Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.4065

ISSN: 2320 – 7051

Int. J. Pure App. Biosci. **5 (3):** 837-843 (2017)

Research Article

International Journal of Pure & Applied Bioscience

OPEN ACCESS

Edible Oil Coatings Prolong Shelf Life and Improve Quality of Guava (*Psidium guajava* L.)

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Received: 16.06.2017 | Revised: 25.06.2017 | Accepted: 27.06.2017

ABSTRACT

Guava (Psidium guajava L.) is highly perishable and has a limited postharvest life up to 4-5 days. Now a day's various chemicals are used to enhance the shelf life of guava which is harmful for human health. Present experiment was laid out in Completely Randomized Design (CRD) with five treatments viz. T_1 (Mustard oil), T_2 (Coconut oil), T_3 (Olive oil), T_4 (Almond oil), T_5 (Grape seed oil) were used for surface coating of guava fruits and stored at ambient temperature and cold storage conditions. Each treatment was replicated three times with one replication to check physiological loss in weight. The results of the research shows that the guava fruits treated with (T_9) olive oil coating at cold storage conditions greatly extend the shelf life of guava (28 days in cold storage and 16 days at ambient conditions) than control (16 days in cold storage and 6 days at ambient conditions). Guava fruits coated with mustard oil at ambient conditions show minimum physiological loss in weight as compared to other treatments. Among the different edible coating treatments and storage conditions, the treatment with coating of guava fruits with olive oil and stored in cold storage conditions has maximum marketable fruits retained, fruit colour, minimum rotting and better organoleptic quality as compared to control and other treatments. Guava fruits treated with T_9 i.e. olive oil coating in cold storage conditions shows maximum shelf life with good organoleptic rating and better fruit quality parameters. This is cost effective and farmers could easily adopt edible oil coating to increase his income by storing the guava fruits for longer duration in the glut period.

Key words: *Bio-chemical properties, Edible oil coatings, Guava, Marketability, Organoleptic analysis, Shelf life.*

INTRODUCTION

Guava (*Psidium guajava* L.), "apple of tropics" belongs to the family Myrtaceae. It occupies fourth position in terms of area and production among fruits crops of India. It is one of the most common and major fruit of India[3]. In India the area under guava fruit is 268 lakh ha. and production is about 3668 lakh MT with productivity of 13.7 MT/ha. In Punjab area is 8.2 lakh ha. with production 180.8 lakh MT and productivity 22.0 MT/ha [1].

Cite this article: Singh, H., Kachwaya, D.S., Kuchi, V.S., Vikas, G., Kaushal, N. and Singh, A., Edible Oil Coatings Prolong Shelf Life and Improve Quality of Guava (*Psidium guajava* L.), *Int. J. Pure App. Biosci.* **5(3):** 837-843 (2017). doi: http://dx.doi.org/10.18782/2320-7051.4065

Guava is a delicious and nutritious fruit rich in vitamin C (100-260 mg\100g pulp), vitamin A, vitamin B_2 (riboflavin) and minerals like iron, calcium and phosphorus. The vitamin C content of guava fruit is 4-5 times higher than the citrus fruits.

As guava is highly perishable and has a limited postharvest shelf life up to 4-5 days that shows intense metabolic activity. Guava fruit becomes fully ripe between three to five days at room temperature. Due to such perishability, the control of fruit ripening is fundamental for increasing shelf life after harvest.

Now a day's various chemicals are used to enhance the shelf life of guava which is harmful for human health. Previous finding revealed that fruits coated with some edible coating substances have enhanced their shelf life, reduced the spoilage and improved the fruit quality by delaying the senescence during storage. So, the effect of different types of edible coating materials to extend shelf life of guava which are easily available and not harmful for humans was planned.

MATERIAL AND METHODS

Present experiment was conducted in the laboratory of Mata Gujri College, Fatehgarh Sahib, Punjab, India. in Completely Randomized Design (CRD) with twelve treatments *viz.* Mustard oil + Ambient conditions (T_1), Coconut oil + Ambient conditions (T_2), Olive oil + Ambient conditions (T_3), Almond oil + Ambient conditions (T_4), Grape seed oil + Ambient conditions (T_5), Untreated + Ambient conditions (T_6),Mustard oil + Cold Storage (T_7), Coconut oil+ Cold storage (T_8), Olive oil + Cold storage (T_9), Almond oil + Cold storage (T_{10}), Grape seed oil + Cold storage (T_{11}), Untreated + Cold storage (T_{12}) were used for surface coating of guava fruits. Each treatment was replicated 3 times.

