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Effect of Packaging Material and Storage Period on Physico-Chemical Attributes of Osmotic Dehydrated Ripe Sapota Slices

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A B S T R A C T

The experiment was carried out with the aim to standardize the processing technique for preparation of osmotic dehydrated ripe sapota slices and to study the changes in nutritional and chemical composition of osmotic dehydrated ripe sapota slices during storage. This investigation was carried out in the laboratory of post-harvest technology, College of Horticulture, Dr. Y.S.R. Horticultural University, Rajendranagar, Hyderabad, India, during the year 2014-215.Sapota were packed in two different packaging materials (aluminium foil covers and 150-gauge polypropylene bags) and stored at two conditions (ambient and refrigerated) for the period of four months. Various physico-chemical parameters like moisture (%), loss or gain in weight (%), microbial count (cfu/g) and organoleptic evaluation were analysed at 15 days interval for 4 months. Dried slices packed in aluminium foil covers and stored at refrigerated temperature resulted to no microbial contamination till the 90th day of storage period, while all other treatments showed more or less microbial contamination on 90th day storage. Dehydrated sapota slices packed in aluminium foil covers and stored at refrigerated condition were found to be best followed by 150-gauge polypropylene bags and stored at refrigerated condition in retaining various attributes like minimal moisture gain, weight gain and organoleptic properties and lesser microbial growth when compared to the other packaging materials and storage conditions during the four months storage period.

Introduction

Sapota (*Achraszapota* L.) is one of the most important tropical fruit. Sapota fruit is a good source of digestible sugar, virtually a treasure of minerals such as iron and calcium. The fruits have an appreciable amount of protein, fat, fibre, calcium, phosphorus, iron, carotene and vitamin C and also rich in bio-iron. It is growing in an area of 177.0 thousand hectares with a production of 1744.3 million tonnes (Indian Horticulture Database- 2014, NHB). It has been observed that when there is a bumper production of sapota, the fruit goes as waste for want of suitable preservation facilities. In sapota, post-harvest losses ranged from 25-30 per cent. Sapota is generally consumed as a fresh fruit. Ripened sapota

cannot be stored for more than a day or two as it is highly perishable in nature, ripens faster and becomes unfit for consumption very soon. Among the various preservation methods, drying is the most convenient and simplest method throughout the world. Besides preserving seasonal commodities, dehydrated fruit products have inherent advantages, such as prolonged shelf life, higher degree of resistance to bacterial attack and lower transportation, handling and storage costs. The methods and the variables of drying, influence both the quality and physicochemical characteristics of the dried products (Krokida and Maroulis, 1997).

Osmotic dehydration has received greater attention in recent years as an effective method with retention of their initial fruit characteristics viz. colour, aroma, and nutritional compounds. Osmotic parameters like sugar gain and water loss are correlated with osmosis time. It involves the dehydration of fruit slices in two stages, removal of water using sugar syrup as osmotic agent and subsequent dehydration in the drier where osmotic content is further reduced to about 15 % to make the product shelf stable.

The shelf life of dehydrated ripe sapota slices depends on different factors like packaging material and storage temperature. The extension in storage life is possible by checking increase in moisture, retention of physico chemical attributes and preventing microbial activity etc. Hence, there is a need to develop a low cost technology for processing sapota fruits into value added products. Therefore, the present investigation was carried out to study the changes in physico-chemical composition of osmotic dehydrated ripe sapota slices during storage.

Materials and Methods

The investigation was carried out in the laboratory of post-harvest technology, College of Horticulture, Dr. Y.S.R. Horticultural University, Rajendranagar, Hyderabad, India, during the year 2014-2015. Three Packaging materials Aluminum foil covers (T_1), 150 gauge Polypropylene bags (T_2), Control [without package] (C_1), and two Storage conditions Ambient temperature [25 ± 2^0C] (S_1) and Refrigerated temperature [8 - 10^0C] (S_2) were included in this investigation. There were altogether six treatments. The experiment was laid out in CRD with factorial concept with four replications.

The observation on Moisture content (%), Loss or gain in weight (%), Microbial load (cfu/ml) and Oganoleptic evaluation were taken at 15 days interval for 4 months. Different parameters taken are as follows

Moisture (%)

Moisture content of fresh fruit as well as dehydrated slices was determined on percentage basis.

