Evaluation of postharvest chemical treatment to increase the shelf life of guava L-49 and Allahabad Safedafruitsunder ambient storage

ABSTRACT

The present study entitled "Evaluation of postharvest chemical treatment to increase the shelf life of guava (*Psidiumguajav*a L.) fruitsunder ambient storage". Physiologically mature, uniform fruits were thoroughly washed and dipped in aqueous solution of T0 (Untreated fruits), T1 (Boric acid at 200ppm), T2 (Boric acid at 300ppm), T3 (NAA at 100ppm), T4 (NAA at 200ppm), T5 (Salicylic acid at 300ppm), T6 (Salicylic acid at 400ppm) for five minutes. Fruits were placed in plastic trays and stored at ambient storage conditions for 12 days. The readings were observed after 4rd, 8th, and 12th days. Physiological weight loss of fruits decreased with storage, further fruits treated with boric acid 300ppm recorded lower Physiological weight loss as compared to other treatments. Total Soluble Solids (TSS), Sugars were increased upto 12 days of storage.

Key words: Fruit quality, Guava, PLW,Room temperature, Shelf life.

Introduction

Guava (*Psidiumguajava*L.) fruit extensively cultivated in tropical and sub- tropical international locations and unearths growing reputation everywhere in the world. It belongs to genus Psidium, of family 'Myrtaceae' and consists of about 150 species, among which only *Psidiumguajava*L. has been exploited for commercial cultivation (Singh et al., 1967)**.** It is one of the maximum not unusual places in India; it is significant after mangoes, bananas and citrus and is recognized as an "apple of tropics" (Gull et al., 2012).India is the world's largest producer of Guava followedby china. The Guava producing countries in the world are Thailand, Indonesia, Pakistan, Mexico, Brazil, Bangladesh, Nigeria, Philippines, Vietnam, Kenya and Egypt (Anonymous. 2017).The Guava fruit consists of approximately 20% peel, 50% flesh component and 30% seed core. It incorporates 74-87% moisture, 13-26% dry matter , 0.8-1.5% protein, 0.4-0.7% fat and 0.5-1% ash (Wilson, 1980).In addition to being a real amount of vitamin A,is also rich in vitamin C and pectin, and also rich in calcium, phosphorus and other minerals and pantothenic acid, ascorbic acid, vitamin A, carotenoid and other nutrients, including B-carotene, Lycopene and niacin (Misra et al., 1968).

The storage of fruit is very difficult for longer period because of its perishable nature especially under tropical conditions. It is common experience that 20-25% of fruit is completely damaged and spoiled before it reaches to the consumers. The export of the Guava fruits, from India is not enough (0.65%), which can be boosted up with the increasing storability of fruits. Therefore, it needs immediate marketing and utilization after harvesting. The Guava is highly perishable, susceptible to mechanical damage and chilling injury and has a limited postharvest shelf life (Ismail et al., 2010).

Material and methods

This experiment was conducted during two seasons 2020 and 2021at the laboratory of Agriculture, Sant Baba Bhag Singh University, Khiala, Jalandhar, Punjab (India) in Completely Randomized Design (CRD) with seven treatments.

The experiment material the fruit of L-49 and Allahabad Safeda were obtained from the farmer Guava orchard atHoshiarpur.The fruit were manually harvested and packed in plastic crates as single layers to avoid any abrasion. The fruits were washed and graded by hand. The uniform sized fruits were selected for storage. Fruits of nearly equal size were randomly selected for carrying out experiments. Fruit were rinsed thrice with distilled water before proceeding with experiments. The washed Guava fruits were randomly divided into 7 groups for each treatment and each treatment was having 10 Guava fruits. Treatments were used in triplicate. The chemical solution of 500 mg/L was prepared in distilled water. The solution was further diluted with water to obtained final concentrations (100ppm, 200ppm, 300ppm and 400ppm) of Boric acid, NAA and Salicylic acid and the fruits were dipped in solution for two minutes. The following treatments were- T_0 (Untreated fruit), T_1 (Boric acid at 200ppm solution), T_2 (Boric acid at 300ppm solution), T_3 (NAA at 100ppm solution), T_4 (NAA at 200ppm solution), T_5 (Salicylic acid at 300ppm solution), T6 (Salicylic acid at 400ppm solution) in ambient condition were used surface coating of guava are each treatment was replicated three times.

