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Growth, flowering, fruiting and yield of guava (*Psidium guajava* L.) cv. SARDAR as influenced by various plant growth regulators

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ABSTRACT
An experiment was conducted during 2002-03 and 2003-04 at Department of Horticulture RCA, Udaipur (Raj.) to study the response of various plant growth regulators at different concentrations namely, NAA (100 and 200 ppm), Ethrel (250 and 500 ppm), Paclobutrazol (250 and 500 ppm), CCC (500 and 1000 ppm) and triacontanol (5 and 10 ppm) on growth, flowering, fruiting and yield of winter season crop of guava cv. Sardar. The results indicated that 60 days after treatment the mean maximum increase in shoot length (36.25%) was observed in 100 ppm NAA treatment followed by 200 ppm NAA (36.23%) and maximum increase in shoot diameter (34.95%) was recorded in 500 ppm PBZ followed by 1000 ppm CCC (34.42%) treatments. However, mean minimum days taken to initiatin of flowering (29.0), maximum number of flowers/shoots (7.77/shoot), maximum fruit set (71.17%), highest fruits retention (73.16%) with minimum days taken to harvesting (115.33) and maximum yield (63.83 kg/plant or 17.74 tonnes/ha) were recorded in 500 ppm paclobutrazol (PBZ) treatment as compared to control.

Key words : Guava, Naphthalein acetic acid, Ethrel, Paclobutrazol, Cycocel and Triacontanol.

INTRODUCTION

The increasing importance of guava (*Psidium guajava* L.) as a commercial tropical fruit crop, both for table purposes and processing, demands its wide spread cultivation ensuring regular cropping and higher production. At present, guava which belongs to family Myrtaceae, is cultivated largely through a traditional system without use of plant growth regulators, under which it is difficult to achieve desired level of production. An overriding need exists either to improve the traditional system or to develop new and modern system of cultivating guava to overcome the problems inherent with this tree.

The use of plant growth regulators has assumed an integral part of new and modern system of fruit production. Therefore, to achieve the desifred level of production of guava the use of plant growth regulator is one of the important factor. Keeping this in view, an attempt has been made in this regard.

MATERIALS AND METHODS

Ten years old plants of guava cv. Sardar, planted 6x6 m apart at instructional farm, Department of Horticulture, Rajasthan College of Agriculture, MPUAT, Udaipur (Raj.). During the year 2002-03 and 2003-04 were selected for the study, single plant considered as an experimental unit was replicated three times in Randomised Block Design with eleven treatments. The treatments consisted of five different plant growth regulators with two concentrations of each. Namely, Naphthalein acetic acid (100 and 200 ppm), Ethrel (250 and 500 ppm), Paclobutrazol (250 and 500 ppm), Cycocel (500 and 1000 ppm) and Triacontanol (5 and 10 ppm) and distilled water sprayed on the plants for control. Observations were recorded on vegetative growth, flowering, fruiting and yield of winter season crop during experimental period. Vegetative characters (i.e. shoot length and diameter) were recorded at 30 days interval after recording initial observations in each treatment for a total period of 60 days. Five newly emerged uniform size shoots were selected randomly in each treatment for measuring length and diameter of shoot and expressed in percent increase, on the basis of initial values. Days taken to initiation of flowering were recorded by visual observation through regular visiting of the orchard. The number of flowers were counted on the five selected shoots and average number of flowers/shoots was calculated. Total number of flowers which set into fruit were counted and percent fruit set was calculated on the basis of number of flowers emerged. Similarly total number of fruit present on the tagged shoot at the time of fruit maturity were counted and percent fruit retention was calculate on the basis of initial number of fruit set. Number of days taken to first picking from date of treatment was counted as days taken to harvesting. The yield of fruit/ha. Was calculated by multiplying the yield of fruit/ plant with number of plants (278) per ha. Data calculated in percentage were angular transformed before statistical analysis, which was carried out as per the methods prescribed by Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

The pooled analysis of two year mean data on growth, flowering, fruiting and yield as influenced by spray of various plant growth regulators at different concentration on winter season guavava cv. Sardar are presented in table-1 and 2.