Dehydrated sapota slices weighing 10 grams were taken in a pre-weighed china dish and kept in a hot air oven at 70^0C for 48 hours and then the weight was recorded using electronic balance. The dry weight was recorded until a constant weight was attained.

Moisture content was determined on fresh weight basis (Ranganna, 1986).

$$\text{Moisture (\%)} = \frac{\text{Loss in weight of sample on drying (g)}}{\text{Weight of sample taken (g)}} \times 100$$

Gain in weight (%)

$$\text{Loss or gain In weight (\%)} = \frac{\text{Loss or gain in weight of Dehydrated slices (g)}}{\text{Weight of fresh slices (g)}} \times 100$$

Microbial load (cfu/ml)

Total bacterial count

For estimation of microbial count in different sample products, dilution plate method was followed (Cruik Shank *et al.,* 1975). 1gram of sample was thoroughly mixed in 9ml of sterile water. 1ml of sample was transferred through a sterile pipette to a screw cap tube containing 9 ml of sterile water. This gave dilution of 10^{-2}. Similarly serial dilutions were made,1ml of the serially diluted sample was placed in the sterile petridish to which cooled plate count agar medium was added and mixed thoroughly with the suspension and then allowed to set and then incubated at 28± 2^0C for 48 hours. Individual colonies were counted by using digital colony counter (light box and pen method) and multiplied with the dilution factor to get the microbial population in 1ml of sample.

$$\text{CFU/ml} = \frac{\text{Number of colonies per ml plate}}{\text{Total dilution factor}}$$

Total mould count

Dilution plate method was followed for estimation of mould population as mentioned above in the total bacterial count (Cruik Shank *et al.,* 1975). Potato dextrose agar medium was used for estimating the yeast and mould population. Samples were diluted in the sterile water before plating.

Organoleptic evaluation

Dried slices prepared under varied pretreatments was evaluated for sensory characteristics *viz.*,colour, appearance, texture, flavour, taste and overall acceptability at Hedonic 9- point rating scale (Amerine *et al.,* 1965). Each attribute was given a separate score of 9 points. From the quality point of view, higher product scoring was treated as more acceptable. The sensory attributes were evaluated as per the format of hedonic 9-rating scale given below.

Packaging and storage

The dehydrated sapota slices were packed in aluminium foil covers and 150-gauge polypropylene bags respectively and were sealed using heat impulse sealer. The packages were stored under ambient temperature (25±2^{0}C) and refrigerated temperature (8-10^{0}C) respectively for 4 months.

Statistical analysis

The data were subjected to statistical analysis as per the procedure outlined by Panse and Sukhatme (1985). The experiment design was Complete randomized design with factorial concept. Three replicates were maintained for each analysis, and the data from the four replicates were processed by one-way analysis of variance using the least significant test to determine the level of significance at $P > 0.05$.

Results and Discussion

Slices were soaking in invert sugar 60^{0}Brix for 8 hours of osmotic dehydrated ripe sapota slices and stored in different packaging materials. Slices were packed in two different packaging materials (aluminium foil covers and 150-gauge polypropylene bags) storage at ambient as well as refrigerated temperature (8-10^{0}C).

Moisture (%)

The data pertaining to the influence of packaging materials and storage period on moisture (%) of osmotic dehydrated ripe sapota slices are presented in table 1.

As it was shown in the Table 1 the moisture in the dehydrated slices were significantly affected by the treatments, storage periods and their interactions.

During the 4 months of storage period, with the increase in duration of storage period, the mean moisture content slightly increased significantly from the initial (8.00) to 120th day (10.17). The highest mean moisture content (10.17) was observed in dehydrated slices on 120 days of storage period closely followed by 105 days storage period (10.07) and was on par with 90 days storage period (10.03), whereas, lowest mean moisture (8.37) pickup was observed on 15th day of storage period followed by 30th day storage period (8.94).

Results revealed that dehydrated slices packed in aluminium foil covers absorbed minimum moisture during storage as compared to 150-gauge polypropylene bags. The changes in moisture content may be due to differences in water vapour permeability of the packaging film and aluminium foil having very low water vapour transmission rate. Similar findings were reported in dehydrated apple rings by Sharma and Kausal (2006) and banana chips and jackfruit chips by Molla *et al.,* (2009).