Physical parameters

Physical analysis of fruits with parameters of Physiological weight loss (%), Marketable fruits retained (%), Organoleptic evaluation, Fruit color (Organoleptic rating) was done with the standard procedure of AOAC[2]. The data obtained was statistically analyzed by the method described by Gomez and Gomez[10].

Chemical parameters

Chemical analysis of fruits having chemical parameters like Total Soluble Solids (TSS)[2], Total Sugars, Reducing Sugar, Non-reducing Sugar, Titratable acidity was done with the standard procedure of AOAC[2].

RESULTS AND DISCUSSION

Physiological Loss in Weight (PLW) %: Physiological loss in weight was significantly influenced by different parameters (Table 1). The table indicates that a gradual increase in weight loss was shown towards the end of storage period. Various edible coating treatments showed a significant influenced in PLW. It is evident from the data that olive oil coated Guava fruits at cold storage conditions showed steady increase in the PLW with passage of time as compared to control (faster rise in PLW was noticed with advancement of storage periods). Maximum PLW (1.65%) was recorded in T_{12} *i.e.* untreated (without coating) guava fruits stored in cold storage conditions. Minimum PLW (0.22%) was recorded in the T_7 i.e. mustard oil coated guava fruits stored in cold storage conditions. The loss in weight increased as the storage period increased. A perusal of the data clearly explains the positive effect of mustard oil coating in reducing the PLW of guava fruits. Minimum reduction in PLW of guava coated with mustard oil coating was probably due to maintenance of maximum moisture content around the surface of the fruit etc. along with storage having high humidity and cold storage conditions. These results are in accordance with the findings of Dorria[8], Panday *et al.*[14] and Jagadeesh *et al.*[11] and are observed significant.

Marketable Fruits Retained (MRF) (%): Marketable Fruits Retained (MRF) (%) was significantly influenced by different

parameters. Table 1 indicates the effect of edible coatings and storage conditions on marketable fruits retained (%) of guava fruits. There was no spoilage of fruits in all the treatments (different edible coatings) and control up to 8 days of storage. After the 8 days of storage interval rotting in fruits starts, maximum rotting of fruits was found in untreated fruits. Minimum M.F.R. (36.25%) was recorded in the T6 untreated guava fruits stored at ambient conditions whereas the maximum M.F.R. (82.55%) was recorded in T9 i.e. olive oil coated guava fruits stored in cold storage conditions. This might be due to the minimum loss of moisture from the surface of fruit because of edible olive oil coating and low temperature conditions of cold storage. These results are in accordance with the findings of Panday *et al.*[14], Singh and Mohammed[15], Mahajan *et al.*[13], Dhemre and Waskar[7] observed significant.

Fruit Colour (Organoleptic rating): The organoleptic rating of fruit colour of guava fruits was significantly influenced by different parameters (Table 2). Various packaging treatments influenced the fruit colour ratings up to some extent also. After 8 days of storage maximum fruit colour rating (9.00%) was recorded in T_9 i.e. olive oil coated guava fruits in cold storage whereas the minimum fruit colour rating (2.00) was recorded in the T_6 i.e. untreated guava fruits stored at ambient storage condition. After 28 days of storage maximum fruit colour rating (7.50) was found in T_9 i.e. olive oil coated guava fruits in cold storage whereas minimum fruit colour rating (2.50) was found in T8 i.e. coconut oil coated guava fruits stored in cold storage conditions which is statistically at par with the T_{10}, T_{11} and T_{12}. These results are in accordance with the findings of Panday *et al*[14].

Oraganoleptic Rating (1-9 scale): Organoleptic rating of guava fruits was significantly influenced by different parameters (Table 2). After 8 days of storage maximum organoleptic rating (9.00) were found in T_9 i.e. olive oil coating in cold storage which is statistically at par with T_{10} and T_{11} whereas minimum organoleptic rating (2.33) was found in T6 i.e. untreated guava fruits at ambient conditions which is statistically at par with T_1 and T_2. After 28 days of storage maximum organoleptic rating (5.00) was found in T_9 i.e. olive oil coating in cold storage which is statistically at par with T_{11} whereas minimum organoleptic rating (2.00) was found in T_{12} i.e. untreated guava fruits stored in cold storage conditions which is in accordance with the findings of Wijewardane[16], Panday *et al.*[14], Dashora and Mohammed[5], Dhaka *et al*[6].