Observations were recorded for different physical parameters like-

Physiological weight loss percentage: Fruits were weighed using SF-400C (Electronic Compact Scale).Using knife, skin of Guava was removed manually and subjected to weighing. Weight loss during storage period was reported as percentage and calculated with help of following equation.

$$\text{Physiological weight loss (PWL \%)} = \frac{W1 - W2}{W1} \times 100$$

Where:

W1 = Initial weight of fruits

W2 = fruit weight at sampling period

Fruit firmness: Fruit firmness was determined by Penetrometer. Fruit were penetrated at three Places and value is reported as mean of three values. It was measured in terms of Kg/cm^2.

Biochemical parameters

Total soluble solids (%): TSS of fruit was recorded by using hand refractrometer at room temperature and expressed in term degree Brix (0-32 ºBrix) (ERMA Inc. Tokyo Japan).

Titratable acidity: Aciditywas determined according to the method described in A.O.A.C. (1990) Results were expressed as % of malic acid in fresh pulp weight.

Total sugars %: Was determined by using the methods of Smith *et al.* (1956) and the concentration were calculated as gm glucose per 100 gm. fresh weight.

Statistical analysis: The observations were analyzed for Completely Randomized Design (CRD) and significance of treatments and storage days were evaluated at 5% level of significance.

Result and discussion

Physical parameters

Physiological weight loss: As evident from table 1, there is a gradual weight loss with advancement of storage period. Fruits treated (T4) with NAA at 200ppm solution exhibited minimum weight loss 24.47% in first season and 28.28% in second season at the end of storage period. Contrary, maximum weight loss was recorded in untreated (T0) fruits (28.96%, 40.30%) in both seasons, at end of storage period. The reduction in physiological weight loss and fruit decay due to treatment with NAA might be associated with reduced transpiration and respiration rate in guava tissues and is in conformity with the studies conducted by Blankenship et al. (2003), Singh et al. (2004) and Martinez et al. (2009).Similar results with decreased physiological weight loss recorded byRao et al. (1988)[Absent in the Reference List.]

Fruit firmness: In the present study, Guava storage resulted in a gradually decrease in the fruit firmness during 12 days storage. Untreated fruits exhibited more rapid decrease in the fruit firmness as compare to other treatments. Maximum decrease in fruit firmness was observed in untreated (T0) fruits (1.40, 1.17) in both seasons after 12 days of storage period. Fruits treated with NAA at 200ppm (T4) solution exhibited less decrease in fruit firmness as compared to control. Boric acid and Salicylic acid treated guava fruit also exhibited significant decreases in the fruit firmness (Table 2). Similar results recorded in/by Kumar et. al.(2001).

Biochemical parameters

Total soluble solid: TSS increased during the storage period Table 3. NAA at 200 ppm was responsible for highestTSS 10.42 in first season and 10.98 in second one. Minimum TSS value was observed in untreated fruit 10.11and 9.80 in both seasons at end of the storage period. The acquired result was similar by Rawat et al. (2010).

Titratable acidity: Postharvest treatment showed different significant effect on acidity percentage of Guava fruits in Table 4,shown that there was observed increase in the flesh acidity during the first three sampling dates followed by a major decrease till the end of the storage period. This major decrease could be attributed to its use as a substrate for respiration. NAA at 200ppm fruits showed the higher acidity content value in the two seasons, also it could be observed that there was no definite trend between treatments in this respect in the two seasons. The same result was reported by Gupta et al. (2011); Patel et al. (2017); Deepti et al. (2016) and El-Sherif et al. (2016[Year Mismatch from the reference list]).

Total sugar: The percentage of total sugar affected by various treatments was observed and the data obtained is presented in Table 5. Among the various treatments it was observed that the minimum total sugar during the treatment was T0 (untreated fruits) 8.91% and 8.44% in both seasons, while the maximum total sugar at T4 (NAA at 200ppm) 9.17% and 8.82% in first and second seasons after 12 days of storage at room temperature. A further increase in NAA concentration at 200 ppm did not significantly reduce the total sugar[What was the reason?]. The result was similar by Bhooriya et al. (2018).

Conclusion

From the both season 2020 and 2021 research discussion, They are 7 treatments in the research with different surface coatings.But all the treatments in which the Fruit treated with Naphthalene acetic acid (200ppm) individually as well their combination was recorded to be most effective and prolongs the ripening days and shelf life of guava fruits with increasing marketable values and reducing physiological weight loss percentage, showed highest fruit firmness, TSS content, total sugar, acidity.