Increase in moisture during storage period was attributed to slight pickup of moisture by osmo-dehydrated sapota slices. Analogous observation was reported by Mehta and Tomar (1980) in guava and papaya, Heikel *et al.,* (1972) in dried mango sheets.

There was a progressive increase in moisture content of the packed upon storage. This might be due to absorption of moisture from the atmosphere by the packaging materials. Similar observation were made by Sagar and Khurdiya (1998) in dehydrated ripe mango slice, Sharma and Kausal (2006) in apple rings and banana chips and jackfruit chips by Molla *et al.,* (2009).

Gain in weight (%)

It is evident from the Table 2 that there were significant differences in gain in weight due to different treatments, storage period and their interactions.

Among the treatments, it was observed that the lowest mean gain in weight (1.92) was recorded in the dehydrated slices packed in aluminium foil covers stored at ambient temperature (T_1S_1) followed by 150-gauge polypropylene bags stored at ambient temperature (2.02). Whereas, the highest mean gain in weight (2.75) was observed in both controls i.e. dehydrated slices stored at refrigerated temperature (8-10^{0}C) without package (C_1S_2) followed by C_1S_1- dehydrated slices stored at ambient temperature without package (2.51) during the 4 months of storage period.

Bacterial count (cfu/g)

The data in the table 3 indicates that there were significant changes in the bacterial contamination of dehydrated slices due to treatments, storage period and the interactions between them.

Significant changes in bacterial contamination were found due to the interactions between the days of storage and treatments. As the storage period increased, the bacterial contamination increased irrespective of the treatments. No bacterial contamination was noticed on the 15th day of storage in all the treatments. On 30th and 45th day of storage, no contamination was observed in packed dehydrated slices except in controls-C_1S_1 (4.37 and 9.62) and C_1S_2 (2.50 and 6.12) respectively. However treatments T_1S_2 and T_2S_2 showed no contamination till the 90th

and 75th day of storage respectively over other treatments. On 120th day of storage, control treatments (C_1S_1 and C_1S_2) both exhibited maximum bacterial contamination, the highest contamination was observed in control C_1S_1 (57.75) followed by control C_1S_2 (45.50). The minimum bacterial contamination was observed in aluminium foil covers stored at refrigerated temperature (15.37) followed by 150-gauge polypropylene bags stored at refrigerated temperature (22.50).

Mould count (cfu/g)

The data in the table 4 indicates that there were significant changes in the mould contamination of dehydrated ripe sapota slices due to treatments, days of storage and the interactions between them.

Significant changes were found due to the interactions between the days of storage and treatments. The mould count (Cfu/ml) was not found (0.00) throughout the storage period in all the treatments except in the control treatments at each successive interval of storage period. However, on the 120th day of storage period, the mould contamination was observed in control treatments which were 2.00 and 1.25 in control C_1S_1 and C_1S_2 respectively. Lowest microbial load was observed in slices packed in aluminium foil covers as compared to 150-gauge polypropylene bags indicating them to be ideal material for long term storage of dehydrated sapota slices. Similar finding were recorded by Krishnaveni *et al.,* (1999) in jackfruit bars and Evelin Mary *et al.,* (2007) in banana powder. The storage stability may be attributed to the preservative effect of KMS and the low permeability of the packaging material to oxygen and water resulting in slower degradation of dehydrated slices hence enhancing the shelf-life.

Effect of packaging materials and storage conditions on organoleptic evaluation of osmotic dehydrated ripe sapota slices during storage

Colour

The data regarding colour of dehydrated sapota slices represented in the table 5 recorded significant variation among the treatments, duration of storage and interaction between them.

There was a significant decline in mean colour score from the initial (7.67) to120th day (5.84) of storage period. The colour score recorded on 15th day was on par with 30th day of colour score (7.47). It was observed that as the storage period increased, there was a decrease in colour score irrespective of the treatment.

