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ORIGINAL ARTICLE

Impact of post-harvest application of chemicals on shelf life of winter guava

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ABSTRACT
Present studies were designed to evaluate the effect of post-harvest applications of certain chemicals on shelf life of guava during the period 2020-2021. Three concentrations of NAA viz. 100ppm, 200ppm and 300ppm (designated as T_1, T_2 and T_3, respectively), Benzyl adenine @ 10 ppm, 20ppm and 30ppm (T_4, T_5 and T_6, correspondingly), Potassium Permanganate @ 1%, 1.5% and 2% (T_7, T_8 and T_9, respectively) Hydrogen peroxide @ 1%, 2% and 3% (T_{10}, T_{11} and T_{12}) while different concentrations of boric acid @ 0.1%, 0.2% and 0.3% were treated asT_{13}, T_{14} and T_{15}, respectively and T_0 was considered as control in which fruits were dipped in normal water. and kept under ambient storage conditions in School of Agriculture, Lovely Professional University, Jalandhar, Punjab. Treated fruits were stored under ambient conditions and analyzed at interval of 3 days i.e., 3rd, 6th, 9th days. The results revealed that various treatments helped guava fruits in retaining better and improved physical and biochemical characters of fruits. Important parameters like fruit spoilage and physiological loss in weight was significantly minimized in different treatments as compare to control. Almost all characters like fruit size, palatable rating, firmness, ascorbic acid and acidity continuously decreased during storage while total soluble sugars and total sugars (reducing and non-reducing) increased up to 6th day of storage but on the contrary, both has shown decreasing trend on evaluation of 9th day.
Key Words: Physical and biochemical characters, Post-harvest treatments, Spoilage, Storage

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INTRODUCTION

The genus Psidium of family *Myrtaceae* consists of 150 species of shrubs, small trees and is one of the most popular tropical and subtropical climacteric fruit. About 20 species have edible fruit. Among these, the most commonly cultivated is guava (*Psidium guajava* L.) was introduced in India in the 17th century by Portuguese from Latin America. In India, total fruit production is about 97.35 thousand MT and productivity is about 15.3 thousand MT [1]. At present, guava is the 5th most important fruit crop in India after banana, mango, citrus and papaya. The annual production of 4054 thousand MT from 256 thousand hectares. In the production of guava India rank 1stfollowed by China and Thailand. In India, Uttar Pradesh is leading state producer of guava with an annual production of 928.44 thousand MT from 49 thousand hectares followed by M.P, Bihar and Maharashtra [1]. In north India, the agro-climatic condition is quite suitable for commercial cultivation of guava and the farmers are looking for enhancing their income. The guava has an important place among the tropical fruits but grown widely in the sub-tropical region also. In Punjab total production of fruit is about 1908.8 thousand MT From the area of about 90.6 thousand hectares [1]. Among the fruit production, guava production in Punjab is about 195.60 thousand MT from an area of about 8.69 thousand hectares. The leading guava producing districts in Punjab are Patiala, Ludhiana and Jalandhar. In Jalandhar total production is about 12.56 thousand MT from an area of about 0.56 thousand ha. Guava is highly perishable and due to its high metabolic activity; it ripens very quickly just after harvest. In between 3-4 days after harvest, the fruit attains overripe and loses its texture and quality at room temperature. Due to its (guava) perishable nature, it is highly

susceptible to bruising and mechanical injuries. It attributed that 20-25 % post-harvest loss in guava. It has been suggested post-harvest losses in guava can be reduced by adopting technologies for keeping quality through proper harvesting, post-harvest handling, proper packaging, treatments with chemicals [2]. To maintain the supply of quality fruits for the long term in a domestic and distant market, delaying the softening process which ultimately leads to improving the shelf-life to facilitate long-distance transportation and increase marketable period. And this delaying of softness process can be achieved through using different postharvest chemical treatments.

