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ORIGINAL ARTICLE

The Effect of Edible Coating Material on Biochemical Factors of Guava (*Psidium guajava* L.) cv. L-49 Storage Life

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ABSTRACT
The current experiment was done in Punjab at School of Agriculture, Lovely Professional University from March to April of 2021-22 to perceive post-harvest effect on edible coatings of Guava. The experiment was set up with 8 treatment combinations and two replications in CRD. Guava is a perishable fruit. Edible coating would possibly assist prolonging the quality of guava. The goal of this study is to decide the impact of edible coatings like Rice Bran oil, Sunflower oil, Aloe vera juice, Bees wax and Citric acid on the quality of fresh guava in comparison with control or uncoated kept at room temperature (29°C) and 95% RH. It was observed that guava covered with Sunflower oil drastically decreased weight reduction and firmness and prolonged the shelf life of guava for eight days in comparison with uncoated guava. Total soluble solid (TSS) of guava accelerated drastically in all coated fruits during the storage. The pH of guava accelerated in the time of storage and is suitable for edible coating types too. Using either vegetable oil or bees wax as a coating to guava is fit for human consumption would possibly increase the shelf life of fresh guava. On the 9th day of storage, it was found that the sunflower oil coating produced longer shelf life, TSS of the fruit (12.30brix), Acidity percentage of the fruit (0.097%), Total vitamin C content (190.23 mg/100gm), Total sugars content (10.12%), Reducing sugars content (6.02%) and non-reducing sugars (3.62%) compared with the individual fruit.
Key words: *Guava, Edible coatings, Aloe vera juice, Sunflower oil, Rice Bran Oil, Citric Acid and Bees wax.*

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INTRODUCTION

Guava (*Psidium guajava* L.) is an essential fruit crop grown below an extensive variety of tropical and subtropical areas with inside the world. It is typically acknowledged as 'The apple of the tropics' belongs to the family Myrtaceae. It is local to tropical America stretching from Mexico to Peru and brought to India through the Portuguese in the course of seventeenth century [13].

Guava is cultivated on business scale in Mexico, Peru, Egypt, India, South Africa, USA, Algeria, Brazil, Columbia, West Indies, etc. In India, Guava is the fifth role after banana, mango, citrus and papaya in terms of location and manufacturing [3] [5]. The overall location, manufacturing and productiveness of guava in India is ready 2.64 lakh ha with 40.53 lakh tones manufacturing and 15.3 Mt/ha production respectively. Madhya Pradesh has productivity and overall area production of guava are 35.08 lakh hectares and 6.86 lakh tones and 17.28 Mt/ha, respectively. Uttar Pradesh is the best guava generating kingdom with inside the country. The other guava developing states are Madhya Pradesh, Karnataka, Bihar, Maharashtra and Tamil Nadu. Major guava producing districts in Madhya Pradesh are Jabalpur, Ujjain, Rewa, Neemuch, Ratlam, Rajarh and Mandsaur[13].

The guava fruit is a berry, spherical or oval in shape, with rough to smooth green in color skin and plenty of small, tough or semi-tough seeds embedded with inside the middle of the pulp. It is the maximum essential, noticeably productive, scrumptious and nutritious fruit cultivated commercially. It is pretty famous fruit crop of India, because of its pleasant taste, flavour and its availability for an extended duration in the course of the 12 months with mild price. It is a noticeably nutritious and fairly top supply of calcium, iron and an honest supply of phosphorus [24]. The fruit is a splendid supply of ascorbic acid and however has low energy (66cal/100 g), Protein content (1%), approximately 17% dry matter and 83% moisture. The

fruit is rich in minerals like phosphorus (23.37 mg/100 g), Calcium (14-30 mg/100 g), iron (0.6-1.4 mg/100 g) as well as nutrients like Niacin, Pantothenic acid, Thiamine, Riboflavin and Vit. A [13].
The flavour of guava is sweet, musky and ripe fruit is fragrant to an excessive degree. It is wealthy in antioxidant pigments particularly carotenoids and polyphenols, giving them particularly excessive nutritional antioxidant fee amongst plant foods. Guavas are generally eaten up normally or processed into many products like jam, jelly, Juice, nectar, paste, etc., There is a great demand of guava in each home and worldwide markets for clean and processing purposes [6].
Recently the usage of aloevera gel as an edible coating material is improved for fruits due to its antifungal activity. Aloevera gel coating is totally fit for human consumption has been proven to save from moisture loss and firmness, controls rate of respiration and maturation development, put off oxidative browning and decrease microorganism proliferation [2]. It has antifungal and antibacterial properties which offers a shielding barrier in opposition to microbial contamination vegetables and fruits. The most important aim is to put together aloe-vera gel coatings as a powerful preservative to enhance the safety, functionality and quality of clean vegetables and fruits [15].