Hedonic 9- point rating scale

Sl. No.	Sensory Attributes	Code A	Code B	Code C	Code D	Code E	Code F	Code G	Code H	Code I
1.	Colour									
2.	Appearance									
3.	Texture									
4.	Taste									
5.	Flavor									
6.	Ovarall Acceptability									

Score: 9- Like extremely, 8- Like very much, 7- Like moderately, 6- Like slightly, 5- Neither like nor dislike, 4- Dislike slightly, 3- Dislike moderately, 2- Dislike very much, 1-Dislike extremely

Table.1 Effect of packaging materials and storage conditions on moisture (%) content of osmotic dehydrated ripe sapota slices during storage

Treatments	Days of storage								Mean
	15 days	30 days	45 days	60 days	75 days	90 days	105 days	120 days	
T_1S_1	8.03	8.47	8.73	8.96	9.04	9.48	9.51	9.59	8.97
T_1S_2	8.03	8.53	8.72	9.02	9.28	9.76	9.96	10.07	9.17
T_2S_1	8.04	8.78	8.94	9.00	9.45	9.85	9.78	9.86	9.21
T_2S_2	8.08	8.85	9.00	9.02	9.57	10.15	10.07	10.18	9.36
C_1S_1	9.03	9.46	9.66	9.77	9.92	10.37	10.39	10.50	9.89
C_1S_2	9.03	9.58	9.92	9.72	10.15	10.57	10.72	10.80	10.06
Mean	8.37	8.94	9.16	9.25	9.57	10.03	10.07	10.17	
F-test S.Em±CD at (0.05%)									
For treatments (T)		**		0.015			0.042		
For days (D)		**		0.017			0.048		
For D x T		**		0.042			0.119		

Initial value- 8.00

Table.2 Effect of packaging materials and storage conditions on gain in weight (%) in osmotic dehydrated ripe sapota slices during storage

Treatments	Days of storage								Mean
	15 days	30 days	45 days	60 days	75 days	90 days	105 days	120 days	
T_1S_1	0.00	0.88	1.30	1.85	2.45	2.64	3.02	3.20	1.92
T_1S_2	0.11	1.15	1.50	2.07	2.56	2.94	3.34	3.56	2.15
T_2S_1	0.00	0.94	1.42	1.94	2.57	2.79	3.20	3.32	2.02
T_2S_2	0.23	1.43	1.71	2.30	2.72	3.10	3.45	3.70	2.33
C_1S_1	0.21	1.55	1.91	2.58	3.03	3.36	3.57	3.91	2.51
C_1S_2	0.27	1.94	2.50	2.77	3.17	3.58	3.76	4.02	2.75
Mean	0.14	1.31	1.72	2.25	2.75	3.07	3.39	3.62	
F-test S.Em±CD at (0.05%)									
For treatments (T)		**		0.013			0.038		
For days (D)		**		0.015			0.044		
For D x T		**		0.038			0.108		

Initial value- 0.00

Table.3 Effect of packaging materials and storage conditions on bacterial count (cfu/ml) in osmotic dehydrated ripe sapota slices during storage

Treatments	Days of storage								Mean
	15 days	30 days	45 days	60 days	75 days	90 days	105 days	120 days	
T_1S_1	0.00	0.00	0.00	0.00	0.00	11.12	19.25	32.25	7.82
T_1S_2	0.00	0.00	0.00	0.00	0.00	0.00	10.00	15.37	3.17
T_2S_1	0.00	0.00	0.00	2.12	6.12	15.75	24.75	35.00	10.46
T_2S_2	0.00	0.00	0.00	0.00	0.00	10.12	15.50	22.50	6.01
C_1S_1	0.00	4.37	9.62	16.00	24.75	35.75	44.25	57.75	24.06
C_1S_2	0.00	2.50	6.12	12.50	17.00	24.50	36.25	45.50	18.04
Mean	0.00	1.14	2.62	5.10	7.97	16.20	25.00	34.72	
F-test S.Em±CD at (0.05%)									
For treatments (T)		**		0.224			0.627		
For days (D)		**		0.259			0.724		
For D x T		**		0.635			1.775		

Initial value- 0.00

Table.4 Effect of packaging materials and storage conditions on mould count (cfu/ml) in osmotic dehydrated ripe sapota slices during storage