It has been observed that storage under low temperatures has been used to delay ageing or ripening, efficiently reducing postharvest decay to maintain quality by slowdown the enzymatic activities [3].

MATERIAL AND METHODS

Experimental Location and pre-cooling: Current investigations were carried out at department of Horticulture in School of Agriculture at Lovely professional university, Phagwara (Punjab). The fruits from untreated guava trees were collected and kept it at room temperature for pre-cooling under ambient conditions.

Treatments, design and storage: There was total 16 treatments with 3 replications which includes different plant growth regulators and chemical compounds. Then guava fruits were dipped in prescribed chemicals of various concentrations for 4-5 minutes. After that these were stored in Corrugated Fiber Board boxes (2 kg capacity) and analysis was carried out after three days interval viz. 3rd, 6th and 9th days.

Recording of observations: Guava fruit size (length and diameter) was recorded vernier calliper and observations were expressed in cm while firmness was measured by Penetrometer (Model no. FT-327) and expressed in unit-Newton (N). To evaluate palatable rating, fruits were judged by panel of 5 judges and following scale is used. Fruits are considered to be excellent is marks are obtained to the tune of 25-30, similarly good quality (20-24), Fair quality (15-19), Poor quality (10-14) and if marks are less than 10 then very poor quality of the fruit, is considered. Recording of physiological loss in weight, was done with help of following formula [4]

$$\text{Physiological loss in weight (\%)} = \frac{\text{Initial Weight} - \text{Final Weight}}{\text{Initial Weight}} \times 100$$

Similarly, fruit spoilage percentage (rotten fruits or turn unfit for consumption) was calculated by counting physically [4].

$$\text{Spoilage (\%)} = \frac{\text{Number of spoiled fruits}}{\text{Total Number of fruits}} \times 100$$

Bio-chemical character of fruits like total soluble solids were noted by using hand refractometer and expressed as °Brix [4]. Other parameters like acidity, ascorbic acid, total sugars and reducing sugar was calculated by method as described by [5].

Analysis of data: The experiment was carried out in two factor Factorial Completely Randomized Design (CRBD) and data was scrutinized by open-source software –***OPSTAT (operational status). CD was calculated at 5% level of significance.***

RESULTS AND DISCUSSION

Fruit length:

The data concerning various treatment, storage periods with their interaction on fruit length of guava under ambient condition, are displayed in table-1. Various application exerted significance influenced towards fruit length. Maximum fruit length (7.10cm) was recorded in BA30ppm (T_6), which was statically at par with (6.90cm) NAA 200 ppm (T_2), NAA 300 ppm (T_3), on 3rd day of storage. On 6thday these value (7.10 cm ,6.90cm and 6.90cm) decreased up to 7.00cm (T_6), 6.70 cm (T_2), 6.70 cm (T_3), respectively. On 9th day of storage BA30 ppm showed maximum fruit length (6.80 cm) which was statically at par with (6.50cm) NAA 200 ppm (T_2), NAA 300 ppm (T_3). On all days of storage untreated guava recorded minimum fruit length (6.20 cm, 5.80cm, 5.11cm respectively). Fruit length decreased on advance of storage. Guava fruit length decreased due to spoilage effect [6].

Fruit diameter:

The data concerning various treatment, storage periods with their interaction on fruit diameter of guava under ambient condition, are displayed in table-1. Various application exerted significance influenced towards fruit diameter. Maximum fruit diameter (5.8cm) was recorded in BA10 ppm (T_4), which was statically at par with $H_2O_2$1% (T_{10}), NAA 200ppm (T_2), H_2O_2 3%(T_{12}), Boric acid 0.1% on 3rd day of storage (5.70cm,5.60cm,5.60cm and 5.60cm, respectively). On 6thday these value (5.80cm,6.70cm and 5.60cm) decreased up to 5.70cm (T_4), 5.5cm(T_{10}), 5.5cm (T_2), respectively. Similarly, 9th day of storage

NAA200 ppm (T_2), showed maximum fruit diameter (5.30cm) which was statically at par with) NAA 300ppm (T_3), $H_2O_2$1% (T_{10}), (5.30cm, 5.10cm, respectively). On all days of storage untreated guava recorded minimum fruit length (5.00cm, 4.60 cm, 4.00cm respectively). Fruit diameter decreased on advance of storage. Fruit diameter decreased due to spoilage effect [6].

