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EFFECT OF FOLIAR SPRAY OF PLANT GROWTH REGULATORS AND MICRONUTRIENT ON GUAVA (*Psidium guajava* L.)

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ABSTRACT

A study was conducted to observe the effect of foliar spray of Plant growth regulators like GA_3, NAA and Ethephon along with boron and salicylic acid on guava variety Allahabad Safeda. Salicylic acid 150 ppm induced maximum increase in the shoot length, leaf area and number of leaves over the control. Minimum day for initiation of flowering (24.36) was taken by ethephon (140 ppm) spray followed by SA 300 ppm (25.35) and ethephon 70 ppm (25.66). Maximum number of fruits (3.18) per shoot and fruit set 74.20 per cent was noted in case of SA 150 ppm which was statistically comparable to NAA 30 ppm. However, minimum fruit set percentage i.e. 35.57 per cent, was recorded in control. GA_3 70 ppm increased the fruit length and ethephon 140 ppm increased the fruit breadth over the other treatments. A maximum yield of 12.32 kg per plant was recorded under treatment SA (150 ppm), followed by NAA 30 ppm (10.81 kg) and GA_3 70 ppm (9.37 kg) . Highest TSS value and Vitamin C was found under 30 ppm and boron 250 ppm, respectively. In economic analysis, highest B:C ratio (11.20) was recorded from the plant treated with SA 150 ppm.

Key words : *Guava, plant growth regulators, growth parameters, yield, economics.*

Guava is a native to tropical America. It was introduced in India in the seventeenth century. It is one of the most important commercial crop, highly productive, delicious and nutritious fruit. Guava (*Psidium guajava* L.) is a fruit of tropical as well as sub-tropical regions upto 1,500m above m.s.l. It has a wide adaptability to varied soil types and climatic conditions. It tolerates a wide range of pH from 4.5 to 8.5. The fruit is a good source of vitamin C, pectin, calcium and phosphorus. The fruit is used for the preparation of processed products like jams, jellies and nectar. Guava jelly puree is very popular for its attractive purplish- red colour, pleasant taste and aroma. The puree can be used in juice, cakes, puddings, sauces, ice-cream, jam and jelly. The fruits can be preserved by canning. In various fruit species including guava, pre- harvest flower and fruit drop is a major problem. This causes a total yield loss and consequently a great economic loss to the growers. In the present era of scientific advancement, growth regulators and mineral nutrients particularly micronutrients like boron have a very important role in improving the produce and benefitting the fruit growers. Application of micronutrients and plant growth substances stimulate the physiological processes and also help in expression of genetic ability under different environmental regimes by influencing the nutritional and hormonal status of the plant (Brian *et al.,* 1962; Klessing and Malamy, 1994). Boron is required for successful completion of plant life cycle (Warington, 1923). Its beneficial effects on improving panicle growth, fruit set and their retention at maturity, yield and quality of horticultural crops have been reported by Dutta *et al.*,2000; Brahamachari, 2001 in litchi. Likewise, a number a growth regulatory substances like Auxin, Gibberellins and Ethaphon have been extensively used for the improvement of fruit crops (Tripathi and Shulka, 2006 in strawberry and Singh *et al.,* 2007 in Aonla). Salicylic Acid (SA) is a new plant growth regulator belonging to a group of plant phenolic compound. It induces flowering in plants (Raskin 1992 and 1992b and Gaffney *et al.,* 1993). Reviewing the above, the present study was conducted to find out the effect foliar application of plant growth regulators and micronutrient on growth, yield and quality of guava (cv. Allahabad Safeda).

MATERIALS AND METHODS

A field experiment was conducted at Horticulture garden, Department of Horticulture, RRS, Agwanpur, Saharsa (*RAU, Pusa, Samastipur, Bihar*) on five years old well managed bearing plant of guava cv. Allahabad Safeda, planted at a spacing of 6x6m during the year 2008-09 on winter season fruiting. A total of eleven treatments with three replications using single plant as a treatment unit in randomized block design was done. Two concentrations each of Boron (250 and 500 ppm),

Table-1 : Effect of PGRs and Boron on the growth parameters, flowering and fruit setting of Guava cv. Allahabad Safeda.

Treatments	Number of leaves	Leaf Area (cm^2)	Increase in shoot diameter (cm)	Initiation of Flowering (days)	Number of Fruits/shoot	Fruit set
Boron 250 ppm	15.51	70.15	16.25	29.65	2.17	56.41
Boron 500 ppm	12.94	59.23	14.29	28.67	1.79	46.85
NAA 15 ppm	13.02	63.31	14.38	31.02	2.05	53.65
NAA 30 ppm	15.18	74.25	16.64	30.03	2.75	70.84
GA_3 35 ppm	14.03	65.40	14.45	32.61	1.89	49.49
GA_3 70 ppm	14.47	67.35	15.44	33.03	2.51	62.65
Ethephon 70 ppm	10.86	48.57	13.81	25.66	1.63	45.35
Ethephon 140 ppm	8.16	46.08	13.59	24.36	1.56	39.41
SA 150 ppm	19.60	89.20	21.61	26.33	3.18	74.20
SA 300 ppm	18.50	83.45	19.60	25.35	2.36	60.24
Control	7.56	39.71	10.03	36.64	1.16	35.57
CD at 5%	3.28	12.96	3.53	1.93	0.71	7.62

Table-2 : Effect of PGRs and Boron on the yield parameters and bio-chemical characters of Guava, cv. Allahabad Safeda and B:C ratio.

