Indian J. Hort. 68(4), December 2011: 547-550

Response of post-harvest chemical treatments on shelf-life and quality of custard apple cv. Balanagar

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ABSTRACT

The custard apple fruits were subjected to various post-harvest chemical treatments, *viz.*, GA_3 50 ppm, NAA 100 ppm, kinetin 10 ppm and control (no chemical). The results revealed that NAA 100 ppm as well as GA_3 50 ppm were found most effective in extending the shelf-life, respectively over control (by 1.75 and 1.42 days), while they helped in maintaining the marketability and tended to reduce the fruit weight loss. The level of acidity and ascorbic acid decreased, while reducing and total sugars increased with advancement of storage period. Application of NAA 100 ppm was more economical than other chemicals.

Kay words: Custard apple, plant growth regulator, shelf-life, quality.

INTRODUCTION

Custard apple (*Annona squamosa* L.) belongs to family Annonaceae is one of the finest fruits gifted to India by tropical America. Area under custard apple is reported to be about 53,000 ha in India. Andhra Pradesh is the major custard apple growing state along with Tamil Nadu, Orissa, Assam, Uttar Pradesh, Bihar and Rajasthan, which produce nearly, 75,000 tonnes of these fruits. However, well organized orchards can be seen only in Gujarat (0.02 lac ha) area with an annual production of 0.15 lac MT mostly from the arid zone, *viz*., Saurashtra, north and middle Gujarat. While in south Gujarat, custard apple is found in 60,000 ha cultivated in Bharuch, Narmada, Valsad and Dang districts with the production of 0.46 thousand MT (Anon, 2).

Custard apple is one of the most delicious and highly perishable fruit. It has its delightful taste, flavour, moderate price in markets and a high nutritional status. Overall the importance of fruits in domestic and export market as fresh fruits and processed products. Under ordinary condition, fruits can keet well only for 3-4 days after harvest. The physiological changes in fruit occur continuously after harvest. By reducing their events, the shelf-life of mature fruits can be effectively increased. The cold storage is not feasible for custard apple because at low temperature, the blackening or discolouraiton of fruits is increased. Extension of shelf-life may be possible by checking the transpiration rate, respiration rate and microbial infection. Certain post harvest chemical treatment like GA_3 have been reported to increase the shelf-life and reduce spoilage in custard apple (Brown *et al*., 4; Tsay and Wu, 13; Tuwar and Ughreja, 14). The other chemicals like NAA have also been reported to retard ripening by extending shelf-life of custard apple (Haribabu *et al*., 6). However, information on above aspects of custard apple is scanty, therefore, present experiment was undertaken to study the influence of different post-harvest chemical treatments on shelf-life and quality.

MATERIALS AND METHODS

The study was carried out in the P.G. Research Laboratory of the Department of Horticulture, N.M. College of Agriculture, Navsari Agricultural University, Navsari during the winter seasons of 2005-2007. Fully mature fresh custard apple fruits of cv. Balanagar were harvested from the Krushi Vigyan Kendra, Chasvad, Dist. Bharuch (BAIF). Fruits of uniform size, colour and free from injuries were selected for the study. The fruits were then randomly separated into lots of ten fruits, for each treatment. The chemicals tried were GA_3 50 ppm, NAA 100 ppm, kinetin 10 ppm and control (no chemical). For application of PGRs, fruits were dipped in respective chemical solutions for 10 min. and allowed for air-drying for 30 min. They were then kept in the laboratory which had a mean temperature between 25 to 28°C and relative humidity ranging from 44 to 49 per cent. The observations on PLW, ripening, shelf-life, marketability, spoilage, fruit pressure, TSS, reducing and total sugars, acidity and ascorbic acid content of fruits were recorded at the interval of two days. The spoilage was recorded by counting the number of fruits showing the decay symptoms, rotting and rancid flavour and expressed as percentage of spoil fruits over total number of fruits. Fruit pulp was prepared and homogenized in a mixer and then used

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for chemical analysis described by Ranganna (10). All the data were analysed statistically using Factorial Completely randomized Design (FCRD) with three replications.

RESULTS AND DISCUSSION

Physiological loss in weight (%) of fruits as influenced by different chemical treatments during storage studies are presented in Table 1. The PLW of fruits was increased with increase of storage period irrespective of treatments. However, the increase has been at a reduced rate in all the treated fruits as compared to control. Though NAA 100 ppm as well as GA_3 50 ppm gave promising results and reduced the physiological loss in weight of fruits during storage period. Reduced weight loss by both the treatments may be due to reduced rate of respiration and transpiration, delayed ripening by opposing action of ethylene produced during ripening. The present observation is in conformity with the results reported Anon (1) in custard apple (Anon, 1).

The data pertaining to shelf-life as influenced by chemical treatments were recorded during the storage are shown in Table 2. The data revealed that the fruits treated with NAA 100 ppm as well as GA_3 50 ppm remained marketable for maximum shelf-life (7.33 and 7.00 days, respectively) as compared to control (5.58 days). Thus, these chemicals extended the shelf life by 1.75 and 1.42 days respectively over control. This extended shelf life has been the consequence of slow ripening changes like reduced weight loss and other physiological as well as biochemical changes in fruits. This finding was in line with Anon (1) and Haribabu *et al*. (6) in custard apple fruits.

Data relating to spoilage percentage as influenced by different chemical treatments have been presented in Table 2. It can be seen from the data that on 8th day of storage, significantly lowest percentage of spoilage were recorded in NAA 100 ppm and GA_3 50 ppm respectively as compared to maximum in control (78.33%). This may be due to treatment effect with retarded ripening and reduced weight loss through controlled transpiration and respiration rates and delayed the disintegration of ripening. Similar results were recorded by Gautam and Chundawat (5) in sapota and Patel *et al.* (8) in guava.