Physiological loss in weight.

The data concerning various treatment, storage periods with their interactions on fruit physiological loss in weight percentage of guava under ambient condition are displayed on table-1. Various application exerted significance influenced towards fruit PLW%. On 3rd day minimum PLW% (0.26%) was observed in NAA 200 ppm which was statically at par with NAA 300ppm (T_3). On 6th day NAA 200 ppm (T_2) showed minimum PLW% (1.56%), followed by BA 20ppm (T_5) and NAA100 ppm (T_1) (2.19% and 2.26% respectively), whereas the maximum PLW% observed in control (T_0) (37.5%). On 9th day of storage, this value (1.56%) increased up to (2.53%) which was recorded as minimum PLW and it was followed by BA 20 ppm (T_5), which was statically at par with NAA 300 ppm (T_3) (4.43%). While throughout storage period i.e., 3rd,6th and 9th day control (T_0) showed highest PLW (2.27%, 6.45%, 9.85% respectively). Physiological loss in weight might be due to loss of moisture by transpiration and respiration [6].

Fruit spoilage:

The date concerning various treatments, storage periods and their interactions on fruit spoilage percentage of guava under ambient conditions, are exhibited in table-1. It has been pointed out that various treatments have exerted significant influence towards fruit spoilage. No spoilage was seen in all treatment up to 3rd day of storage. It was interesting to note that up to 6th day T_2 (NAA 200 ppm), and T_{11}, T_{12} (H_2O_2 @ 2%, 3% showed no spoilage. On the contrary, maximum spoilage was recorded in control (T_0) to a value of 37.5%. At the end of storage i.e., on 9th day maximum fruit spoilage (62.5%) was observed in control while minimum spoilage was recorded in T_2, T_{11} and T_{12} (NAA 200 ppm, H_2O_2 2%, 3%, respectively). Spoilage percentage inclined as the storage period advanced [6].

Table1. Effect of different post-harvest treatments on length, diameter, PLW and spoilage of guava fruit

Treatments		Fruit length (cm)			Fruit diameter (cm)			PLW (%)			Spoilage (%)		
		3rd day	6th day	9th day	3rd day	6th day	9th day	3rd day	6th day	9th day	3rd day	6th day	9th day
Control		6.20	5.80	5.11	5.00	4.60	4.00	2.27	6.45	9.85	0.00	37.50	62.50
NAA	100ppm	6.80	6.60	6.30	5.50	5.30	4.90	0.68	2.26	4.06	0.00	25.00	25.00
	200ppm	6.90	6.70	6.50	5.60	5.50	5.30	0.26	1.56	2.53	0.00	0.00	12.50
	300ppm	6.90	6.70	6.50	5.40	5.20	5.10	1.28	2.53	4.43	0.00	25.00	25.00
BA	10ppm	6.20	6.10	5.90	5.80	5.70	5.00	1.14	2.70	4.04	0.00	25.00	37.50
	20ppm	6.60	6.40	6.20	5.53	5.30	5.00	0.92	2.19	3.23	0.00	12.50	25.00
	30ppm	7.10	7.00	6.80	5.30	5.10	4.80	1.32	2.92	4.25	0.00	12.50	25.00
KMnO4	1.00%	6.90	6.70	6.50	5.10	4.90	4.60	1.50	2.82	3.95	0.00	25.00	37.50
	1.50%	6.20	6.00	5.80	5.00	4.80	4.60	1.17	2.57	4.12	0.00	25.00	25.00
	2.00%	6.80	6.60	6.20	5.20	5.00	4.50	1.50	2.63	4.28	0.00	25.00	25.00
H2O2	1.00%	6.30	6.10	5.90	5.70	5.50	5.10	1.39	2.55	4.34	0.00	12.50	25.00
	2.00%	6.50	6.30	6.00	5.50	5.30	5.00	1.11	2.24	3.79	0.00	0.00	12.50
	3.00%	6.20	6.10	5.90	5.60	5.40	5.20	1.79	3.24	5.11	0.00	0.00	12.50
Boric acid	0.10%	6.50	6.30	6.10	5.60	5.30	4.90	1.47	2.46	3.73	0.00	25.00	25.00
	0.20%	6.00	5.80	5.60	5.30	4.80	4.50	1.31	2.55	4.08	0.00	12.50	25.00
	0.30%	6.30	6.10	5.80	5.30	5.10	4.70	1.78	3.26	4.89	0.00	25.00	37.50
Mean		6.53	6.34	6.07	5.40	5.18	4.83	1.31	2.81	4.42	0.00	17.97	27.34
0 day		6.51			5.61			0.00			0.00		
Factors		CD5%	SE(d)	SE(m)	CD5%	SE(d)	SE(m)	CD5%	SE(d)	SE(m)	CD5%	SE(d)	SE(m)
Treatments		0.31	0.15	0.11	0.25	0.12	0.09	1.31	2.81	4.42	1.69	0.85	0.60
Days		N/S	0.07	0.05	N/S	0.05	0.04	1.31	2.81	4.42	0.73	0.37	0.26

