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INFLUENCE OF PACLOBUTRAZOL AND ETHEPHON ON FRUIT QUALITY OF 'ALLAHABAD SAFEDA' GUAVA

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ABSTRACT: Investigation on 4-year old plants of guava cv. Allahabad Safeda was conducted to find out the influence of gibberellin-inhibitor paclobutrazol (PBZ), [(2RS, 3RS)-1-(4-chlorophenyl)-4,4-dimethyl-2-(1,2,4 triazol-1-yl)pentan-3-ol] and ripening promoter ethephon [(2-chloroethyl) phosphonic acid], on fruit quality. Treatments in the form of foliar application were applied repeatedly during March 2007 and 2008 at 500 and 1000 ppm of each chemical on plants at 6x5m spacing. Fruit size and weight was recorded higher in all treated plants during both rainy and winter seasons as compared to untreated plants. Number of seed was counted highest in fruits obtained from control plants during both seasons. Pulp proportion was not affected significantly with treatments. The palatability rating and TSS of fruits during both rainy and winter season were recorded higher and acidity was recorded lower in treated plants as compared to untreated plants. Highest vitamin C content was noted in fruits obtained from ethephon 1000 ppm treated plants during rainy season and ethephon 500 ppm during winter season. Although, PBZ 500 ppm was found to increase the fruit size and weight particularly during rainy season but ethephon 500 ppm treated plants provided fruits with best eating quality.

Keywords: *Guava, paclobutrazol, ethephon, physical and chemical characters.*

Guava (*Psidium guajava* L.) is very important tropical as well as subtropical fruit crop of the world and is a potential crop of India. Due to its hardy, prolific bearing nutritive, highly remunerative nature, it surpasses many other fruit crops. Moreover this fruit can be grown satisfactorily even in adverse soil and climatic conditions. Although, the area and production of guava increased in last decade, but there is no significant increase in productivity. Presently the productivity of guava is much below the productive potential, due to lack of suitable planting system, planting of less number of trees per unit area, lack of canopy management practice etc. Therefore, the main emphasis should be laid on management of tree canopy in such a way that leads to accommodation of higher number of plans as to get higher production of good quality fruits per unit area. As guava plants exhibits extensive vegetative growth annually and are highly responsive to canopy modification, there is always a scope to increase production and income from a unit land area by using various cultural techniques and application of certain chemicals which restricts the vegetative growth without affecting the fruit quality. Therefore, the present investigations are aimed to study the effect of growth retardants on physico-chemical properties of guava fruits.

MATERIALS AND METHODS

Investigation on 4-year plants of guava cv. Allahabad Safeda was conducted to examine the effect Paclobutrazol (PBZ) and Ethephon on fruit quality. Treatments in the form of foliar application were applied repeatedly during March 2007 and 2008 at 500 and 1000 ppm of each chemical on plants at 6x5m spacing. Physical characters of both rainy and winter season crops were recorded in July-August and November-December, respectively during the year 2007 and 2008. The observations on physical characters of fruits were noted in terms of fruit size, fruit weight, seed

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number per fruit and pulp proportion was recorded. The quality characters of both rainy and winter season fruits were recorded in July-August and November-December, respectively during both the years. The data on quality characters of fruits were determined in terms of palatability rating, total soluble solids, acidity, pulp content and vitamin C.

Palatability rating in terms of general appearance, taste and flavour were recorded by panel of five judges on the basis of Hedonic scale 1-9 as follow.

Rating of fruits

Extremely desirable	9 marks,
Very much desirable	8 marks
Moderately desirable	7 marks,
Slightly desirable	6 marks
Neither like nor dislike	5 marks,
Slightly dislike	4 marks
Moderately dislike	3 marks,
Very much dislike	2 marks
Extremely dislike	1 mark

Total soluble solids content of juice was determined with the help of Bausch and Lomb hand refractometer in terms of degree Brix. The values of total soluble solids were corrected at 20°C with the help of temperature correction chart (AOAC, 1). Similarly, acidity and Vitamin C was determined according to the method of AOAC (1). Colour of the fruits was recorded with the help of Horticultural Colour Charts (Wilson, 6).

