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Influence of foliar application of plant growth regulators on quality of guava in winter season crop

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Abstract

Foliar spray of NAA (20, 40 and 60 ppm), 2, 4-D (10,15 and 20 ppm) and GA_3 (30, 60 and 90 ppm) was done on guava trees of cultivar 'Sardar' at fruit setting stage and repeated after one month. The chemical characteristics like T. S. S., reducing sugar, non-reducing sugar and total sugar were recorded maximum in treatment with NAA at 60 ppm viz. 15.45 %, 4.56 %, 3.12 % and 7.84 %, respectively. The minimum acidity of 0.395 % was also recorded in the same treatment. Whereas, the mean maximum ascorbic acid and pectin content were recorded in treatment with GA_3 at 90 ppm viz., 205.16 mg/100 g pulp and 0.80 %, respectively.

Key words: *Growth regulators, guava, chemical characterestics*

Introduction

Guava (*Psidium guajava* L.) is the most important, highly productive, delicious and nutritious fruit of tropical and sub tropical regions. It is a good source of calcium and iron, fair source of phoshorus, and a rich source of vitamin C and pectin. It is enjoyed both as fresh as well as in procesed from. In north Indian agro-climatic conditions, guava flowers twice in a year i.e., April-May for rainy season crop and then, in August-September for winter season crop. Generally, fruit yield is more in rainy season crop as compared to winter season crop, but are poor in quality. In recent years, plant growth regulators like auxins, and gibbrellins have been extensively used for improving the quality of various fruits like ber (Masalkar and Wavhal, 1991), litchi (Brahmachari *et al.*, 1996), etc. Auxins as well as GA_3 have been found to accelerate the translocation of metabolites from other parts of the plant towards developing fruits. Keeping in view the above facts, an attempt was made to improve the quality of winter season crop of guava with pre-harvest application of plant growth regulators.

Materials and methods

The studies were carried out at Instructional Farm, Development of Horticulture, Rajasthan College of Agriculture, Udaipur during two successive years i.e. 2004-05 and 2005-06 in which 14 years old guava (*Psidium guajava* L.) trees of cv. Sardar were selected. Three plant growth regulators with following concentrations were taken.

1. Naphthelene Acetic Acid (NAA)-20, 40 and 60 mg l^{-1}
2. 2, 4-Dichlorophenoxy Acetic Acid (2, 4-D)-10, 15, and 20 mg l^{-1}
3. Gibberellic acid (GA_3)- 30, 60 and 90 mg l^{-1}
4. Control-Distilled water spray.

One tree was kept as a unit with three replications in RBD. The selected trees were sprayed with different concentrations of NAA, 2, 4-D and GA_3 in first week of September and first week of October during the study period. The fruits were harvested at colour break stage with full maturity. To determine the fruit quality a sample of 10 fruits was taken from each tree and chemical analysis like TSS was determined with hand refractometer. Other chemical properties i.e., acidity and ascorbic acid were estimated following the procedures laid in A O A C (1990), pectin content (Ranganna, 1977), reducing sugar (Somogyi, 1952) and total sugar (Dubois *et al.*, 1951).

Results and discussion

It is evident from the data (Table 1) that the mean highest TSS (15.45%), lowest acidity (0.395%) and maximum TSS /acid ratio (39.23) were recorded at 60 mg l^{-1} NAA Similar beneficial effect on TSS, acidity and TSS/ acid ratio was also recorded by Vijaylakshmi and Srinivasan (2000) and Gupta and Brahamchari (2004) in mango. The increase in TSS of the juice of treated fruits may be due to the increasd mobilisation of carbohydrates from the source to sink (fruits) by auxin treatment, hydrolysis of polysaccharides, conversion of organic acids into soluble sugars. The reduction in acidity may be attributed to fast conservation of acids into sugars and their derivatives by reactions

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Table 1. Effect of plant growth regulators on TSS, acidity and TSS/ acid ratio of guava cv. 'Sardar'

Treatments	TSS (%)			Acidity (%)			TSS/ Acid ratio		
	2004-05	2005-06	Pooled	2004-05	2005-06	Pooled	2004-05	2005-06	Pooled
Control	12.46	10.90	11.68	0.59	0.63	0.610	21.12	17.32	19.22
NAA 20 ppm	15.40	13.88	14.64	0.40	0.41	0.405	38.54	33.88	36.21
NAA 40 ppm	15.32	14.88	15.10	0.39	0.41	0.400	39.30	36.31	37.81
NAA 60 ppm	15.80	15.10	15.45	0.38	0.41	0.395	41.58	36.88	39.23
2, 4-D 10 ppm	13.60	11.40	12.50	0.51	0.55	0.530	26.71	20.73	23.72
2, 4-D 15 ppm	13.90	13.74	13.82	0.40	0.42	0.410	34.73	32.73	33.73
2, 4-D 20 ppm	14.62	12.54	13.58	0.44	0.48	0.460	33.32	26.13	29.72
GA3 30 ppm	13.78	11.66	12.72	0.49	0.48	0.485	28.15	24.30	26.23
GA 3 60 ppm	14.40	12.86	13.63	0.40	0.46	0.430	36.05	27.99	32.02
GA3 90 ppm	14.80	12.70	13.75	0.44	0.43	0.435	33.90	29.60	31.75
C D at 5%	0.79	0.25	0.40	0.029	0.030	0.020	2.32	1.76	1.40