Firmness

The data concerning fruit firmness in various treatments and storage periods with including interactions under ambient condition, are presented in table-2. Various type of influence was recorded towards guava fruit firmness. Maximum fruit firmness (8.70 kg/ m^2) was recorded in NAA 200ppm treatment (T_2), followed by (8.60 kg/ m^2) in BA 20ppm (T_5), and $KMnO_4$ 1% (T_2) on 3rd day of storage. On 6th and 9th day of storage NAA 200ppm showed maximum fruit firmness. Throughout storage period, untreated guava showed minimum fruit firmness. Generally, firmness declining trend with advance of storage. Fruit firmness decreased due to breakdown of insoluble proto-pectin's into soluble pectin or by hydrolysis of starch [6].

Palatability rating

Influence of various treatment along with storage periods and their interactions on palatability rating of guava has been exhibited in table-2. On 3rd day all fruits, kept under various treatment showed excellent quality (>24 out of 30) except control which quality decreased too much. On 6th day fruit treated with NAA 200ppm (T_2), showed slightly better "excellent" (24.8) quality while in other treatment, fruits showed good quality (20-24). During evaluation on 9th day all treated fruits showed fair quality (15-19) whereas controlled fruits (T_0) were poor quality (10-14). At end of storage, we can conclude that NAA 200 ppm (T_2) proved to be best concerning highest palatable rating throughout storage while control (T_0) exhibited minimum palatable rating. It has been established that when guava fruits were treated with various chemicals like boric acid and NAA at different days of storage, result in the maximum rating in comparison to another treatment which was considered 'excellent' and the lowest score in last day of evaluation in all treatments due to spoilage even under cold conditions. The decrease in palatable rating in the advance of storage might be due to spoilage activity [6].

Total soluble solids

The data concerning effect of various treatment, storage periods with their interactions under ambient condition, are demonstrated in table-2. Minimum fruit TSS (12.30 °Brix) was recorded in NAA 200ppm (T_2) and boric acid 0.1% (T_{13}), which was statically at par with NAA 300ppm (T_3), BA 20ppm (T_5) H_2O_2 1% (T_{10}), NAA 100 ppm (T_1) (12.40, 12.40, 12.40, 12.45 °Brix respectively) on 3rd day of storage. On 6th day T_3 recorded minimum TSS, which was statically at par with various other treatments (T_1, T_{13}, T_5, T_3, T_4, T_8). At the end of the storage (9th day) NAA 200 ppm showed highest reading of TSS (12.70 °Brix), while in control fruits TSS was minimum TSS (11.00 °Brix). During storage TSS increased up to 6th day then after it was decreased. Initial incremate of TSS might be due to hydrolysis of starch into sugar, in advance of storage it starts decreased might be due to increasing rate of respiration resulting its utilization in oxidation process. It may be concluded that NAA 200 ppm (T_2) proved to be best treatment concerning TSS during 3rd,6th and 9th day of storage [7].