MATERIAL AND METHODS

The present investigation entitled "The Effect of edible coating material on biochemical parameters for enhancement of the lifespan of Guava (*Psidium guajava* L.) cv. L-49" is being conducted at post-harvest laboratory, Department of Horticulture, Lovely Professional University, Punjab during the academic year 2021-2022. The experiment was conducted in Completely Randomized Design (CRD), comprising of 8 treatments with two replications.
The mature and uniform sizes of guava var. L-49 were taken from the Instructional cum research fruit orchard and coatings were prepared as per treatments to complete the experiments. Prior to the post-harvest treatment, the fruits were washed in distilled water. The fruits were kept to dry in shade before application of treatments. The details of the treatments are T1Rice bran oil (80%), T2 Sunflower oil(80%), T3 Aloevera (75%), T4Beewax(15%),T5Bees wax+ Rice Bran Oil (60%),T6 Sunflower oil+ Rice Bran Oil(70%),T7 Citric Acid (25%), T8 Control, each treatment was replicated twice with 10 fruits in each replication. The observations on physical and quality parameters were recorded at an interval of 3rddays.

Results and Discussion

The Effect of Edible coatings on TSS (^{0}brix) of Guava fruit:

Total soluble solids results showed significant differences among the treatments in 3rd, 6th and 9th days after storage of Guava in ambient conditions. On day of storage, among various postharvest treatments, minimum TSS was observed in fruits treated with T8(Control) to the tune of 9 ^{0}brix followed by T4with a valueof10^{0}brix where as maximum TSS was observed in citric acid powder(10.4^{0}brix).Onthe9th dayofstorage,minimalTSSwasseeninthesameT8 treatment to the range of 10.4 ^{0}brix and followed by T3treatment where it was only 11^{0}brix. TSS were maximum under citric acid conditions as it ranged (12.3) during8th days storage period showing in table 1.
The better retention of syndrome price with the increasing storage might be thanks to the degradation of starch into straightforward sugars, that act as major parts for TSS. Similar results were determined by Emad*et al.,* [8] in Orange, Hayat *et al.,*[10] in Khagzi lime.

The Effect of Edible coatings on Acidity (%) of Guava fruit:

Acidity results showed significant differences among the treatments in 3rd, 6th and 9th days after storage of Guava in ambient conditions. On 3rd day of storage, among various postharvest treatments, minimum acidity was observed in fruits treated with T2 (Sunflower oil) to the tune of 3.2% followed by T5 with a value of 0.215% where as maximum acidity was observed in control fruits (0.362%). On the 9th day of storage, minimal acidity was seen in the same T5 treatment to the range of 0.043% and followed by T2 treatment where it was only 0.047%. Acidity was maximum under control conditions as it ranged from(0.152%)during 8th days storage period showing in table 1.
Respiration is a necessary metabolic mechanism in fruits which will use organic acids as a substrate for energy generation, leading to a discount in acidity during long-run storage. The highest rate in titratable acidity and also the lowest rate of titratable acidity could be due coating oil that enhances to a quicker respiration rate and corresponding metabolic activity, that will increase organic acid intake. These results are supported by findings of by Deka*et al.,* [7] in Pear, Parsa*et al.,* [14] in Banana and Singh *et al.,* [15] in Guava.

The Effect of Edible coatings on Total vitamin C content (mg/100gm) of Guava fruit:

Total vitamin C content results showed significant differences among the treatments in 3rd, 6th and 9th days after storage of Guava in ambient conditions.On3$^{rd.}$day of storage, among various postharvest

treatments, minimum vitamin C content was observed in fruits treated with T2 (Sunflower oil) to the tune of 231.33 mg/100gm followed by T1 with a value of 230.67 mg/100 gm whereas maximum vitamin C content was observed in bees wax (216 mg/100gm).On the 9th day of storage,minimal vitamin C content was seen in the same T8 treatment to the range of 161.21mg/100gm and followed by T7 treatment where it was only 162.23 mg/100gm. Total vitamin C content maximum underT2 asitranged190.23 mg/100gm during 8 days storage period showing in table 2.
The retention of additional ascorbic acid in oil coated fruits might be attributed to reduced ascorbic acid respiration or oxidation. Most vitamin C loss in the control cluster could be attributed to increased respiration rate, that causes ascorbic acid loss. Analogous results were supported with findings of Hazarika *et. al.,* [11] in Papaya, Manisha and Navdeep [12] in Kinnow mandarin, bees wax treated fruits had the very best rate for vitamin C.

