77	1.03	1.31	3.17	3.17	1.74	0.14	0.01	0.02	0.45	2.23
C.D. at 5%	6.16	0.21	N/A	2.20	2.80	6.78	6.78	N/A	N/A	0.02	0.04	0.95	4.77

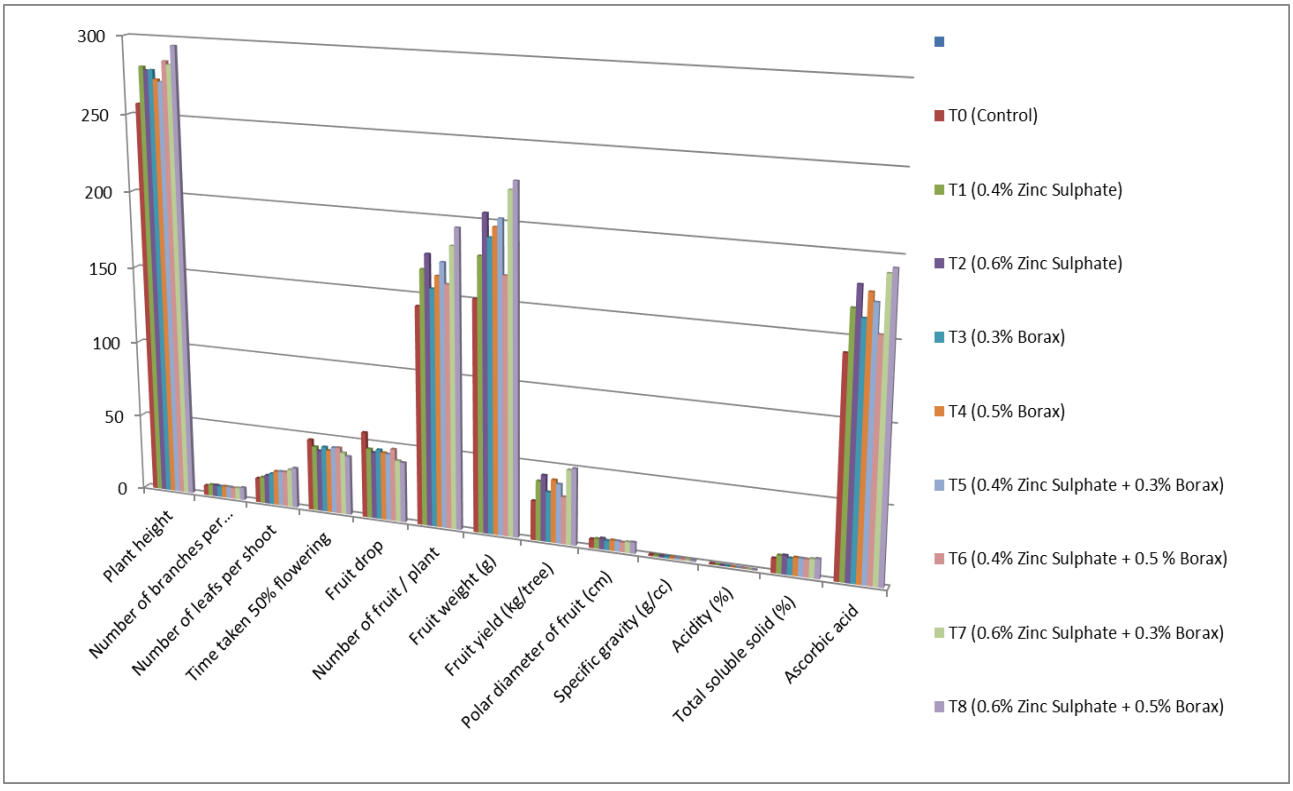

Fig 1: Effect of foliar spray of urea and zinc on yield and quality of guava under high density planting

Conclusion

On the basis of results obtained in the present investigation it is concluded that foliar spray of $ZnSO_4$ 0.6% + Boric acid 0.5% was found to be most beneficial treatment for maximum increase in plant height, number of leaves per shoot, number of branches per tree, fruit drop, fruit yield (kg per tree), number of fruits per tree, average weight of fruit, specific gravity, polar diameter of fruit and reduction in time taken for 50% flowering which ultimately increased the yield per tree. Various quality parameters like TSS, TSS/acid ratio were improved and fruit drop and acidity were reduced with the foliar application of $ZnSO_4$ 0.6% + Boric acid 0.5%.

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