Ascorbic acid

Effects on ascorbic acid content of various treatment and storage periods are shown in table-2. Highest amount of ascorbic acid (225.23 kg/100g) was documented in NAA 200ppm followed by NAA 100 ppm (222.43 mg/ 100g) on 3rd day of storage. Also, on 6th and 9th day of storage NAA 200ppm (T_2) showed maximum ascorbic acid content followed by NAA100ppm. It has been noted that controlled guava fruits were with minimum ascorbic acid content i.e., 212 mg/100g, 200mg/100g, 185mg/100g, respectively. Overall, it could be generalized that NAA200ppm (T_2) showed best result on 3rd,6th and 9th day of storage. Ascorbic acid decreased during storage period might be due to oxidation of the same [8].

Table2. Effect of different post-harvest treatments on firmness, palatability rating, TSS and ascorbic acid of guava fruit

Treatment		Firmness (kg/m2)			Palatability rating (Out of 30)			Total soluble solid (°Brix)			Ascorbic acid (mg/100g)		
		3rd day	6th day	9th day	3rd day	6th day	9th day	3rd day	6th day	9th day	3rd day	6th day	9th day
Control		7.42	5.00	2.80	21.00	17.00	10.60	12.80	13.60	11.00	212.00	200.00	185.00
NAA	100ppm	8.00	6.50	4.44	26.00	22.60	17.00	12.45	12.90	12.25	222.40	211.20	200.00
	200ppm	8.60	7.00	5.66	27.00	24.80	18.00	12.30	12.85	12.70	225.20	213.00	201.15
	300ppm	8.50	6.60	4.53	25.20	23.00	16.40	12.40	13.00	12.30	220.50	209.60	198.45
BA	10ppm	8.40	6.20	4.30	25.80	21.20	16.00	12.50	13.00	12.20	219.60	209.00	198.10
	20ppm	8.70	6.72	4.22	26.00	21.50	15.00	12.40	12.95	12.50	220.70	209.60	198.66
	30ppm	8.44	6.14	4.16	25.90	23.40	17.00	12.55	13.20	12.00	219.00	208.00	198.00
KMnO4	1.00%	8.60	6.10	4.11	26.00	22.50	16.60	12.60	13.15	12.00	220.00	207.40	198.10
	1.50%	8.44	6.14	4.16	26.70	22.60	17.00	12.60	13.00	12.00	221.50	208.00	199.00
	2.00%	8.49	6.20	4.06	25.40	22.00	15.60	12.51	13.00	12.30	221.00	210.10	198.67
H2O2	1.00%	8.53	6.16	4.13	26.30	22.40	16.50	12.40	12.90	12.20	219.60	207.10	197.62
	2.00%	8.46	6.26	4.10	26.30	22.60	16.40	12.50	13.10	12.20	218.40	207.00	196.11
	3.00%	8.55	6.28	4.03	26.30	22.40	16.60	12.52	13.00	12.30	219.00	208.10	197.00
Boric acid	0.10%	8.36	6.25	4.07	26.20	21.80	16.40	12.30	12.90	12.32	218.00	206.90	196.45
	0.20%	8.43	6.32	4.23	26.40	22.50	16.30	12.50	13.20	12.10	220.00	208.10	196.73
	0.30%	8.40	6.12	4.00	26.20	21.81	16.00	12.50	13.10	12.23	216.40	205.20	195.62
Mean		8.40	6.25	4.19	25.79	22.13	16.09	12.48	13.03	12.18	219.60	208.00	197.17
0 day		10.00			28.00			12.00			230.15		
Factors		CD5%	SE(d)	SE(m)	CD5%	SE(d)	SE(m)	CD5%	SE(d)	SE(m)	CD5%	SE(d)	SE(m)
Treatments		0.04	0.02	0.01	0.54	0.27	0.19	0.16	0.08	0.06	0.57	0.29	0.20
Days		0.02	0.01	0.01	0.23	0.12	0.08	0.07	0.04	0.03	0.25	0.12	0.09