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Table 1:- Effect of post harvesting treatment on Physiological weight loss (%) in Guava during ambient condition

Treatments	July-Aug. 2020			July-Aug. 2021		
	Storage periods/day					
	4	8	12	4	8	12
T0 (Untreated fruits)	6.50	18.98	28.96	8.12	20.20	40.30
T1 (Boric acid at 200ppm)	4.73	13.29	26.55	5.23	18.06	33.13
T2 (Boric acid at 300ppm)	3.95	12.76	25.97	4.18	16.83	31.16
T3 (NAA at 100ppm)	4.50	12.85	26.26	4.83	17.48	32.77
T4 (NAA at 200ppm)	3.02	12.13	24.47	3.77	16.15	28.28
T5 (Salicylic acid at 300ppm)	5.33	14.65	27.36	5.27	17.97	32.98
T6 (Salicylic acid at 400ppm)	5.14	13.73	26.47	4.36	16.72	30.60
CD at 0.5%	2.28	1.21	1.12	0.11	0.10	0.11

Table 2:- Effect of post harvesting treatment on fruit firmness (kg/cm$^{2)}$) in Guava during ambient condition

Treatments	July-Aug. 2020			July-Aug. 2021		
	Storage periods/day					
	4	8	12	4	8	12
T0 (Untreated fruits)	3.23	2.43	1.40	3.42	2.30	1.17
T1 (Boric acid at 200ppm)	3.64	2.64	2.06	3.56	2.51	1.41
T2 (Boric acid at 300ppm)	3.66	2.76	2.23	3.65	2.75	1.62
T3 (NAA at 100ppm)	3.65	2.70	2.14	3.59	2.56	1.49
T4 (NAA at 200ppm)	3.69	2.99	2.39	3.73	2.90	1.72
T5 (Salicylic acid at 300ppm)	3.45	2.73	2.12	3.55	2.45	1.36
T6 (Salicylic acid at 400ppm)	3.56	2.89	2.28	3.62	2.73	1.59
CD at 0.5%	0.13	0.12	0.13	0.35	0.38	0.23

Table 3:- Effect of post harvesting treatment on total soluble solid (%) in Guava during ambient condition

Treatments	July-Aug. 2020			July-Aug. 2021		
	Storage periods/day					
	4	8	12	4	8	12
T0 (Untreated fruits)	8.08	9.08	10.11	8.48	9.45	9.80
T1 (Boric acid at 200ppm)	8.17	9.11	10.22	8.65	9.56	10.09
T2 (Boric acid at 300ppm)	8.19	9.15	10.36	8.76	9.70	10.48
T3 (NAA at 100ppm)	8.18	9.12	10.28	8.68	9.61	10.12
T4 (NAA at 200ppm)	8.22	9.17	10.42	9.00	10.03	10.98
T5 (Salicylic acid at 300ppm)	8.12	9.10	10.17	8.59	9.50	10.01
T6 (Salicylic acid at 400ppm)	8.15	9.13	10.34	8.73	9.67	10.36
CD at 5%	0.10	0.022	0.021	0.20	0.32	0.44

Table 4:- Effect of post harvesting treatment on Titratable Acidity (%) in Guava during ambient condition

Treatments	July-Aug. 2020			July-Aug.2021		
	Storage periods/day					
	4	8	12	4	8	12
T0 (Untreated fruits)	0.44	0.31	0.19	0.49	0.28	0.18
T1 (Boric acid at 200ppm)	0.43	0.33	0.21	0.51	0.36	0.25
T2 (Boric acid at 300ppm)	0.41	0.35	0.24	0.55	0.42	0.29
T3 (NAA at 100ppm)	0.42	0.34	0.22	0.52	0.39	0.27
T4 (NAA at 200ppm)	0.40	0.36	0.26	0.58	0.46	0.33
T5 (Salicylic acid at 300ppm)	0.43	0.33	0.20	0.53	0.42	0.26
T6 (Salicylic acid at 400ppm)	0.42	0.34	0.23	0.57	0.44	0.28
CD at 5%	0.022	0.018	0.019	0.02	0.05	0.03

Table 5:- Effect of post harvesting treatment on Total Sugar (%) in Guava during ambient condition

Treatments	July-Aug.2020			July-Aug. 2021		
	Storage periods/day					
	4	8	12	4	8	12
T0 (Untreated fruits)	8.15	8.45	8.91	7.98	8.17	8.44
T1 (Boric acid at 200ppm)	8.21	8.49	9.04	8.12	8.30	8.62
T2 (Boric acid at 300ppm)	8.23	8.53	9.12	8.17	8.39	8.75
T3 (NAA at 100ppm)	8.22	8.48	9.08	8.14	8.33	8.64
T4 (NAA at 200ppm)	8.24	8.55	9.17	8.22	8.45	8.82
T5 (Salicylic acid at 300ppm)	8.17	8.47	9.06	8.13	8.31	8.62
T6 (Salicylic acid at 400ppm)	8.19	8.50	9.09	8.19	8.41	8.74
CD at 5%	0.036	0.043	0.054	0.30	0.26	0.33