Growth and flowering :

It is revealed from the pooled data presented in table-1 that growth (length and diameter of shoot) and flowering (Days taken to initiation of flowering and number of flowers per shoot) characters were significantly influenced by the use of various plant growth regulators at different concentrations. Pooled mean indicated that application of NAA and triacontanol showed significantly higher rate of increase in shoot length over control. On the contrary, the

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rate of increase in shoot length was reduced as a result of ethrel, PBZ and CCC treatments. The mean maximum increase in shoot length (36.25%) Was recorded at 100 ppm NAA which was closely followed by 200 pm NAA highest increase in shoot diameter as a result of CCC and PBZ treatment might be due to reduction in apical growth and internodal length of the growing shoot as evident from the present study. Similar result of increase in shoot

Table 1 : Effect of plant growth regulators on vegetative growth and flowering of guava cv. Sardar (pooled mean of two year).

Treatments	Percent increase in shoot length		Percent increase in shoot diameter		Days taken to initiation of flowering	No. of flowers/ shoot
	30 days after spray	60 days after spray	30 days after spray	60 days after spray		
Control (water spray) (T_1)	26.15	33.49	24.09	31.76	38.00	5.30
	(19.44)	(30.45)	(16.66)	(27.71)		
NAA 100 ppm (T_2)	28.40	36.25	25.41	33.80	31.83	7.23
	(22.64)	(34.97)	(18.42)	(30.95)		
NAA 200 ppm (T_3)	29.59	36.23	25.94	34.33	30.16	7.53
	(24.38)	(34.94)	(19.14)	(31.81)		
Ethrel 250 ppm (T_4)	24.35	30.29	25.05	33.41	30.67	6.87
	(17.02)	(25.44)	(17.94)	(30.37)		
Ethrel 500 ppm (T_5)	23.65	28.73	23.77	32.41	29.00	7.73
	(16.10)	(23.11)	(16.25)	(28.74)		
Paclobutrazol 250 ppm (T_6)	25.18	29.54	24.35	34.05	31.16	7.13
	(18.12)	(24.31)	(17.02)	(31.35)		
Paclobutrazol 500 ppm (T_7)	23.38	27.50	24.76	34.95	29.00	7.77
	(15.77)	(21.32)	(17.55)	(32.83)		
CCC 500 ppm (T_8)	25.15	30.68	24.35	32.71	31.50	7.00
	(18.08)	(26.04)	(17.00)	(29.22)		
CCC 1000 ppm (T_9)	23.62	28.35	24.48	34.42	30.33	7.63
	(16.07)	(22.57)	(17.18)	(31.95)		
Triacontanol 5 ppm (T_{10})	27.94	35.12	25.20	33.13	34.33	6.43
	(21.96)	(33.10)	(18.13)	(29.89)		
Triacontanol 10 ppm. (T_{11})	28.82	34.90	24.44	33.59	34.67	6.93
	(23.25)	(32.75)	(17.14)	(30.62)		
SE ±	0.49	0.33	0.42	0.28	0.57	0.16
CD at 5%	1.46	0.96	NS	0.81	1.68	0.46

NS : Non significant
- Figure in parenthesis are recoverted values

treatment on 60 days after treatment. Similar effect of increase in shoot length as a result of NAA application was also recorded bySingh and Singh (1972) in mango. It might be because of NAA enhances the growth of shoot by cell enlargement and cell elongation mechanism (Pandey and Sinha, 2001). The minimum increase in shoot growth (27.50%) by application of 500 ppm PBZ is attributed to GA-inhibitory activity of paclobutrazol as gibberellins are known to promote elongation growth (Murti *et al.*, 2001). A perusal of pooled data on shoot diameter (table 1) showed than on 60 days after treatment maximum increase in shoot diameter (34.95%) was observed in 500 pm PBZ treatment which was closely followed by 1000 ppm CCC (33.42 %) as compare to mean minimum in control (31.76%). The diameter due to application of CCC was observed by Sing (1999). He stated that the overall increase in horizontal growth of vine as compared to vertical growth of the vine might be responsible for increase in shoot diameter. The minimum days taken to initiation of flowering (29.0) were recorded at 500 ppm ethrel and 500 ppm paclobutrazol (PBZ) treatment. The highest number of flowers (7.77 / shoot) was recorded at 500 ppm PBZ treatment followed by 500 ppm ethrel (7.73 / shoot). Similar results of earliest and promoted flowering due to application of PBZ was recorded by Singh (2000) in mango. Earlier and profuse flowering were also observed by application of ethrel in guava (Brahmachari *et al.*, 1996) and in mango (Vijaylakshmi and Srinivasan, 1998).