Acidity;

Table-3 reveals the data concerning the effect on titratable acidity of guava, is exhibited. Various treatments influenced acidity content in a significant way. Maximum titratable acidity (0.84%) was noted in NAA (200 ppm) followed by BA 20 ppm to the tune of 0.80 while it was at par NAA 100 ppm and BA 30 ppm (0.79% and 0.78%, respectively). On the contrary the minimum was in boric acid @ 0.2% (0.71%). It was noted that titratable acidity was influenced significantly and decreased gradually, irrespective of treatment throughout the storage period. Maximum titratable acidity (0.84%) was observed on initial day and 6th day of storage in NAA 200 ppm and at the end of storage, this treatment had retained the highest value of acidity (0.62%). Overall, declining trend was noted among various treatments. The decline in titratable acidity may be attributed to the increased rate of metabolic activities and conversion of different organic compounds into sugar during storage period. On the contrary, least acidity was recorded in naphthalene acetic acid @ 100 ppm [9].

Total sugar

Various application exerted significance influenced towards fruit total sugar as displayed in table-3. Minimum fruit total sugar (6.51%) was recorded in NAA 200 ppm (T_2) which was statically at par with NAA100 ppm (6.60%) followed by NAA 300ppm. On 6th day T_3 shown minimum TSS while at the end of the storage NAA 200ppm showed highest value of total sugar (7.1%) followed by (6.53%) in BA 10ppm (T_4), while control fruits showed minimum total sugar (5.8%). Initial incremate of total sugar might be due to losses of moisture through evaporation and transpiration from fruit surface and prevent the activities of sugar degradation enzyme where as in advance of storage it starts decreased might be due to utilization sugar in process of respiration [6].

Reducing sugar

The data concerning reducing sugar as affected by various treatment and storage periods are demonstrated in table-3. Minimum fruit reducing sugar (3.56%) was recorded in NAA 200ppm (T_2) which was statically at par with T_4, T_3 and T_1 on 3rd day of storage. Similar patten was seen during evaluation of 6th day. At the end of the storage NAA 200ppm showed highest reading of reducing sugar (4.00%) followed by (3.7%) in NAA100 ppm which is statically at par with H_2O_2 1%, while control fruits showed minimum reducing sugar (2.8%) reading. Initial incremate of reducing sugar might be due to losses of moisture through evaporation and transpiration from fruit surface and prevent the activities of sugar degradation enzyme where as in advance of storage it started decrease, this might be due to utilization sugar in process of respiration. It was submitted while carrying out studies quality retention in guava fruits that boric acid 200, 300 and NAA 300 ppm, 400 ppm were equally effective [6].

Table 3. Effect of different post-harvest treatments on acidity, total sugar, reducing sugar and non-reducing sugar of guava fruit.