The Effect of Edible coatings on Total sugars(%)of Guava fruit:

Total sugars results showed significant differences among the treatments in 3rd, 6th and 9thdays after storage of Guava in ambient conditions. On 3rdday of storage, among various postharvest treatments, minimum total sugars content was observed in fruits treated with T8 (Control)to the tune of 7.45% followed by T6with a valueof7.58% where as maximum total sugars content was observed inT2 (Sunflower oil) 8.33%.On the 9th day of storage, minimal total sugars content was seen in the same T8 treatment to the range of 8.22% and followed by T_6 treatment where it was only 8.63% Total sugars content were maximum underT2 (Sunflower oil) 10.12% as it ranged during 8th days storage period showing in table 2.
Total sugars of the fruit are thought-about one amongst the fundamental criteria to judge the fruit ripening. That is clear from the results that at the time of harvest the sugars were terribly low however with the passage of time ripening enhances and ultimately total sugars increased at first with the very best on the sixth day of storage and henceforth declined this trend was seen in all the treated fruits of guava. However, throughout storage of fruits total sugars considerably increased in all treatments except control, as storage enhanced the speed of respiration, transpiration and inhibition of catalyst activities chargeable for degradation of sugars, whereas the subsequent decline is also thanks to utilization of sugars in respiration. These outcomes are in accordance with work of Arvind *et. al.,* [4] in Kinnow mandarin and Singh *et al.,* [15] in Guava.

The Effect of Edible coatings on Reducing sugars(%) of Guava fruit:

Total reducing sugars results showed significant differences among the treatments in 3rd, 6th and 9th days after storage of Guava in ambient conditions. On 3rdday of storage, among various postharvest treatments, maximum total reducing sugars content was observed in fruits treated with T2(Sunflower oil) to the tune of 5.33% followed by T3with a valueof5.04% where as minimum total reducing sugars content was observed in control fruits (4.77%). On the 9th day of storage,maximal total reducing sugars content was seen in the same T2 (Sunflower oil) treatment to the range of 6.02% and followed by T7treatment where it was only 5.89%. Total reducing sugars content were minimum under control conditions as it ranged from(5.21%)during 8th days storage period showing in table 3.
Throughout storage of fruits total sugars considerably increased in all treatments except control, as storage enhanced the speed of respiration, transpiration and inhibition of catalyst activities chargeable for degradation of sugars, whereas the subsequent decline is also thanks to utilization of sugars in respiration. Fruit treated with vegetable oil having most sugars 100% determined maximum prices. These outcomes are in association with works of Singh *et al.* [15] and Anis *et al.* [1]in guava fruit

The Effect of Edible coatings on non-reducing sugars (%) of Guava fruit:

Total non-reducing sugars results showed significant differences among the treatments in 3rd, 6th and 9thdays after storage of Guava in ambient conditions. On 3rdday of storage, among various postharvest treatments, maximum total non-reducing sugars content was observed in fruits treated with T2(Sunflower oil)to the tune of 3% followed by T3 with a value of 2.83% where as minimum total non-reducing sugars content was observed inT6(2.72%).Onthe9thdayofstorage,maximal total non-reducing sugars content was seen in the same T_2 treatment to the range of 3.62% and followed by T3treatment where it was only 3.42%. Total non-reducing sugars content were minimum under T1(Rice bran oil) as it ranged from(2.84%)during 8th days storage period showing in table 3.
The impact of various treatment materials and storage amount considerably influence on the marketable quality of the guava fruits. The initial rise within the non-reducing sugars upto 6th day of storage then decreases bit by bit until finish of the storage.These results are noted by Singh *et al.,* [15] and Eryan*et al.,* [9] in guava fruits.

Table 1: Effect of post-harvest treatments on TSS(^{0}brix) and Acidity (%) of guava cv. L- 49 during storage

Symbols	Treatments	TSS(^{0}brix)				Mean	Acidity (%)				Mean
		Storage period (Day)					Storage period (Day)				
		0th	3rd	6th	9th		0th	3rd	6th	9th	
T1	Rice Bran Oil	10.2	10.4	10.6	11.1	10.57	0.427	0.341	0.149	0.123	0.26
T2	Sunflower Oil	10.2	10.4	10.7	12.3	10.9	0.325	0.215	0.085	0.097	0.180
T3	Aloe Vera Juice	10.3	10.6	10.8	11	10.67	0.384	0.292	0.107	0.094	0.219
T4	Bees Wax	10	10.3	10.6	11.7	10.65	0.363	0.272	0.107	0.092	0.208
T5	Beeswax+Sunflower oil	9.9	10.2	10.4	11.9	10.6	0.320	0.251	0.085	0.043	0.174
T6	Rice Bran+Sunflower oil	10.2	10.5	10.7	12.1	10.87	0.363	0.274	0.105	0.047	0.197
T7	Citric Acid Powder	10.4	10.6	10.9	11.2	10.77	0.320	0.253	0.107	0.089	0.192
T8	Control	9	9.2	9.5	10.4	9.52	0.427	0.362	0.171	0.152	0.278
S.Em±		0.089	0.062	0.083	0.059	0.073	0.006	0.008	0.007	0.011	0.008
C.D @5%		0.265	0.192	0.254	0.176	0.221	0.023	0.017	0.023	0.024	0.021

