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RESEARCH PAPER

Response of different plant bioregulators for retaining marketability of guava (*Psidium guajava* L.) fruits cv. CISH G-1 stored under ambient temperature

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Abstract : Guava (*Psidium guajava* L.) is a highly perishable fruit with intense metabolic activity after harvest. Thus, novel methods need to be explored for increasing its shelf life. PGRs (Plant growth regulators) are known to modify physiological processes within a plant. Guava fruits (cv. CISH G-1) at greenish yellow stage were dipped in four different concentrations of gibberellic acid and benzyl adenine after harvest in February 2007 and were subsequently stored under ambient temperature. A wide variation was observed in various physico-chemical parameters studied. GA_3 100ppm (T_3) was found to be best for improving significantly, length, breadth, specific gravity, CPLW per cent and acidity of guava fruits. BA 50ppm (T_4) was beneficial for enhancing TSS and GA_3 50ppm (T_2) retained maximum ascorbic acid in guava fruits. These treatments were found to be effective for storage up to 8 days after harvest even under ambient condition.

Key Words : PGRs, Shelf-life, Guava (*Psidium guajava* L.)

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INTRODUCTION

Guava (*Psidium guajava* L.), a native of tropical America, was introduced in India in the seventeenth century and is grown in almost all parts of tropical and subtropical regions occupying fourth position in terms of both, production and acreage. Guava is a climacteric fruit showing a typical increase in respiration and subsequent ethylene production during ripening (Brown and Wills, 1983 and Ali and Lazan, 1997). Thus, storage of guava fruits is a problem as the quality deteriorates very fast due to its climacteric nature. However, post harvest life of guava fruits at lower temperature (5 to 10° C) increases by about 2 to 3 weeks in storage (Yahia, 1998). Considering its increasing commercial importance and heavy losses during storage after harvesting, it is essential to investigate methods for prolonging shelf life and improvement of quality of guava fruits during storage. Phytochemicals *viz.*, plant bio regulators at different concentration have been reported to enhance shelf life and quality of different fruits during storage *viz.*, papaya (Mehta *et al.*, 1986), mango (Singh and Singh, 1992), guava (Sharma *et al.*, 2002). Keeping in view the above facts, a study was conducted in the Horticulture Laboratory of the Department of Applied Plant Science, Babasaheb Bhimrao Ambedkar University, Lucknow during 2007 to study the effect of PBR's on the physical and biochemical changes in guava fruits during storage periods and their effect on the shelf-life

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of guava fruits under ambient storage.

MATERIAL AND METHODS

The investigation was carried out in the Horticulture Laboratory of the Deportment of Applied Plant Science, Babasaheb Bhimrao Ambedkar University, Vidya Vihar Raebareli Road, Lucknow.

Collection of fruits :

Fully mature guava fruits (cv. CISH-G-1) at greenish yellow stage were harvested by hand in the month of February from research farm of Central Institute for sub-tropical Horticulture, Raebareli Raod Campus, Lucknow. Individual fruits were dipped in the PGR solutions as per the following treatments: T_1, Control, T_2 (GA_3 50 ppm), T_3 (GA_3 100 ppm), T_4 (BA 50 ppm) and T_5 (BA 100 ppm).

Preparation of the growth regulators solution :

GA_3 (Gibberellic acid) :

A stock solution of 2000ppm was prepared and 50ml of this stock solution was drawn and diluted to 1ltr. with distilled water in order to prepare a 100ppm solution. 25ml of the same stock was drawn and diluted to 1 ltr. with distilled water to prepare a 50ppm solution of GA_3 (Ranganna, 1986).

BA (6-Benzyladenine) :

A stock solution of 2000ppm was prepared and 50ml of this stock solution was drawn and diluted to 1ltr. with distilled water in order to prepare a 100ppm solution and 25ml of the same stock solution was drawn and diluted to 1ltr. with distilled water to prepare a 50ppm solution of BA (Ranganna, 1986).

The fruits were dipped in growth regular solution containing teepol as surfactant for 10 minutes and dried at room temperature. Fruits were treated individually and stored under ambient temperature (20 ± 4ºC) condition.