Treatments		Acidity (%)			Total sugar (%)			Reducing sugar (%)			Non-reducing sugar (%)		
		3rd day	6th day	9th day	3rd day	6th day	9th day	3rd day	6th day	9th day	3rd day	6th day	9th day
Control		0.62	0.40	0.35	6.84	7.75	5.80	3.84	4.74	2.80	3.00	3.01	3.00
NAA	100ppm	0.79	0.54	0.48	6.60	7.36	6.16	3.67	4.30	3.70	2.93	3.06	2.46
	200ppm	0.84	0.66	0.60	6.51	7.30	7.10	3.56	4.20	4.00	2.94	3.10	3.10
	300ppm	0.75	0.59	0.52	6.65	7.40	6.50	3.65	4.35	3.41	3.00	3.05	3.09
BA	10ppm	0.73	0.58	0.54	6.75	7.50	6.53	3.62	4.40	3.48	3.13	3.10	3.05
	20ppm	0.80	0.62	0.58	6.78	7.54	6.33	3.76	4.38	3.51	3.02	3.16	2.82
	30ppm	0.78	0.59	0.53	6.74	7.45	6.30	3.70	4.50	3.55	3.04	2.95	2.75
KMnO4	1.00%	0.74	0.58	0.46	6.70	7.42	6.35	3.74	4.40	3.50	2.96	3.02	2.85
	1.50%	0.66	0.53	0.42	6.75	7.53	6.20	3.71	4.30	3.40	3.04	3.23	2.80
	2.00%	0.73	0.52	0.44	6.76	7.57	6.36	3.72	4.45	3.56	3.04	3.12	2.80
H2O2	1.00%	0.75	0.57	0.48	6.73	7.51	6.33	3.70	4.41	3.67	3.03	3.10	2.66
	2.00%	0.75	0.56	0.45	6.79	7.60	6.28	3.73	4.50	3.51	3.06	3.10	2.77
	3.00%	0.72	0.56	0.46	6.73	7.50	6.32	3.79	4.36	3.42	2.94	3.14	2.90
Boric acid	0.10%	0.73	0.54	0.49	6.75	7.46	6.29	3.69	4.51	3.53	3.06	2.95	2.76
	0.20%	0.71	0.56	0.52	6.74	7.51	6.35	3.75	4.30	3.50	2.99	3.21	2.85
	0.30%	0.74	0.51	0.49	6.76	7.58	6.25	3.77	4.25	3.45	2.99	3.33	2.80
Mean		0.74	0.56	0.49	6.72	7.50	6.34	3.71	4.40	3.50	3.01	3.10	2.84
0 day		0.96			6.00			3.10			2.90		
Factors		CD5 %	SE(d)	SE(m)	CD5 %	SE(d)	SE(m)	CD5 %	SE(d)	SE(m)	CD5 %	SE(d)	SE(m)
Treatments		0.03	0.01	0.01	0.1	0.05	0.04	0.12	0.06	0.04	0.13	0.06	0.04
Days		0.01	0.01	0	0.04	0.02	0.02	0.05	0.03	0.02	N/s	0.02	0.02

Non-reducing sugar

The data concerning various treatment, storage periods with their interactions on non-reducing sugar of guava under ambient condition, are displayed on table-3. Various application exerted significance influenced towards fruit reducing sugar. Maximum non-reducing sugar (3.13%) was recorded in BA10ppm (T_4) on 3rd day of storage. On 6th day NAA 200ppm (T_2) BA10ppm (T_4) recorded maximum non-reducing sugar (3.10%). At the end of the storage (at 9th day) NAA 200 ppm showed highest reading of non-reducing sugar (3.10%) followed by (3.7%) in NAA100 ppm. Initial incremate of reducing sugar might be due to losses of moisture through evaporation and transpiration from fruit surface and prevent the activities of sugar degradation enzyme where as in advance of storage it started decrease (except NAA 200 ppm), this might be due to utilization sugar in process of respiration [6].

CONCLUSION

Out of various applications, it may be concluded that physical parameters of the fruit like Fruit length, diameter, weight, firmness and palatable rating were retained best in NAA @200 ppm while minimum spoilage and physiological loss in weight was recorded in the same treatment. Regarding bio-chemical characters viz., acidity, TSS, ascorbic acid, total sugar and reducing sugar were shown with improved retained values in same treatment. Above all, only one character i.e., non-reducing sugar was found superior in BA@ 30ppm treated fruits, under ambient conditions.

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