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RESEARCH PAPER

Studies on the effect of pre-harvest application of plant growth regulators and chemicals on yield and quality of guava (*Psidium guajava* L.) cv. L.-49

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Abstract : A field experiment to study the effect of pre-harvest application of plant growth regulators and chemicals namely giberellic acid, naphthalene acetic acid, calcium chloride, zinc sulphate, potassium sulphate and control on yield and post harvest quality of guava (*Psidium guajava* L. cv. L.-49) was conducted at the Department of Horticulture, Agricultural College and Research Institute, Tamil Nadu Agricultural University, Killikulam during the year 2012. The experiment was laid out with six treatments replicated three times in a Randomized Block Design. In the present investigation, application of potassium sulphate (1 %) significantly enhanced the yield parameters *viz.*, fruit length (9.0 cm), number of fruits (145.1), fruit weight (138.3 g) and yield per tree (20.06 kg) and quality parameters *viz.*, TSS (9.5 %), acidity (0.25 %), total sugars (9.25 %), reducing sugars (4.76 %) and ascorbic acid (130 mg/100g pulp).

Key Words : Pre-harvest application, Growth regulators, Yield, Quality, Guava

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INTRODUCTION

India is the second largest producer of fruits after China. Guava is the fourth most widely grown commercial fruit crop after mango, banana and citrus in India. Bihar is the leading state in guava production followed by Andhra Pradesh and Uttar Pradesh. The other states where guava is grown widely were Gujarat, Karnataka, Punjab and Tamil Nadu. The area under guava cultivation in India increased by 64 per cent from 94 thousand ha. in 1991-92 to 155 thousand ha. in 2001-02 whereas the production increased by 55 per cent from 11 lakh tones to 17 lakh tonnes. Guava fruits have very short shelf life making it difficult for distant marketing. For long distance transportation, use of refrigerated transport and also proper packaging and cushioning material is required to enhance the shelf life of fruits which hampers economic viability. A package of practice is imperative to enhance the yield, quality and shelf life of guava fruits by application of plant growth regulators and chemicals. The present investigation was carried out under this objective.

MATERIAL AND METHODS

A field experiment was conducted at the Department of Horticulture, Agriculture College and Research Institute (TNAU), Killikulam during the year 2012. The experiment was laid out in Randomized Block Design with three replications and six treatments *viz.*, T_1-GA_3 100 ppm, T_2-NAA 50 ppm,T_3-$CaCl_2$ 2 per cent, T_4-Zinc sulphate 0.5 per cent, T_5-K_2SO_4 1 per cent and control. The required concentration of

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chemicals *i.e.*, $CaCl_2$, zinc sulphate and K_2SO_4 were prepared by directly mixing required quantity of chemicals in water and those spray solutions were used for spraying immediately after preparation. The stock solution of GA_3 and NAA were prepared by dissolving 1 gram of respective growth regulator in 50 ml alcohol and added distilled water to make volume of 1 litre. The ripened fruits were harvested and collected 30 days after the foliar spray and peeled with hands. Then the pulp was chopped, blended to homogenous mixture in a mortar and pistle and this mixture was used for chemical analysis. Total soluble solids, titrable acidity, sugars and ascorbic acid contents of fruits were estimated by using A.O.A.C (1975) methods. Growth regulators and chemicals on leaves of both the sides were sprayed during August and November-December, respectively of 10 year old trees with three trees per treatment maintained under uniform cultural practices. Precautions were taken to avoid the drizzling of the sprays on the other treatments. Observations were recorded and statistically analyzed as per the methods given by Panse and Sukhatme (1967).

RESULTS AND DISCUSSION

In the present investigation, all the treatments of growth regulators and chemicals significantly increased the yield attributes of guava as compared to control (Table 1). However, fruit length (cm) was recorded maximum for 1 per cent K_2SO_4 with the per cent increase of 1.1 over 100 ppm GA_3 and 3.3 per cent 0.5 per cent zinc sulphate. The minimum being recorded in control which was 15.5 per cent lesser than 1 per cent K_2SO_4. However, for fruit diameter, 2 per cent $CaCl_2$ exerted a significant influence as compared to other treatments which recorded 7.5 cms followed by 1 per cent K_2SO_4 (7.4 cms) and 0.5 per cent zinc sulphate (7.3 cms). The highest increase for number of fruits per tree was achieved with the application of 1 per cent K_2SO_4 (12.89 %) followed by 50 ppm NAA and 2 per cent $CaCl_2$ (13.72 %) in decreasing order. The results obtained by Haribabu (1980) and Singh and Revathy (1996) reported that more number of fruits per tree were produced in Kagzi lime due to the treatment of chemicals and plant growth regulators.