RESULTS AND DISCUSSION

Physical characteristics of guava fruits

The fruit size was significantly affected by different growth regulator treatments in both the seasons. During rainy season, the mean fruit size under all treatments was found increased compared to control. Maximum fruit length (4.98 cm) in PBZ 500 ppm and breadth (5.12 cm) in PBZ 1000 ppm was observed during rainy season (Table 1) and minimum fruit size (4.46 cm length and 4.56 cm breadth) was obtained in control plants. In winter season (Table 2), the maximum fruit length and breadth was noted with PBZ 1000 ppm (6.65 cm and 6.43cm) and minimum with untreated (6.29 cm and 6.23 cm) plants.

Fruit weight was also influenced by the application of growth regulators in both the seasons. During rainy season maximum fruit weight (76.33g) was observed with PBZ 500 ppm treatment and minimum fruit weight (62.33 g) was observed in untreated plants. However, in winter season fruits, plants sprayed with PBZ 1000 ppm exhibited highest (158.5 g) fruit weight and control plants gave lowest (128.4 g) fruit weight. Increase in fruit size and weight may be attributed to the increased supply of nutrient and photosynthates to the developing fruits at the expense of restricted vegetative growth.

PBZ and ethephon treatments also influenced the seed setting in guava fruits. The least number of seeds i.e. 212 was extracted from the rainy season fruits picked from the plants sprayed with the ethephon 1000 ppm and maximum seeds (257) were observed in fruit obtained from the plants kept as control. In a similar way maximum number of seeds (324) was extracted from control plants and minimum (266) in PBZ 1000 ppm treated plants during winter season. Reduction in seed number in fruits treated with chemicals may be due to adverse effect on pollen germination on the stigma. Treatments of growth regulators had non-significant effect on pulp proportion in both rainy and winter season crops.

Chemical characteristics of guava fruits

The palatability of fruits was judged highest in rainy season (Table 3) guava plants applied with ethephon 1000 ppm (6.42) and minimum (6.28) in control plants. In winter season (Table 4) ethephon 1000 ppm also makes the fruits more palatable with PLR of 8.11 followed by 8.09 in ethephon 500 ppm. Untreated plants provided fruits with least palatability rating of 7.95. The results obtained are in line with those of Yadav *et al.* (7), who obtained

Table 1 : Effect of PBZ and ethephon on physical characteristics of rainy season guava fruits.

Treatments (ppm)	Fruit length(cm)	Fruit breadth (cm)	Fruit weight (g)	Seed numbers	Pulp content (%)
P-500	4.98	5.01	76.33	232	89
P-1000	4.86	5.12	73.67	242	89.1
E-500	4.72	5.10	71.91	226	88.9
E-1000	4.86	4.93	70.79	212	88.6
Control	4.46	4.56	62.33	257	88.2
CD (P=0.05)	0.11	0.12	3.92	10.2	NS

Table 2 : Effect of PBZ and ethephon on physical characteristics of winter season guava fruits.

Treatments (ppm)	Fruit length(cm)	Fruit breadth (cm)	Fruit weight (g)	Seed numbers	Pulp content (%)
P-500	6.58	6.30	153.1	311	93.1
P-1000	6.65	6.43	158.5	266	94.1
E-500	6.47	6.35	154.3	294	94.0
E-1000	6.35	6.41	145.5	301	94.3
Control	6.29	6.23	128.4	324	93.9
CD (P=0.05)	0.11	0.13	10.4	12.1	NS

Table 3 : Effect of PBZ and ethephon on chemical characteristics of rainy season guava fruits.