Treatments	Days of storage								Mean
	15 days	30 days	45 days	60 days	75 days	90 days	105 days	120 days	
T_1S_1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
T_1S_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
T_2S_1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
T_2S_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C_1S_1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.25
C_1S_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.25	0.15
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.54	
F-test S.Em±CD at (0.05%)									
For treatments (T)	**		0.024		0.068				
For days (D)	**		0.028		0.078				
For D x T	**		0.069		0.193				

Initial value- 0.00

Table.5 Effect of packaging materials and storage conditions on colour of osmotic dehydrated ripe sapota slices during storage

Treatments	Days of storage								Mean
	15 days	30 days	45 days	60 days	75 days	90 days	105 days	120 days	
T_1S_1	7.51	7.47	7.44	7.40	7.40	7.02	6.90	6.57	7.21
T_1S_2	7.64	7.60	7.59	7.55	7.50	7.22	7.05	6.72	7.36
T_2S_1	7.49	7.48	7.43	7.39	7.39	6.95	6.80	6.07	7.12
T_2S_2	7.61	7.58	7.54	7.50	7.44	7.07	6.90	6.57	7.27
C_1S_1	7.33	7.35	7.29	7.19	6.45	5.75	5.00	4.50	6.30
C_1S_2	7.40	7.36	7.30	7.20	6.51	5.90	5.25	4.70	6.45
Mean	7.51	7.47	7.43	7.37	7.11	6.65	6.32	5.84	
F-test S.Em± CD at (0.05%)									
For treatments (T)	**		0.015		0.042				
For days (D)	**		0.017		0.049				
For D x T	**		0.043		0.120				

Initial value-7.67

Table.6 Effect of packaging materials and storage conditions on appearance of osmotic dehydrated ripe sapota slices during storage

Treatments	Days of storage								Mean
	15 days	30 days	45 days	60 days	75 days	90 days	105 days	120 days	
T_1S_1	7.33	7.00	6.51	6.07	5.86	5.54	5.45	5.35	5.88
T_1S_2	7.33	7.05	6.74	6.52	6.13	5.71	5.63	5.60	6.34
T_2S_1	7.33	6.89	6.51	6.00	5.68	5.49	5.41	5.38	6.08
T_2S_2	7.33	7.00	6.67	6.29	6.00	5.61	5.60	5.50	6.25
C_1S_1	7.00	6.47	5.84	5.37	4.75	4.47	3.95	3.57	5.17
C_1S_2	7.00	6.54	6.00	5.56	5.05	4.37	4.00	3.70	5.28
Mean	7.22	6.82	6.38	5.97	5.58	5.20	5.00	4.85	
F-test S.Em±CD at (0.05%)									
For treatments (T)	**		0.021		0.059				
For days (D)	**		0.024		0.068				
For D x T	**		0.059		0.167				

Initial value-7.33

Table.7 Effect of packaging materials and storage conditions on texture of osmotic dehydrated ripe sapota slices during storage

Treatments	Days of storage								Mean
	15 days	30 days	45 days	60 days	75 days	90 days	105 days	120 days	
T_1S_1	6.55	6.32	6.12	6.00	5.82	5.67	5.57	5.40	5.93
T_1S_2	6.66	6.57	6.50	6.36	6.15	6.05	5.92	5.70	6.24
T_2S_1	6.50	6.30	6.00	5.85	5.72	5.55	5.37	5.15	5.80
T_2S_2	6.60	6.41	6.32	6.15	6.02	5.85	5.67	5.52	6.07
C_1S_1	6.10	5.65	5.37	5.00	4.55	4.30	3.87	2.62	4.68
C_1S_2	6.17	5.76	5.45	5.07	4.72	4.42	4.10	3.57	4.91
Mean	6.43	6.17	5.96	5.74	5.50	5.30	5.08	4.66	
F-test S.Em± CD at (0.05%)									
For treatments (T)	**	0.046	0.130						
For days (D)	**	0.053	0.150						
For D x T	**	0.131	0.368						

Initial value-6.67

Table.8 Effect of packaging materials and storage conditions on taste of osmotic dehydrated ripe sapota slices during storage