Present results (Table 1) revealed that application of 1 per cent K_2SO_4 considerably increased the fruit weight (g) as compared to control (118.5), the highest being registered in 1 per cent K_2SO_4 (138.3) followed by 2 per cent $CaCl_2$ (135.2) and 0.5 per cent zinc sulphate (132.6). As the length and diameter of fruit were increased significantly, it might have resulted in increase in weight of fruit. Number of workers has reported the beneficial effect of plant growth regulators and chemical application in increasing size and weight of various kinds of fruits. Hwang *et al.* (1994) found more percentage of large fruit with the increasing concentration of NAA in Ponken mandarin. The possible reason for increase in volume, diameter and weight of fruit may be reflection of increased vegetative growth as well as increased chlorophyll content of leaves which might have resulted in the synthesis of more metabolites. These metabolites were translocated to the fruit by which the physical traits of the fruits increased with the

Table 1 : Effect of growth regulators and chemicals on fruit length, fruit diameter, fruit weight, number of fruits per tree and yield per tree of guava

Treatments	Fruit length (cm)	Fruit diameter (cm)	Fruit weight (g)	Number of fruits/tree	Yield/tree (kg)
GA_3 (100 ppm)	8.9	7.0	120.5	102.3	12.32
NAA (50 ppm)	8.5	7.2	127.7	126.4	16.14
CaCl(2%)	7.8	7.5	135.2	125.2	16.92
Zinc Sulphate (0.5%)	8.7	7.3	132.6	110.9	14.70
K_2SO_4 1 %	9.0	7.4	138.3	145.1	20.06
Control	7.6	6.6	118.5	95.4	11.30
S.E. ±	0.24	0.17	2.15	5.56	1.32
C.D. (P=0.05)	0.53	0.37	4.79	12.39	2.94

Table 2 : Effect of growth regulators and chemicals on quality attributes of guava fruits

Treatments	TSS (%)	Acidity (%)	Total sugars (%)	Reducing sugars (%)	Ascorbic acid (mg/100g pulp)
GA_3 (100 ppm)	9.0	0.38	8.44	3.72	126
NAA (50 ppm)	9.2	0.35	8.55	4.28	129
CaCl (2%)	9.2	0.41	8.26	4.18	126
Zinc Sulphate (0.5%)	9.4	0.31	9.12	4.55	127
K_2SO_4 1 %	9.5	0.25	9.25	4.76	130
Control	8.9	0.39	8.10	3.20	119
S.E. ±	0.07	0.01	0.08	0.15	0.68
C.D. (P=0.05)	0.15	0.03	0.18	0.33	1.52

chemical spray. Zinc is an important ingredient which regulates the semi permeability of cell wall by which more water is mobilized into fruit by which increasing the volume and diameter of the fruit. 1 per cent K_2SO_4 significantly influenced the character yield per tree (kg) which recorded the highest values of 20.06 and was 15.7 per cent, 19.5 per cent and 26.7 per cent increase over the treatment 2 per cent $CaCl_2$, 50 ppm NAA and 0.5 per cent zinc sulphate, respectively. The superiority of 1 per cent K_2SO_4 over control for yield per tree (kg) was 43.7 per cent. Increased yield efficiency under this treatment 1 per cent K_2SO_4 may be attributed to increased number of fruits per tree, fruit weight (g) and fruit length (cm).

The spray of plant growth regulators and chemicals showed significant effect on improving the quality attributes of guava fruits var. L-49 (Table 2). There was a noticeable increase in the total soluble sugars with the application of 1 per cent K_2SO_4 (9.5 %) followed by 05 per cent zinc sulphate (9.4 %). However, 50 ppm NAA and 2 per cent $CaCl_2$ recorded at par values (9.2 %). The range between 1 per cent K_2SO_4 and control was 0.6 per cent. The maximum titrable acidity was recorded with 2 per cent $CaCl_2$ (0.41 %) and the minimum with 1 per cent K_2SO_4 (0.25 %). The acids under the influence of chemicals might have either been firstly converted into sugars and their derivatives by the reactions involving reversal of glycolytic pathway or might have been used in respiration both. Brahmachari *et al.* (1997) also reported similar results. Upon the pre harvest application, 1 per cent K_2SO_4 recorded significantly for both the total sugars (1 %) and reducing sugars (1 %) (9.25 and 4.76, respectively) compared to control (8.10 and 3.20, respectively). This was followed by 0.5 per cent zinc sulphate and recorded 9.12 and 4.55, respectively for the above characters. This might be due to the conversion of starch and acid into sugars with the pre harvest sprays in addition to the continuous mobilization of sugars from leaves to fruits. The results are in confirmation with the findings of Anitha (1993); Vivency (1995) and Josen *et al.* (2001) in pearlette grape. With regard to ascorbic acid (mg/100 g pulp), 1 per cent K_2SO_4 recorded maximum (130) followed by 50 ppm NAA (129) and 0.5 per cent zinc sulphate (127). 2 per cent $CaCl_2$ and 100 ppm GA_3 were statistically similar to each other and registered at par values (126). Minimum was recorded with control. Agarwal (2012); Goswami *et al*. (2012); Jayachandran *et al.* (2005) and Rajput *et al.* (2008) on guava; Bhowmick *et al.* (2012) on mango and Gupta *et al.* (1980) on grapes also worked on the related topic.

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