Treatments (ppm)	Palatability rating (out of 9)	Total soluble solids (%)	Acidity (%)	Vitamin C (mg/100g pulp)	Fruit colour
P-500	6.36	9.34	0.17	131.94	YGG 144 D
P-1000	6.33	9.49	0.169	135.85	GG 142 B
E-500	6.37	9.5	0.174	138.07	Y 144 C
E-1000	6.42	9.6	0.172	140.04	Y 12C
Control	6.28	9.33	0.176	132.94	GG 142 B
CD (P=0.05)	0.11	0.14	0.04	5.22	-

Table 4 : Effect of PBZ and ethephon on chemical characteristics of winter season guava fruits.

Treatments (ppm)	Palatability rating (out of 9)	Total soluble solids (%)	Acidity (%)	Vitamin C (mg/100g pulp)	Fruit colour
P-500	8.03	10.25	0.211	163.1	GG 142 B
P-1000	8.04	10.43	0.202	164.3	YGG 149 A
E-500	8.09	10.43	0.214	168.2	YG 150C
E-1000	8.11	10.7	0.2	166.4	YGG 154 B
Control	7.95	10.2	0.23	163.83	GG 142 B
CD (P=0.05)	0.04	0.14	0.01	2.98	-

maximum palatability rating of guava fruits with ethrel 1000 ppm (8.1 out of 10). In a similar way the palatability was observed maximum under ethephon treatment (1000 ppm) when treatments of ethephon and PBZ @500 and 1000ppm each were given to guava cv. Allahabad Safeda (Singh and Bal, 3).

In rainy season, the total soluble solids were found maximum i.e.9.60 % with ethephon 1000 ppm followed by 9.50 % in ethephon 500 ppm treated plants. The fruits taken from control plants exhibits lowest (9.33 %) TSS content. Winter season fruits of guava gave highest TSS i.e.10.70 % in ethephon 1000 ppm treated plants. Fruits taken from untreated plants gave minimum TSS of 10.20 %. Acid content in fruits was recorded highest in plants kept as control in both rainy (0.176 %) and winter (0.23 %) season crops. The plants sprayed with PBZ 1000 ppm in rainy season and ethephon 1000 ppm in winter season contained fruis with minimum acid content of 0.169 and 0.2 %, respectively. The results obtained are in similar lines with Singh *et al.* (2) and Yadav *et al.* (7) who reported no significant effect of ethrel on the acidity of guava fruits. The results are in line with that of Suleman et al (5) who sprayed ethephon during May and reported that the acidity was significantly reduced by higher dose of ethephon during both rainy and winter season fruits.

Ethephon treatments increased the vitamin C content in rainy as well as winter season fruits. Maximum content of vitamin C was noticed in rainy season guava fruit (140.04 mg/ 100 g fruit pulp) obtained from trees treated with ethephon 1000 ppm and 168.2 mg/ 100 g fruit pulp in ethephon 500 ppm treatment in winter season. The minimum vitamin C content (131.94 mg/100g) was estimated in rainy season and 163.1 mg/ 100 g fruit pulp in winter season in plants treated with PBZ 500 ppm application. The observations on estimation of vitamin C are not coincide with the results of Singh (4) who recorded the higher vitamin C content in fruits of rainy season guava cv. Sardar received from plants sprayed with PBZ 500ppm compared to other treatments.

The colour of rainy season fruits (Table 3) was found to be improved with both 500 and 1000 ppm ethephon treatments i.e. yellow green (Y 144 C) and yellow (Y 12 C), respectively. Fruit colour of PBZ treated plants was less developed compared to ethephon. In PBZ treatments, the colour of the fruits ranged from light yellow green (YGG 144 D) to light green (YGG 142 B). The least colour development of the fruits i.e. light green (GG 142 B) was noted in the fruits in untreated plants under paclobutrazol treatment. Similarly in winter season (Table 4), both the ethephon treatments showed better colour development of fruits i.e. yellow to yellow green as compared to paclobutrazol and control. Fruit colour improvement in ethephon treatments may be due to ripening enhancing properties of ethephon.

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