Treatments	Days of storage								Mean
	15 days	30 days	45 days	60 days	75 days	90 days	105 days	120 days	
T_1S_1	8.00	7.89	7.79	7.75	7.60	7.50	7.20	7.00	7.59
T_1S_2	8.00	7.94	7.90	7.82	7.70	7.58	7.51	7.27	7.71
T_2S_1	8.00	7.88	7.79	7.71	7.58	7.45	7.07	6.84	7.54
T_2S_2	8.00	7.90	7.82	7.80	7.63	7.56	7.38	7.12	7.65
C_1S_1	7.65	7.50	7.40	7.00	6.12	5.50	5.00	4.25	6.30
C_1S_2	7.70	7.53	7.42	7.15	6.25	5.57	5.20	4.52	6.42
Mean	7.89	7.77	7.69	7.54	7.14	6.86	6.56	6.17	
F-test S.Em±CD at (0.05%)									
For treatments (T)	**	0.018	0.052						
For days (D)	**	0.021	0.060						
For D x T	**	0.052	0.148						

Initial value-8.00

Table.9 Effect of packaging materials and storage conditions on flavour of osmotic dehydrated ripe sapota slices during storage

Treatments	Days of storage								Mean
	15 days	30 days	45 days	60 days	75 days	90 days	105 days	120 days	
T_1S_1	6.67	6.55	6.47	6.40	6.35	6.21	6.05	5.87	6.32
T_1S_2	6.67	6.62	6.55	6.48	6.43	6.33	6.21	5.95	6.40
T_2S_1	6.60	6.46	6.41	6.36	6.24	6.05	5.89	5.65	6.21
T_2S_2	6.66	6.57	6.50	6.43	6.41	6.25	6.00	5.62	6.30
C_1S_1	6.42	6.12	5.47	5.02	4.87	4.57	4.41	4.00	5.11
C_1S_2	6.40	6.12	5.62	5.20	5.00	4.67	4.50	4.12	5.20
Mean	6.57	6.41	6.17	5.98	5.88	5.68	5.51	5.20	
F-test S.Em± CD at (0.05%)									
For treatments (T)	**	0.013	0.038						
For days (D)	**	0.015	0.044						
For D x T	**	0.038	0.108						

Initial value-6.67

Table.10 Effect of packaging materials and storage conditions on overall acceptability of dehydrated ripe sapota slices during storage

Treatments	Days of storage								Mean
	15 days	30 days	45 days	60 days	75 days	90 days	105 days	120 days	
T_1S_1	7.33	7.07	6.95	6.78	6.60	6.41	6.33	6.00	6.68
T_1S_2	7.33	7.20	7.07	7.00	6.83	6.63	6.48	6.32	6.86
T_2S_1	7.33	7.00	6.91	6.67	6.52	6.37	6.30	5.92	6.63
T_2S_2	7.33	7.17	7.00	6.84	6.71	6.51	6.41	6.21	6.77
C_1S_1	7.00	6.50	6.35	6.02	5.42	5.00	4.72	4.25	5.65
C_1S_2	7.05	6.67	6.40	6.12	5.50	5.10	4.85	4.50	5.77
Mean	7.22	6.93	6.78	6.57	6.26	6.00	5.85	5.53	
F-test S.Em± CD at (0.05%)									
For treatments (T)		**		0.014			0.041		
For days (D)		**		0.017			0.047		
For D x T		**		0.041			0.117		

Initial value-7.33
T_1S_1 -Aluminium foil covers + Storage at ambient temperature.
T_2S_1-150 gauge Polypropylene bags + Storage at ambient temperature.
T_1S_2-Aluminium foil covers + Storage at refrigerated temperature (8-10^{0}C).
T_2S_2 -150 gauge Polypropylene bags + Storage at refrigerated temperature (8-10^{0}C).
C_1S_1-Control without package + Storage at ambient temperature.
C_1S_2 -Control without package+Storage at refrigerated temperature (8-10^{0}C).

Appearance

The data regarding the appearance of dehydrated sapotaslices presented in the table 6 recorded significant variation among the treatments, duration of storage and interaction between them.

Among the treatments best mean appearance score (6.34) was observed in dehydrated slices packed in aluminium foil covers and stored at refrigerated temperature (T_1S_2) followed by packed in 150-gauge polypropylene bags and stored at refrigerated temperature (T_2S_2) (6.25) while least mean appearance score 5.17 was found in control with ambient temperature (C_1S_1) followed by with refrigerated temperature 5.28 (C_1S_2).