Data pertaining to reducing sugar as influenced by different chemical treatments are presented in Table 3. The data revealed that the content of reducing sugar was found to be highest in the fruits treated with NAA 100 ppm as compared to control. The increased accumulation of reducing sugar might be due to function of starch metabolism, which decline later on during storage might be due to their rate of

Table 1. Effect of post-harvest chemical treatments on PLW (%), shelf-life (days) and spoilage (%) in custard apple fruits cv. Balanagar.

Treatment	PLW (%)					Shelf-life (days)	Spoilage (%)				
	Storage period (days)						Storage period (days)				
	2nd	4th	6th	8th	10th		2nd	4th	6th	8th	10th
No chemical	6.61	9.70	13.47	24.26	29.31	5.58	0.83	8.33	35.00	78.33	100.00
$GA_3$50 ppm	5.39	8.37	11.55	20.60	26.02	7.00	0.00	0.00	10.00	63.33	95.83
NAA 100 ppm	5.09	7.85	10.97	20.09	23.85	7.33	0.00	0.00	5.00	60.00	96.66
Kinetin 10 ppm	6.22	9.54	13.12	23.91	28.37	5.66	0.00	7.50	31.66	74.16	100.00
CD at 5%	0.19	0.30	0.30	0.54	0.54	0.17	0.41	1.25	1.55	1.50	1.10

Table 2. Effect of post-harvest chemical treatments on reducing sugar (%) and total sugar (%) in custard apple fruits cv. Balanagar.

Treatment	Reducing sugar (%)					Total sugars (%)				
	Storage period (days)					Storage period (days)				
	2nd	4th	6th	8th	10th	2nd	4th	6th	8th	10th
No chemical	11.74	13.51	16.18	17.60	16.94	13.61	14.23	16.58	19.57	19.08
$GA_3$50 ppm	11.82	13.73	16.25	17.75	17.18	13.85	15.01	17.65	20.03	19.58
NAA 100 ppm	11.96	13.84	16.34	17.91	17.35	13.95	15.16	18.06	20.33	19.73
Kinetin 10 ppm	11.81	13.62	16.18	17.71	17.03	13.59	14.28	16.68	19.73	19.14
CD at 5%	0.10	0.13	0.11	0.16	0.29	0.24	0.60	0.30	0.25	0.38

Table 3. Effect of post-harvest chemical treatments on titrable acidity (%) and ascorbic acid (mg/100 g pulp) in custard apple fruits cv. Balanagar.

Treatment	Titrable acidity (%)					Ascorbic acid (mg/100 g pulp)				
	Storage period (days)					Storage period (days)				
	2nd	4th	6th	8th	10th	2nd	4th	6th	8th	10th
No chemical	0.41	0.39	0.27	0.23	0.19	20.19	17.96	15.12	14.71	13.49
GA_3 50 ppm	0.39	0.38	0.24	0.21	0.17	19.66	16.19	14.41	14.08	13.87
NAA 100 ppm	0.38	0.37	0.24	0.20	0.17	19.48	16.16	14.57	13.93	14.03
Kinetin 10 ppm	0.40	0.39	0.27	0.22	0.18	20.14	16.79	15.04	14.41	13.57
CD at 5%	0.01	0.01	0.01	0.01	0.01	0.24	0.36	0.21	0.22	0.23

consumption for respiration and other energy sources of fruits. Such information has been reported by Broughton and Tan (3) in custard apple fruits.

Data relating to total sugars percentage as influenced by different chemical treatments have been presented in Table 3. The data revealed that the total sugar percentage were maximum in fruits treated with NAA 100 ppm and GA_3 50 ppm as compared to control. The level of total sugars increased up to eating ripeness and then decreased up to the end of shelf-life. This may be due to consequence of release of sugars by the hydrolysis of starch reserve during the post harvest stage. The higher rate of acceleration in NAA treated fruits may be due to retardation in rate of normal changes of polysaccharides to total sugars because of its low rate of respiration and oxidation in treated fruits reported by Roe and Bruemmer (11) and Yuvraj *et al*. (14) in mango fruits.

Data pertaining to titrable acidity as influenced by different chemical treatments are presented in Table 3. The various treatments of retardant chemicals affected titrable acidity significantly in custard apple fruits. During the storage studies, the lowest acidity content was recorded with the fruits treated with NAA 100 ppm as well as GA_3 50 ppm as compared to control. This may be due to the utilization of acid in the respiratory process or conversion of acid into sugar. The similar findings have been also advocated by Paull (9), and Tuwar and Ughreja (14) in custard apple fruits.

The perusal of the data (Table 4) revealed that the ascorbic acid (vit-C) (mg/100 g pulp) showed a constant decrease during the storage period. At the end of storage period, NAA 100 ppm treated fruits retained lower content of ascorbic acid may be due to more utilization of organic acid in the process of respiration. NAA has showed down the respiration and therefore lower level of ascorbic acid in treated fruits was observed. These findings are in proximity with those of Khedkar *et al*. (7), and Broughton and Tan (3) in custard apple.

Among all the treatments attempted as post harvest dip, NAA 100 ppm as well as GA_3 50 ppm were found effective and regarded effective treatments not only in extension of shelf-life but also in reduction of post harvest losses without adversely affecting the quality of custard apple fruits cv. Balanagar.

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Received: November, 2009; Revised: October, 2011; Accepted : November, 2011