Treatments	Fruit Length (gm)	Fruit Breadth (cc)	Seed (Kg/plant)	TSS (0Brix)	Vitamin C (mg/100g)	B:C Ratio
Boron 250 ppm	6.05	5.86	8.29	10.50	173.43	7.02
Boron 500 ppm	5.89	6.02	6.81	11.30	151.81	5.45
NAA 15 ppm	5.94	6.17	7.67	10.90	126.09	6.62
NAA 30 ppm	6.37	6.21	10.81	11.58	144.65	9.79
GA_3 35 ppm	6.00	6.23	7.24	12.00	130.24	3.20
GA_3 70 ppm	6.95	6.65	9.37	12.30	139.44	2.84
Ethephon 70 ppm	6.02	5.95	6.34	9.70	108.45	5.10
Ethephon 140 ppm	5.85	6.97	6.11	9.59	101.46	4.62
SA 150 ppm	6.67	6.53	12.32	11.00	125.00	11.20
SA 300 ppm	6.16	6.08	8.74	10.00	120.37	7.61
Control	5.35	5.67	5.39	9.10	86.86	4.39
CD at 5%	0.45	0.57	2.05	1.75	15.17	

NAA (15 and 30 ppm), GA_3 (35 and 70 ppm), Ethephon (70 and 140 ppm) and SA (150 and 300 ppm) were used along with one control (i.e. no spray). Two sprayings were done, first before new shoot initiation and second after the fruit set. All the cultural practices were adopted during the course of experiment. All the observations related to the physical characteristics, growth, flowering and fruiting were noted by applying standard practices. The leaf area of the leaves on each shoot was measured with the help of an integrator. The area of each leaf and the chemical composition of ripe fruit was recorded.

RESULTS AND DISCUSSION

The data on various stages of the plants i.e. growth, flowering, fruiting influenced by spraying of different concentrations on guava cv. Allahabad Safeda were recorded and presented in Table-1 and 2.

The figures in Table-1 show that the various treatments under the experiment significantly improved the vegetative growth expressed by the increase in shoot length, maximum number of leaves and larger leaf area. The highest average increase in the shoot length (21.61 cm), maximum number of leaves (19.60) and leaf area (89.20sq.cm) were recorded with the spray of salicylic acid 150 ppm, followed by salicylic acid 300 ppm and NAA 30 ppm over control. It can be inferred that Salicylic acid might be regulating the plants physiological processes including increase in cell metabolic rate and synthesis of auxin or cytokinin or both (Matwally *et al.,* 2003). Similarly, enhancement in vegetative growth as a result of NAA application was

also reported by Jain and Dashora (2007) in guava cv. Sardar. Initiation of flowering in minimum days (24.36) was recorded at ethephon 150ppm followed by salicylic acid 300ppm. Similar results of earliest and promoted flowering in guava was reported by Brahamachari *et al.* (1997), which supports the present results.

Table-1 also indicates the data regarding number of fruits per shoot and fruit set percent. Salicylic acid 150 ppm recorded a maximum number of fruits per shoot (3.18) and fruit set percent (74.20) as compared to control. Similar effect of salicylic acid on the number of fruits per shoot and fruit set was also observed by Nicholas and Embree (2004) and Liao *et al.,* (2006) in apple and citrus respectively. Increase in the number of fruits per shoot and fruit set might be as a result of increased pollen tube elongation and fertilization, either by controlling pollen germination on the stigma or the growth of pollen tube through style.

From Table-2, it is inferred that GA_3 70 ppm induced maximum fruit length (6.95) followed by salicylic acid 150 ppm (6.67cm) and NAA 30 ppm (6.37cm) whereas, maximum fruit breadth (6.97) was recorded in ethephon 140 ppm, followed by GA_3 70 ppm (6.65) and salicylic acid 150 ppm (6.53). However, the maximum size of fruit (5.35 x 5.67 cm) was recorded in control. The spray of GA_3 and ethephon might have increased the level of growth promoting substances, which in turn stimulated cell division and elongation and consequently, the rate of growth and development of fruit was enhanced. The present results were also recorded by Maurya *et al.,* (1973) in mango cv. Dashahari with the application of GA_3 and Gupta and Kaur (2007) in Sutlaj purple plum with ethaphon.

The effect of PGRs and Boron on plant yield, the data in table-2 reveals that amongst the various plant growth regulators and boron treatments, the mean highest yield (12.32 kg/plant) was recorded at 150 ppm salicylic acid which was statistically at par with 300 ppm NAA, which in turn, is at par with 70 ppm GA_3, 300 ppm SA and 500 ppm boron spray. However, the mean lowest yield of guava 2.04 Kg per plant was recorded at control. The results are in corroboration with the observations made by Karlidag *et al.* (2009) in strawberry by SA application; Pandey (1999) in ber with NAA and GA_3 and Yadav (2002) in guava with NAA application. Yield enhancement due to SA might be due to enhanced assimilatory power of leaves to synthesize more organic metabolites (Seagel *et al.,* 2008).

It was observed that the various treatments of PGRs and boron augmented TSS and vitamin C content of fruits. These might have diverted more solids towards developing fruits and might have also enhanced the conversion of complex polysaccharides into simple sugars. In the present study, maximum TSS content 12.20^0 brix was noted with 70 ppm GA_3 followed by NAA 60 ppm. These findings accorded with Iqbal *et al.,* (2009) in guava and Dutta *et.al.,* (2008) in carambola. Maximum increase in vitamin "C" content of fruits was recorded by application of boron 250 ppm and 500ppm. The increase in Ascorbic acid might be due to boron which facilitated sugar transport within the fruit and it was also reported that borate reacted with sugar to form sugar borate which was more easily able to transverse (Gauch and Duggar, 1953). Table-2 also reveals that the highest Benefit:Cost ratio (11.20) was recorded in case of SA 150 ppm, followed by NAA 30 ppm (9.79) and SA 300 ppm (7.61).

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