There was a significant decline in mean appearance score from the initial (7.33) to 120th day (4.85) of storage period. It was observed that as the storage period increased, there was a decrease in appearance score irrespective of the treatment.

Texture

The data pertaining to texture score of dehydrated sapota slices presented in the table 7 recorded significant variation among the treatments, duration of storage and interaction between them.

Among the treatments best mean texture score (6.24) was observed in dehydrated slices packed in aluminium foil covers and stored at refrigerated temperature (T_1S_2) followed by packed in 150-gauge polypropylene bags and stored at refrigerated temperature (T_2S_2) (6.07) while least mean texture score (4.68) was found in control with ambient temperature (C_1S_1) followed by (4.91) control with refrigerated temperature (C_1S_2).

There was a significant decline in mean texture score from the initial (6.67) to 120th day (4.66) of storage period. It was observed that with increase in storage period, there was a decrease in texture score irrespective of the treatments.

Taste

The data pertaining to taste score of dehydrated sapota slices represented in the table 8 recorded significant variation among the treatments, duration of storage and interaction between them.

Among the treatments best mean taste score (7.71) was observed in dehydrated slices packed in aluminium foil covers and stored at refrigerated temperature (T_1S_2) followed by packed in 150-gauge polypropylene bags and stored at refrigerated temperature (T_2S_2) (7.65) while least taste score (6.30) was found in control with ambient temperature (C_1S_1) followed by (6.42) control with refrigerated temperature (C_1S_2).

Flavour

The data pertaining to flavour score of dehydrated sapota slices presented in the table 9 recorded significant variation among the treatments, duration of storage and interaction between them.

Among the treatments best mean flavour score (6.40) was observed in dehydrated slices packed in aluminium foil covers and stored at refrigerated temperature (T_1S_2) followed by packed in aluminium foil covers and stored at ambient temperature (T_1S_1) (6.32) and which was on par with T_2S_2 (6.30) while least flavour score (5.11) was found in control with ambient temperature (C_1S_1) followed by (5.20) control with refrigerated temperature (C_1S_2).

There was a significant decline in mean flavour score from the initial (6.67) to 120th day (5.20) of storage period.

It was observed that as the storage period increased, there was a decrease in flavor score irrespective of the treatment.

Overall acceptability

The data regarding overall acceptability score of dehydrated ripe sapota slices represented in the table 10 recorded significant variation among the treatments, duration of storage and interaction between them.

Among the treatments best mean overall acceptability score (6.86) was observed in dehydrated slices packed in aluminium foil covers and stored at refrigerated temperature (T_1S_2) followed by packed in 150-gauge polypropylene bags and stored at refrigerated temperature (T_2S_2) (6.77) while least overall acceptability score (5.65) was found in control with ambient temperature (C_1S_1) followed by (5.77) control with refrigerated temperature (C_1S_2).

There was a significant decline in mean overall acceptability score from the initial (7.33) to 120th day (5.53) of storage period. It was observed that as the storage period increased, there was a decrease in mean overall acceptability score irrespective of the treatment.

There was a gradual decrease in score during the 4 months storage for colour, appearance, texture, taste, flavor and overall acceptability in all samples at ambient as well as at refrigerated storage temperature. Osmotic dehydrated sapota slices prepared using invert sugar and fructose sugar syrup gave first and second rank with highest taste score. Similar trend was observed after 4 months in slices stored at ambient and refrigerated temperature.

Refrigerated storage obtained higher score for sensory properties than those stored at ambient condition. Similar results were reported by Gawade and Waskar (2003), Deol and Bhullar (1972), Gouda *et al.,* (1975) and Thonta and Patil (1988) for dried figs.

The organoleptic score is varied with the treatment and packaging during storage. Osmotic followed by solar dehydrated slices packed in aluminium foil covers and stored at refrigerated temperature scores highest overall acceptability than the other treatments. The lower scores for 150-gauge polypropylene bags and stored at ambient temperature may be due to higher moisture absorption and gas permeability characteristics of the polypropylene bags. Similar results were reported by Vijayanand *et al.,* (2000) while working on guava fruit bar.