Total Soluble Solids (°Brix): Total Soluble Solids (°Brix) was significantly influenced by different parameters (Table 3). After 8 days of storage maximum TSS (11.50 °Brix) was observed in T_{11} i.e. grape seed oil coating in cold storage which is statistically at par with the treatment combination of T_8 whereas minimum TSS (6.80°Brix) was recorded in T_{10} i.e. almond oil coated guava fruits stored in cold storage conditions. After 28 days of storage maximum TSS (13.50 ^{0}Brix) was recorded in T_{11} *i.e.* grape seed oil coated guava fruits stored in cold storage conditions which is statistically at par with T_8 whereas minimum TSS (9.00) was recorded again in T_{10} *i.e.* almond oil coated guava fruits stored in cold storage conditions which is statistically at par with T_7, T_9 and T_{12}. The interaction between storage and treatments found to be significant. These results are in accordance with the findings of Panday *et al.*[14], Chandra[3], Das and Medhi[4] and Wijewardane[16].

Titratable Acidity (%): Titratable Acidity (%) was significantly influenced by different parameters (Table 3). After 8 days of storage maximum titratable acidity (0.43%) was conditions whereas minimum titratable acidity (0.12%) was recorded in T_1 *i.e.* mustard oil coating at ambient conditions which is statistically at par with T_7. After 28 days of storage maximum titratable acidity (0.27%) was also recorded in T_8 i.e. coconut oil coated

guava fruits stored in cold storage. conditions which is statistically at par with T_9 whereas minimum titratable acidity (0.10%) was recorded in T_7 *i.e.* mustard oil coated guava fruits stored in cold storage conditions. These results are in accordance with the findings of Keditsu *et al.*[12] and Wijewardane[16].

Reducing Sugars (%): Reducing sugars (%) were significantly influenced by different treatments (Table 4). After 8 days of storage maximum reducing sugars (%) (2.35%) was recorded in T_3 *i.e.* olive oil coating at ambient storage conditions whereas the minimum reducing sugars (1.15%) was recorded in the T_{10} i.e. almond oil coating in cold storage conditions. After 28 days of storage maximum reducing sugars (2.35%) was found in T_9 *i.e.* olive oil coated guava fruits stored in cold storage conditions which is statistically at par with T_8 and T_{12} whereas minimum reducing sugars (%) (1.80%) was found in T_7 *i.e.* mustard oil coated guava fruits stored in cold storage conditions which is statistically at par with T_{10} and $T_{11.}$ These results are in accordance with the findings of Panday *et al.*[14], Chandra[3] and Das and Medhi[4].

Non-Reducing Sugars (%): Non-Reducing Sugars were significantly influenced by different treatments (Table 4). Various edible coating treatments showed a significant influenced in non-reducing sugars (%). After 8 days of storage maximum non-reducing sugars (3.83%) was recorded in T_9 *i.e.* olive oil coating in cold storage whereas the minimum non-reducing sugars (1.62%) was recorded in the T_{11} i.e. grapeseed oil coated guava fruits stored in cold storage conditions which is statistically at par with T_6 and T_7. After 28 days of storage maximum non-reducing sugars (%) (2.81%) was found in T_{12} i.e. untreated guava fruits stored in cold storage conditions, minimum non-reducing sugars (2.17 %) was found in T_{10} i.e. almond oil coated guava fruits stored in cold storage conditions which is T_8 and T_9. These results are in accordance with the findings of Panday[14] and El-Monem *et al*[9].