Table 2. Effect of plant growth regulators on Ascorbic acid (Vitamin-C) and pectin content of guava cv. 'Sardar'

Treatment	Ascorbic acid (mg/100g pulp)			Pectin content (%)		
	2004 -05	2005 -06	Pooled	2004 -05	2005 -06	Pooled
Control	174.40	173.76	174.08	0.62	0.60	0.61
NAA 20 ppm	197.35	195.45	196.40	0.68	0.71	0.70
NAA 40 ppm	201.95	203.15	202.55	0.79	0.77	0.78
NAA 60 ppm	204.78	203.00	203.89	0.80	0.79	0.80
2, 4-D 10 ppm	196.42	195.52	195.97	0.67	0.61	0.64
2, 4-D 15 ppm	199.00	200.30	199.65	0.71	0.73	0.72
2, 4-D 20 ppm	198.24	200.18	199.21	0.70	0.71	0.71
GA3 30 ppm	200.37	198.55	199.46	0.73	0.71	0.72
GA 3 60 ppm	203.17	201.19	202.18	0.77	0.76	0.77
GA3 90 ppm	206.03	204.29	205.16	0.79	0.81	0.80
C D at 5%	6.62	5.80	4.25	0.05	0.05	0.03

involving reverse glycolytic pathways. Improvement in T S S/acid ratio could be attributed to increase in TSS content and reduced acid content under N. A. A. treatments. Similar results have also been reported by Yadav *et al.* (2001) in guava.

The data (Table 2) reveals that the application of plant growth regulator had significantly increased the ascorbic acid and pectin content of the guava fruit over control. Among the various plant growth regulator treatments, the mean maximum ascorbic acid of 205.16 mg/ 100 g pulp and pectin of 0.80 per cent were recorded at 90 ppm GA_3 treatment followed by 60 mg l^{-1} NAA whereas, the minimum ascorbic acid (174.08 mg/ 100 g pulp) and pectin content (0.61%) were observed with control. The present results are in line with the findings of Brahmachari *et al.* (1997) in guava. The increase in ascorbic acid content might be due to catalytic influence of GA_3 on biosynthesis of ascorbic acid from sugar.

The data presented in Table 3 clearly indicate that the application of plant growth regulators significantly increased the sugar content (reducing, non-reducing and total sugar) of guava fruits. The highest reducing, non-reducing and total sugar content of 4.56, 3.12 and 7.84 per cent, respectively were recorded with 60 mg l^{-1} NAA treatment, whereas the mean minimum reducing sugar (3.95%), non-reducing (2.28%) and total sugar (6.35%) were

Table 3. Effect of plant growth regulators on reducing, non-reducing and total sugar content of guava cv. 'Sardar'

Treatments	Reducing sugar (%)			Non-reducing sugar (%)			Total sugar (%)		
	2004-05	2005-06	Pooled	2004-05	2005-06	Pooled	2004-05	2005-06	Pooled
Control	4.04	3.86	3.95	2.44	2.12	2.28	6.61	6.09	6.35
NAA 20 ppm	4.42	4.22	4.32	2.69	2.21	2.45	7.25	6.55	6.90
NAA 40 ppm	4.56	4.34	4.45	2.89	2.96	2.93	7.60	7.46	7.53
NAA 60 ppm	4.68	4.44	4.56	3.09	3.14	3.12	7.93	7.75	7.84
2, 4-D 10 ppm	4.06	4.04	4.05	2.79	2.32	2.56	7.00	6.48	6.74
2, 4-D 15 ppm	4.38	4.02	4.20	2.64	2.28	2.46	7.16	6.42	6.79
2, 4-D 30 ppm	4.49	4.25	4.37	2.54	2.78	2.66	7.16	7.18	7.17
GA3 30 ppm	4.22	4.02	4.12	2.76	2.38	2.57	7.12	6.52	6.82
GA 3 60 ppm	4.55	4.31	4.43	2.76	2.57	2.66	7.45	7.02	7.24
GA3 90 ppm	4.42	4.32	4.37	3.09	2.63	2.86	7.67	7.09	7.38
C D at 5%	0.17	0.17	0.12	0.29	0.12	0.15	0.28	0.19	0.16

recorded at control. The possible reason for increase in sugar content is that NAA might have promoted hydrolysis of strach into sugars. Auxins have been found to accelerate the translocation of metabolites from other parts of the plant towards developing fruits. The present results are corroborated with the findings of Kher *et. al.* (2005) in guava and Singh *et al.* (1989) in ber.

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