The observations were recorded for the physico-chemical parameters at 0, 4 and 8 days interval at ambient temperature until the fruits retained their marketable quality. Length (cm) and breadth of fruits (cm) was measured with the help of digital vernier calipers (Mitutoyo make, Japan), cumulative physiological loss in weight (CPLW %) (Ranganna, 1986) and specific gravity, and bio-chemical parameters were acidity, ascorbic acid (Ranganna, 1986) and total soluble solids (TSS) were determined by using a hand refractometer (0-30ºB, Erma Japan). Acidity in the fresh fruit of guava was determined by titrating it against 0.1 N sodium hydroxide solution using phenolpthalein as an indicator for acidity estimation. The ascorbic acid in fresh fruit per pulp was estimated using 2, 4-dichlorophenol indophenol dye by titration method as reported by (Ranganna, 1986).

RESULTS AND DISCUSSION

A wide variation was observed in various physico-chemical parameters of different treatments under ambient storage condition. Fruit length was found to be decreased in all treatments at 8 days of storage (Table 1). Maximum

Table 1 : Effect of different PBR concentration on fruit length (cm), breadth (cm), specific gravity and physiological loss in weight (%) of Guava (*Psidium guajava* L.) cv. CISH G-1

Treatments	Length (cm)			Breadth (cm)			Specific gravity			Physiological loss in weight (%)		
	0 day	4 days	8 days	0 day	4 days	8 days	0 day	4 days	8 days	0 day	4 days	8 days
T_1- Control	5.16	4.43	4.33	5.82	5.4	4.89	1.04	0.97	0.9	0	7.83	10.67
T_2- GA_3 50ppm	5.14	4.55	4.41	5.99	5.57	5.22	1.03	0.99	0.95	0	7.27	10.51
T_3- GA_3 100ppm	5.41	5.19	5.1	6.04	5.97	5.79	1.05	1.01	0.98	0	7.15	10.3
T_4- BA 50ppm	5.3	4.82	4.78	5.86	5.63	5.58	1.04	0.98	0.96	0	7.3	10.37
T_5- BA 100ppm	5.36	4.87	4.72	5.9	5.57	5.27	1.09	1.01	0.99	0	7.18	10.33
C.D. (P=0.05)	0.08	0.12	0.4	0.03	0.06	0.23	0.0	0.05	0.0	0.0	1.04	1.17
S.E. ±	0.04	0.06	0.19	0.02	0.03	0.11	0.0	0.02	0.0	0.0	0.48	0.54

GA_3 = Gibberellic acid BA = 6-Benzyladenine

Table 2 : Effect of different PBR concentration on fruit TSS (^{0}Brix), acidity, and ascorbic acid of Guava (*Psidium guajava* L.) cv. CISH G-1

Treatments	TSS (^{0}Brix)			Acidity			Ascorbic acid		
	0 day	4 days	8 days	0 day	4 days	8 days	0 day	4 days	8 days
T_1- Control	11.07	12.7	13.63	0.49	0.44	0.35	210.21	207.64	203.15
T_2- GA_3 50ppm	10.5	11.9	12.77	0.51	0.48	0.36	208.93	210.85	206.41
T_3- GA_3 100ppm	10.03	13.15	12.3	0.5	0.49	0.38	213.42	210.6	205.85
T_4- BA 50ppm	11.7	13.93	12.5	0.51	0.46	0.36	213.68	210.09	206.36
T_5- BA 100ppm	11.2	12.93	13.43	0.48	0.45	0.37	213.29	212.91	205.59
C.D. (P=0.05)	2.76	3.55	2.78	0.0	0.0	0.0	18.49	10.34	7.66
S.E. ±	1.29	1.66	1.29	0.0	0.0	0.0	29.67	22.18	3.57