Table 1: Effect of different edible coatings and storage conditions on Physiological loss in weight (PLW) (%) and Marketable Fruits Retained (M.R.F.) (%) of guava cv. Allahabad safeda

Symbol	Treatments	Physiological loss in weight (%)				Marketable Fruits Retained (%)			
		Days after Storage				Days after Storage			
		4	8	28	Mean	4	8	28	Mean
T_1	Mustard oil + Ambient conditions	0.61	1.00	0.00	0.54	58.00	33.33	0.00	47.83
T_2	Coconut oil + Ambient conditions	0.53	0.89	0.00	0.47	57.70	32.83	0.00	47.63
T_3	Olive oil + Ambient conditions	0.59	2.20	0.00	0.93	72.50	44.50	0.00	54.25
T_4	Almond oil + Ambient conditions	0.64	1.01	0.00	0.55	71.67	41.63	0.00	53.32
T_5	Grapeseed oil + Ambient conditions	0.45	0.69	0.00	0.38	67.00	43.30	0.00	52.57
T_6	Untreated + Ambient conditions	0.91	1.46	0.00	0.79	35.00	10.00	0.00	36.25
T_7	Mustard oil + Cold storage	0.06	0.10	0.49	0.22	98.33	92.40	25.33	79.01
T_8	Coconut oil + Cold storage	0.08	0.59	1.10	0.59	99.70	63.00	26.50	72.30
T_9	Olive oil + Cold storage	0.05	0.48	1.03	0.52	99.90	95.50	34.80	82.55
T_{10}	Almond oil + Cold storage	0.07	0.69	1.08	0.61	98.50	82.30	25.17	76.49
T_{11}	Grapeseed oil + Cold storage	0.06	0.33	1.05	0.48	99.00	94.00	33.70	81.67
T_{12}	Untreated + Cold storage	1.17	1.64	2.15	1.65	97.33	54.67	12.50	66.12
Mean	-	0.43	0.92	0.57	0.64	79.55	57.29	13.17	62.50
S.Em±		-	-	-	-	0.89	0.84	1.06	-
C.D. @ 5%		-	-	-	-	2.59	2.44	3.01	-

Table 2: Effect of different edible coatings and storage conditions on fruit colour and oraganoleptic rating of guava cv. Allahabad safeda

Symbol	Treatments	Colour				Organoleptic rating			
		Days after Storage				Days after Storage			
		4	8	28	Mean	4	8	28	Mean
T_1	Mustard oil + Ambient conditions	6.00	4.00	0.00	4.75	6.00	4.00	0.00	4.75
T_2	Coconut oil + Ambient conditions	7.00	3.50	0.00	4.87	7.00	3.50	0.00	4.87
T_3	Olive oil + Ambient conditions	8.00	6.00	0.00	5.75	8.00	6.00	0.00	5.75
T_4	Almond oil + Ambient conditions	7.50	4.50	0.00	5.25	7.50	4.53	0.00	5.26
T_5	Grapeseed oil + Ambient conditions	7.00	6.00	0.00	5.50	7.00	5.33	0.00	5.33
T_6	Untreated + Ambient conditions	5.00	2.00	0.00	4.00	5.00	2.33	0.00	4.08
T_7	Mustard oil + Cold storage	8.00	7.00	3.00	6.75	8.00	7.00	3.00	6.75
T_8	Coconut oil + Cold storage	8.50	6.00	2.50	6.50	8.50	6.00	2.50	6.50
T_9	Olive oil + Cold storage	9.00	9.00	5.33	8.08	9.00	9.00	5.00	8.00
T_{10}	Almond oil + Cold storage	8.00	8.67	3.50	7.29	8.00	7.50	3.50	7.00
T_{11}	Grapeseed oil + Cold storage	9.00	8.17	4.00	7.54	9.00	8.50	4.00	7.62
T_{12}	Untreated + Cold storage	7.00	5.00	2.00	5.75	7.00	5.00	2.00	5.75
Mean	-	7.50	5.82	2.00	6.00	7.50	5.72	1.66	5.97
S.Em±	-	0.74	0.70	0.42	-	0.53	0.62	0.38	-
C.D. @ 5%	-	2.14	2.05	1.22	-	1.53	1.82	1.11	-

Table 3: Effect of different edible coatings and storage conditions on Total Soluble Solids (°Brix) and Titratable acidity (%) of guava cv. Allahabad safeda

