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Effect of foliar spray of zinc sulphate and gibberellic acid on growth and quality of guava G-27 (*Psidium guajava* L.)

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ABSTRACT : A field experiment was conducted at university guava orchard, Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya, Gwalior (M.P.) during the year 2014-15. Guava plants were treated with zinc sulphate at 0.2 per cent, 0.3 per cent and 0.4 per cent and GA_3 at 30 ppm, 60 ppm and 90 ppm along with a control. Higher concentration of zinc sulphate (0.40%) and GA_3 (90 ppm) spray enhanced the tertiary shoot length (8.08 cm), Shoot diameter (4.26 mm) and number of leaves per shoot (7.10). The maximum fruit set (95.55%) and fruit retention (77.48%) was recorded with higher dose of zinc sulphate and GA_3. The higher dose of zinc sulphate and GA_3 minimize the fruit drop (18.07%). Maximum TSS (11.65) was recorded in higher dose of zinc sulphate and GA_3. Minimum acidity (0.20%) was recorded in higher dose.

KEY WORDS : Foliar spray, Zinc sulphate, GA_3, Quality of guava

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Guava (*Psidium guajava* L.) "Apple of tropics" is one of the most important fruits of India. It is very hardy and can be grown under adverse conditions also. But the yield and quality of fruit is poor as it has not received the deserved attention in its cultivation. Mineral nutrients and phyto hormones affect plant growth, development, yield and quality of fruits.

Micronutrient plays a vital role in growth and development of plants besides being improving the quality of the produce. Zinc (Zn) is an essential trace element for plants, being involved in many enzymatic reactions and is necessary for their good growth and development. Zinc is also involved in regulating the protein and carbohydrate metabolism (Swietlik, 2002). The plant growth regulators (PGR) act as messengers and are needed in small quantities at low concentrations. Plant growth regulators enhance the rapid changes in physiological and biochemical characters and improve crop productivity. Plant growth regulators play important role in fruit set, fruit production, fruit weight and fruit size without causing any adverse effect in fruit quality (Rao, 2001 and Tondon *et al*., 1989). NAA induces more fruiting, promotes flowering, whereas, GA_3 increases fruit retention. The guava orchards are declining in their productivity and one of the reasons for, decline could be the lack of application of optimum dose of micronutrients and plant growth regulators. There is an urgent need to find out appropriate dose of micronutrients and plant growth regulators for guava fruit crop to improve the productivity in this zone.

RESEARCH METHODS

The experiment was conducted at Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya, Gwalior (M.P.), Department of Horticulture (Fruit Science) during 2014-2015. The experiment comprised of 16 treatments

in all *viz*., three concentration of each of zinc sulphate (0.2%, 0.3% and 0.4%) and GA_3 (30 ppm, 60 ppm, 90 ppm) and their combination along with a control replicated thrice under a Randomized Block Design. The required quantity of zinc sulphate mixture was prepared by directly mixing required quantity of zinc sulphate in water and spray solution used for spraying immediately after preparation. The stock solution of GA_3 was prepared by dissolving 1g of GA_3 in 50 ml of alcohol and added distilled water to make volume of 1 litre Zinc sulphate and GA_3 were sprayed on leaves on both the side using hand sprayer. Precautions were taken to avoid the drizzling of the on the other treatment. Vegetative observations were recorded by routine method and chemical estimations were done as per (A.O.A.C., 1970).

RESEARCH FINDINGS AND DISCUSSION

All the treatment of zinc sulphate and GA_3 significantly increase the tertiary shoot length as compared to control (Table 1), however, the highest tertiary shoot length was achieved, with the application of 0.4 per cent zinc sulphate + 90 ppm GA_3 (8.08 cm) followed by treatment of 0.3 per cent zinc sulphate + 90 ppm GA_3 in decreasing order. The foliar sprays of chemical *viz*., Zn and GA_3, might have induced the synthesis of chlorophyll and thus lead to increase in chlorophyll content which in turn resulted in higher vegetative growth (Chhonkar and Singh 1981).

The maximum shoot diameter (4.26 mm) was recorded under treatment 0.4 per cent zinc sulphate + 90 ppm GA_3 while, the minimum shoot diameter (2.50 mm) noticed under control. The presence of zinc in chloroplast cell was also considered the possible causes of increased growth of plants (Wood and Sibley, 1950). The maximum number of leaves per shoot (7.10) was recorded under 0.4 per cent zinc sulphate + 90 ppm GA_3 followed by 0.3 per cent zinc sulphate + 90 ppm GA_3 while, the minimum number of leaves per shoot (3.27) noticed under control because the increase in number of leaves per shoot with Zn and GA_3 spray, this may be because Zn has an obvious affect on photosynthesis and GA_3 is indispensable for photosynthesis. Improvement in vegetative growth of this present findings also are in conformity with several workers (Ghosh, 1986; Dahiya *et al*., 1993 and Balakrishnan, 2001) in guava.