Table 2: Effect of post-harvest treatments on Total Vitamin C content(mg/100gm)and Total sugars (%) of guava cv. L- 49 during storage

Symbols	Treatments	Total Vitamin C content (mg/100gm)				Mean	Total sugars (%)				Mean
		Storage period (Day)					Storage period (Day)				
		0th	3rd	6th	9th		0th	3rd	6th	9th	
T1	Rice Bran Oil	230.67	213.67	200	185	207.33	7.11	7.66	8.21	8.82	7.95
T2	Sunflower Oil	231.33	218.33	205.33	190.23	211	7.46	8.33	9.21	10.12	8.78
T3	Aloe Vera Juice	228	212.67	196.67	181.53	204.71	7.11	7.87	8.64	9.23	8.21
T4	Bees Wax	216	203.67	190	176.24	196.64	7.18	7.69	8.2	8.72	7.94
T5	Beeswax+Sunflower oil	222.67	206.5	191.33	173.52	199.63	7.07	7.68	8.3	8.96	8
T6	Rice Bran+Sunflower oil	220.67	207.67	194	172.31	198.66	7.01	7.58	8.15	8.63	7.84
T7	Citric Acid Powder	221.33	200.62	178.67	162.23	190.7	7.14	7.8	8.47	8.96	8.09
T8	Control	216.67	209.73	178	161.21	191.24	7.05	7.45	7.85	8.22	7.64
S.Em±		1.135	0.961	1.212	0.765	1.018	0.091	0.132	0.131	0.153	0.126
C.D @5%		3.068	2.762	3.571	2.306	2.976	0.271	0.392	0.393	0.453	0.377

Table 3: Effect of post-harvest treatments on Reducing sugars (%) and non-reducing sugars (%) of guava cv. L- 49 during storage.

Symbols	Treatments	Reducing sugars (%)				Mean	Non reducing sugars (%)				Mean
		Storage period (Day)					Storage period (Day)				
		0th	3rd	6th	9th		0th	3rd	6th	9th	
T1	Rice Bran Oil	4.55	4.95	5.25	5.55	5.07	2.56	2.73	2.95	3.12	2.84
T2	Sunflower Oil	4.78	5.33	5.89	6.02	5.5	2.69	3	3.31	3.62	3.15
T3	Aloe Vera Juice	4.55	5.04	5.53	5.85	5.24	2.56	2.83	3.11	3.42	2.98
T4	Bees Wax	4.6	4.92	5.25	5.55	5.08	2.59	2.77	2.95	3.15	2.86
T5	Beeswax+Sunflower oil	4.51	4.92	5.31	5.63	5.09	2.55	2.77	2.99	3.13	2.86
T6	Rice Bran+Sunflower oil	4.48	4.85	5.22	5.53	5.02	2.52	2.72	2.93	3.17	2.83
T7	Citric Acid Powder	4.57	4.99	5.42	5.89	5.21	2.57	2.81	3.05	3.23	2.91
T8	Control	4.53	4.77	5.03	5.21	4.88	2.54	2.82	3.1	3.32	2.94
S.Em+		0.062	0.071	0.126	0.084	0.085	0.045	0.062	0.064	0.062	0.058
C.D @5%		0.182	0.209	0.371	0.258	0.255	0.135	0.185	0.182	0.146	0.162

CONCLUSION

On the basis of result observed from this experiment it was found that Treatment (T2) Sunflower oil(100%)coating was found most effective postharvest edible coated treatment followed by Treatment (T4) Bees wax (15%),Treatment (T6) Rice bran oil + Sunflower oil (70%), Treatment (T1) Rice bran oil (100%), Treatment (T5) Beeswax + Sunflower oil(80%), Treatment (T7) Citric acid (25%) and Aloe vera (75%),coating which enhanced the shelf life and consumer acceptance of the stored guava fruits. The Sunflower oil (100%) coated guavas has more overall acceptability because this coating helped in improving the quality, appearance, taste and color of fruits. Hence this technology could be more useful for increase shelf life of fruits at low cost, reduce the post-harvest loss and the use of harmful chemicals by growers.

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