Symbol	Treatments	Total Soluble Solids (°Brix)				Titratable acidity (%)			
		Days after Storage				Days after Storage			
		4	8	28	Mean	4	8	28	Mean
T_1	Mustard oil + Ambient conditions	7.00	7.60	0.00	5.95	0.24	0.12	0.00	0.16
T_2	Coconut oil + Ambient conditions	10.10	9.37	0.00	7.17	0.28	0.21	0.00	0.19
T_3	Olive oil + Ambient conditions	8.00	9.33	0.00	6.63	0.35	0.24	0.00	0.22
T_4	Almond oil + Ambient conditions	8.20	7.07	0.00	6.12	0.32	0.21	0.00	0.20
T_5	Grapeseed oil + Ambient conditions	9.10	7.33	0.00	6.41	0.28	0.21	0.00	0.19
T_6	Untreated + Ambient conditions	8.80	7.00	0.00	6.25	0.20	0.20	0.00	0.17
T_7	Mustard oil + Cold storage	9.70	7.90	10.00	9.20	0.26	0.15	0.10	0.20
T_8	Coconut oil + Cold storage	8.70	11.00	13.20	10.52	0.32	0.43	0.27	0.32
T_9	Olive oil + Cold storage	13.00	8.00	10.10	10.07	0.39	0.28	0.24	0.30
T_{10}	Almond oil + Cold storage	10.00	6.80	9.00	8.75	0.38	0.27	0.23	0.29
T_{11}	Grapeseed oil + Cold storage	10.90	11.50	13.50	11.27	0.35	0.23	0.22	0.27
T_{12}	Untreated + Cold storage	11.60	7.50	9.50	9.45	0.22	0.36	0.18	0.26
Mean	-	9.59	8.37	5.44	-	0.30	0.24	0.10	0.23
S.Em±	-	0.61	0.53	0.62	-	0.01	0.02	0.01	-
C.D. @ 5%	-	1.77	1.53	1.79	-	0.03	0.05	0.03	-

Table 4: Effect of different edible coatings and storage conditions on reducing sugars (%) and Non-reducing sugars (%) of guava cv. Allahabad safeda

Symbol	Treatments	Reducing sugars (%)				Non-reducing sugars (%)			
		Days after Storage				Days after Storage			
		4	8	28	Mean	4	8	28	Mean
T_1	Mustard oil + Ambient conditions	1.16	1.55	0.00	1.17	2.35	2.49	0.00	1.54
T_2	Coconut oil + Ambient conditions	1.83	2.19	0.00	1.50	1.77	2.33	0.00	1.35
T_3	Olive oil + Ambient conditions	2.12	2.35	0.00	1.61	2.86	2.86	0.00	1.76
T_4	Almond oil + Ambient conditions	0.98	1.21	0.00	1.04	2.27	2.35	0.00	1.48
T_5	Grapeseed oil + Ambient conditions	1.21	1.70	0.00	1.22	2.36	2.38	0.00	1.51
T_6	Untreated + Ambient conditions	1.21	2.25	0.00	1.36	2.29	1.81	0.00	1.35
T_7	Mustard oil + Cold storage	1.24	2.29	1.80	1.83	2.28	1.73	2.41	1.93
T_8	Coconut oil + Cold storage	1.39	2.12	2.15	1.91	2.66	2.48	2.20	2.16
T_9	Olive oil + Cold storage	2.00	1.44	2.35	1.94	2.80	3.83	2.18	2.53
T_{10}	Almond oil + Cold storage	1.09	1.15	1.82	1.51	2.19	2.83	2.17	2.12
T_{11}	Grapeseed oil + Cold storage	1.20	2.19	2.02	1.85	2.35	1.62	2.54	1.95
T_{12}	Untreated + Cold storage	1.60	1.35	2.25	1.80	2.22	2.61	2.81	2.24
Mean	-	1.42	1.82	1.03	1.56	2.37	2.44	1.19	1.83
S.Em±	-	0.14	0.25	0.16	-	0.16	0.16	0.05	-
C.D. @ 5%	-	0.53	N.S.	0.46	-	0.47	0.46	0.14	-

CONCLUSION

Edible oils and storage conditions significantly influence the shelf life of guava fruits. The guava fruits treated with olive oil greatly extend the shelf life of guava (28 days in cold storage (T_9) and 16 days at ambient conditions (T_3) than control (16 days in cold storage T_{12} and 6 days at ambient conditions. On the basis of present investigation, it can be concluded that application of different edible coatings and storage conditions not only improve the quality and postharvest life of fruits but they are also eco-friendly. T_9 i.e. olive oil + cold storage resulted in better organoleptic rating and shelf life as compared to other methods. The present study suggests that guava fruits coated with application of olive oil coating both in ambient conditions and in cold storage conditions seem to hold promise and considered the most benefited one in extending the marketability, shelf life and quality of guava.

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