Fruiting and yield :

It is evident from the pooled mean data that the application of plant growth regulator treatments had significantly increased the fruit set, fruit retention days taken to harvesting and yield over control (table 2). The mean maximum fruit set (71.17%) and fruit retention (73.16%) were recorded at 500 ppm PBZ treatment as compared to mean minimum at control i.e. fruit set 57.50 percent and fruit retention of 65.03 percent. Similar beneficial effect of PBZ on fruit set and fruit retention was also recorded by Subhadrabandhu *et al.* (1999) and Albuquerque *et al.* (2000) in mango, which supports the present results. The application of PBZ increased cytokinin, t-ZR and DHZR content. The increase in these ribosyl derived cytokinins is reported to act positively in flower bud formation (Murti *et al.* 2001) Among the various plant growth regulator treatments attempted the mean highest yield 63.83 kg. Per plant (17.74 tonnes/ha) was recorded at 500 ppm paclobutrazol followed by 200 ppm NAA and 250 ppm PBZ treatments. However, the mean lowest yield of guava fruit 45.67 kg/plant (12.69 tonnes/ha) was obtained at control. The increase in yield by application of paclobutrazol and NAA may be attributed to the fact that partitioning of assimilates by PBZ and NAA more towards the fruit development which may leads to improvement in yield contributing characters like size and weight of fruit which ultimately increased the yield (Anbu *et al.,* 2001 and Sarkar *et al.,* 1998).

Thus, from the present investigation it may be concluded that among various plant growth regulators used under study, 500 ppm paclobutrazol (PBZ) is superior to the other plant growth regulators with regards to flowering, fruiting and yield of fruits of winter season guava cv. Sardar.

Table 2 : Effect of plant growth regulators on fruiting and yield of guava cv. Sardar (pooled mean of two year).

Treatments	Fruit set (%)	Fruit Retention (%)	Days taken to Harvesting	Yield (Kg/plant)	Yield (Tonnes/ha.)
Control (water spray) (T_1)	57.50 (71.12)	65.03 (82.13)	126.00	45.67	12.69
NAA 100 ppm (T_2)	67.25 (85.03)	68.92 (87.05)	118.50	56.00	15.56
NAA 200 ppm (T_3)	64.77 (81.80)	70.39 (88.64)	118.83	58.78	16.34
Ethrel 250 ppm (T_4)	62.51 (78.65)	66.81 (84.46)	117.50	49.17	13.66
Ethrel 500 ppm (T_5)	62.44 (78.58)	66.42 (83.86)	115.50	50.42	14.01
Paclobutrazol 250 ppm (T_6)	67.39 (85.14)	70.13 (88.38)	119.00	58.75	16.33
Paclobutrazol 500 ppm (T_7)	71.17 (89.57)	73.16 (91.58)	115.33	63.83	17.74
CCC 500 ppm (T_8)	65.81 (83.21)	60.54 (87.83)	120.33	53.90	14.98
CCC 1000 ppm (T_9)	69.73 (87.94)	69.91 (88.08)	117.16	55.08	15.31
Triacontanol 5 ppm (T_{10})	61.19 (76.77)	68.36 (86.36)	123.33	52.17	14.50
Triacontanol 10 ppm. (T_{11})	62.56 (78.75)	68.31 (86.31)	121.67	54.50	15.14
SE ±	0.83	1.06	0.70	0.90	0.25
CD at 5%	2.44	3.12	2.06	2.62	0.73

- Figure in parenthesis are reconverted values.

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