The chemical significantly increased the fruit set as compared to control (Table 2) however, the highest fruit set (95.86%) was obtained with the application of 0.2 per cent zinc sulphate + 90 ppm GA_3 followed by treatment of 0.4 per cent zinc sulphate + 90 ppm GA_3. It has been early reported that fruit set in pear can be promoted with application of plant bio-regulators like GA_3. The results shown that use of 0.4 per cent zinc sulphate + 90 ppm GA_3 minimized the fruit drop (18.07%) in guava. Whereas maximum fruit drop reported in control suggested that primitive effect of growth substances in

Table 1 : Effect of $ZnSO_4$ and GA_3 sprays on tertiary shoot length, shoot diameter and number of leaves of guava trees

Treatments		Tertiary shoot length (cm)	Shoot diameter (mm)	No. of leaves per shoot
$ZnSO_4$ (%)	GA_3 (ppm)			
0	0	3.70	2.50	3.27
0.2	0	4.36	2.61	3.29
0.3	0	4.49	2.71	3.59
0.3	0	4.71	2.82	3.80
0	30	4.84	3.07	4.31
0.2	30	5.42	3.36	4.31
0.3	30	5.46	3.46	4.51
0.4	30	5.57	3.15	4.53
0	60	5.69	3.16	4.68
0.2	60	5.94	3.42	4.80
0.3	60	6.10	3.45	4.88
0.4	60	6.49	3.39	4.89
0	90	6.49	3.36	5.25
0.2	90	7.01	3.44	5.36
0.3	90	7.34	3.55	5.77
0.4	90	8.08	4.26	7.10
C.D. (P=0.05)		0.220	0.027	0.221

Table 2 : Effect of $ZnSO_4$ and GA_3 sprays on fruit set, fruit drop and fruit retention of guava trees.

Treatments		Fruit set. (%)	Fruit drop. (%)	Fruit retention. (%)
$ZnSO_4$ (%)	GA_3 (ppm)			
0	0	86.74	43.29	43.45
0.2	0	91.56	39.47	52.09
0.3	0	91.35	36.53	54.82
0.3	0	92.41	35.78	56.63
0	30	91.77	31.93	59.83
0.2	30	91.06	29.52	61.54
0.3	30	92.25	28.28	63.97
0.4	30	92.95	26.69	66.26
0	60	93.46	25.97	67.50
0.2	60	93.01	22.93	70.08
0.3	60	94.40	23.39	71.01
0.4	60	95.43	23.11	72.32
0	90	95.17	21.94	73.22
0.2	90	95.86	21.72	74.14
0.3	90	95.28	19.36	75.92
0.4	90	95.55	18.07	77.48
C.D. (P=0.05)		0.886	1.450	0.645

Table 3 : Effect of $ZnSO_4$ and GA_3 sprays on TSS and acidity guava trees

Treatments		TSS	Acidity
$ZnSO_4$ (%)	GA_3 (ppm)		
0	0	7.34	0.45
0.2	0	7.46	0.42
0.3	0	8.01	0.40
0.3	0	8.59	0.39
0	30	8.92	0.37
0.2	30	10.78	0.35
0.3	30	10.96	0.31
0.4	30	11.00	0.29
0	60	11.20	0.32
0.2	60	11.38	0.26
0.3	60	11.26	0.25
0.4	60	11.38	0.26
0	90	11.40	0.29
0.2	90	11.15	0.24
0.3	90	11.52	0.23
0.4	90	11.65	0.20
C.D. (P=0.05)		0.237	0.009

greater retention of fruit may be attributed to reduction in fruit drop. In this study, this treatment when applied it caused higher increase in fruit retention (75.92%) compared to other treatment. The result are in conformity with those of who was observed that application of growth regulators like GA_3 and promalin had more consistent effect on fruit retention in pear.

Application of zinc sulphate, GA_3 and its combination increased the total soluble solid in fruits as compared to control (Table 3). The highest TSS (11.65) was found in fruit that treated with 0.4% zinc sulphate + 90 ppm GA_3. Similar results were also reported by (Arora and Singh, 1972 and Chaitanya *et al.*, 1997) in guava. In the present investigation zinc sulphate applied alone or combination

with GA_3 increased acidity. Minimum acidity (0.20) observed under treatment 0.4% zinc sulphate + 90 ppm GA_3 and maximum in control. These results are in accordance with the findings of (Brahmachari *et al.*, 1997) in guava where they reported minimum acidity with foliar application of GA_3. Maximum fruit volume (210.06) was observed under treatment 0.4% zinc sulphate + 90 ppm GA_3 minimum in control.

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