GA_3 = Gibberellic acid BA = 6-Benzyladenine

decrease in fruit length (4.33cm) was in treatment T_1 (control) and minimum decrease in fruit length (4.41cm) was in treatment T_3 (GA_3 100ppm) up to 8 days of storage. Fruit breadth was observed in all treatments in 8 days of storage. Minimum decrease in fruit breadth (5.22cm) was in treatment T_3 (GA_3 100ppm) and maximum decrease in fruit breadth (4.89cm) was in treatment T_1 (control) up to 8 days of storage (Table 1). The maximum decrease in fruit size was recorded in treatment T_1 (control) at storage periods. These results are in accordance with the finding of Sharma *et al.* (2002) in winter guava where it was found that treatment of GA_3 100ppm recorded minimum decreases in fruit size as compared to other treatments, similar results have been obtained even in lemon by Sindhu and Singhrot (1993) and in Asian pear by Mahajan *et al.* (2004). Specific gravity was decreased in all treatments in 8 days of storage. Minimum decrease in specific gravity (0.98) was in treatment T_3 (GA_3 100ppm) and maximum specific gravity (0.90) decreased in treatment T_1 (control) up to 8 days of storage. Similar observations were recorded in guava by Kumar *et al.* (2001). Specific gravity of guava fruits increased with increasing storage periods. It has been observed that maximum cumulative physiological loss in weight (CPLW %) (10.67%) was in treatment T_1 (control) and minimum cumulative physiological loss in weight (CPLW %) (10.30%) was found treatment T_3 (GA_3 100ppm) up to 8 days of storage. These results are in accordance with a similar study in papaya fruits by Rajkumar *et al.* (2005) in which fruits were treated with GA_3 @ 150ppm for 5 minutes had effectively reduced the moisture losses and maintained higher fruit weight even at 9 days of storage and Sharma *et al.* (2002) also got the same results in winter guava. Mehta *et al.* (1986) suggested that GA_3 @ 100ppm significantly suppress the succinate activities of malate-dehydrogenase during post-harvest ripening of papaya and thus, retard ripening. Rajkumar *et al.* (2005) reported that fruits treated in GA_3 or $CaCl_2$ had the reduced the rate of respiration and other derivative physiological processes that resulted in minimum loss of weight. Similar findings were reported for mango (Moottoo, 1991). There was an increase in total soluble solid (TSS) at 4 days of storage and there after values decreased in all treatments. Maximum TSS (13.63ºB) was found in treatment T_1 (control) and minimum TSS (12.5ºB) was found in treatment T_4 (BA 50ppm) up to 8 days of storage (Table 2). These results are in accordance with a similar study in guava by Hiwale and Singh (2003) and in grapes by Kumar *et al.* (2004). Balakrishnan (1998) suggested that the maintenance of TSS in stored fruits may be due to the decline in hydrolytic enzymes that are associated with fruit ripening. Acidity was decreased during 8 days in respect to treatment under storage condition. Minimum acidity (0.38%) decreased in treatment T_3 (GA_3 100ppm) and maximum acidity (0.35%) decreased in treatment T_1 (control) up to 8 days of storage. The result is in accordance with a similar study in sapota by (Banik *et al.*, 1988) in which fruits treated with GA_3 @ 100ppm recorded the highest acidity which indicates slow ripening and similar results have been found by (Shindu and Singhrot, 1993) in which fruits were treated with GA_3 @ 200ppm recorded the increase in acidity of the fruits during storage of 21 days and there after decrease in acid content was observed till the end of storage period up to 45 days. (Rajkumar *et al.*, 2005) titrable acidity of papaya fruits decreased with the advancement of ripening process regardless of post-harvest treatment. Fruits treated in GA_3 @ 100ppm and $CaCl_2$ @ 2 per cent has maintained higher titrable acidity value at the end of 9th day. This suggested that post-harvest treatments with GA_3 or calcium could be ascribed for delay in the fruit deterioration process. Similar observations were reported for sapota by (Gautam and Chundawat, 1989). There was also a decrease in ascorbic acid during 8 days of storage. Minimum ascorbic acid (206.41mg/100g) decreased in treatment T_2 (GA_3 50ppm) and maximum ascorbic acid decreased in treatment T_1 (control) 203.15mg/100g up to 8 days of storage. Similar trend obtained by (Sharma *et al.*, 2002) who reported that minimum ascorbic acid decreased was observed in GA_3 50ppm (197.1mg/100g) and maximum ascorbic acid decreased in control (190.5mg/100g). (Rajkumar *et al.*, 2005) ascorbic acid content of the increased as the period of storage also increased in all the treatments. Fruits treated with GA_3 @ 100ppm recorded the highest acidity. Which is indicates slow ripening. This was in line with the findings of (Banik *et al.*, 1988).

Conclusion :

The main achievement of present investigation entitled "Response of different plant bioregulators for retaining marketability of guava (*Psidium guajava* L.) fruits cv. CISH G-1 stored under ambient temperature" conducted is that quality grade guava fruits can be obtained by providing suitable treatments of plant bio- regulators. GA_3 100ppm (T_3) was found to be good for retaining significant, length, breadth, specific gravity, CPLW per cent and acidity of guava fruits. The BA 50ppm (T_4) was found beneficial for enhancing TSS and GA_3 50ppm, (T_2) retained maximum ascorbic acid in guava fruits. These treatments were found to be effective for storage up to 8 days even under ambient condition.

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