Sensory quality of dehydrated ripe sapota slices was significantly affected during four months of storage period. Overall sensory score of slices showed a decreasing trend with advance in storage period, could be due to enzymatic and non-enzymatic oxidation process, which might have caused for reduction in sensory score of the slices. Similar findings were reported in guava slices by Mehta and Tomar (1980). Gurumeenakshi *et al.,* (2005) also reported gradual decrease in colour and appearance of osmotic followed by solar dried papaya slices during storage. Loss of flavor during storage was also reported in papaya slices (Aruna *et al.,* 2000).

The texture and taste score also decreased and this could be also due to the same effect. The decrease in overall acceptability of osmotic followed by solar dried sapota slices during storage was significantly evident and could be because of reduction score of all sensory parameters of sapota slices. Gurumeenakshi *et al.,* (2005) also reported similar results on osmo-dried papaya.

References

Amerine, M. A., Pangborn, R. M. and Roesslev, E. B. 1965. *Principle of Sensory Evaluation of Food.* Academic Press Inc, New York.

Aruna, K., Vimala, V. and Dhanalaxmi, K. 2000.Studies on preparation and keeping quality of papaya. *Bev Food World,* 27: 15-20.

Cruick Shank, Durgid, J. P., Marimon, B. P. and Surian R. H. A. 1975.Medical microbiology. The practice of medical microbiology. Churchil living stone, Edinberg, London and New York 306.

Deol, J.S., and Bhullar, D.S.1972. Effect of wrappers and growth regulators on the storage life of mango fruits. *Punjab Horti. Journal,* 12(2-3): 114-119.

Evelinemary, A., Jecobb john, P and Vijayanand, D. 2007. Packaging and storage study on spray dried ripe banana powder under ambient conditions. *Journal of Food Science Technology,* 44(1) 16-21.

Gawade, M.H., and Waskar, D.P. 2003. Studies on processing and storage of fig fruits. *Journal of maharastra Agric Univ.,* 28:188-150.

Gouda, M.S., Zouil, M.B., EL-Zalaki, E.M. and Mohamed, M. 1975. Technology studies on fig varieties planted in Arab republic of Egypt. *Alexandria Journal of Agric. Res.,* 25:459-466.

Gurumeenakshi, G., Manimegalar, G., Maragatham, S. and Jaberaj, S. 2005.Ascorbic acid and KMS as new food additives for osmo-dried foods.*Bev Food World,* 32:50-51

Heikel, H.A., Sanafiri, N.Y and Shooman, M.A. 1972. Some factor affecting quality of dried mango sheets. *Agr. Res. Rev.,* 50:185-194.

Krishnavedi, A., Manimegalai, G., Vennila, P. and Sravanakumar, R. 1999. Storage stability of jackfruit bar in different packaging materials. *Indian Food Packer,* 53: 67-71.

Krokida, M.K., and Maroulis, Z.B. 1997. Effect of drying method on shrinkage and porosity. *Drying Technology,* 15:

1145–1155.

Mehta, G.L., and Tomar, M.C. 1980. Studies on dehydration of tropical fruits in Uttar Pradesh Guava: *Indian food packer*, 34(3): 12-15.

Molla, M.M., Nasrin T.A.A., Islam M.N. and Bhuyan A.J. 2009. Preparing and packaging of jackfruit chips. *International Journal of Sustainable Crop Production*, 3(6) : 41-57.

Panse, V.G., and Sukhatme, P.V. 1985. Statistical methods for agricultural workers. Indian Council of Agricultural Research, New Delhi, pp. 152-155.

Pearson, D., 1990. Pearson's Composition and Analysis of food.8th ed. 13.Longman Publishing Ltd. Singapore.

Ranganna, S., 1986. Handbook of analysis and quality control for fruit and vegetable products, 2nd edn, Tata McGraw-Hill, New Delhi, India, Pp. 1-3, 594-645.

Sagar, V.R., and Khurdiya, D.S. 1998. Improved products from ripe mango (cv. Dashehari).*Indian Food Packer*, 52(6): 3-7.

Sharma, K.D., and Alkeshkausal, B.B.L. 2006.Evaluation of apple cultivars for dehydration.*Journal Food Science Technology*, 43(2):177-181.

Thonta, G.T., and Patil, V.K. 1988. Studies on drying of fig fruits.*Indian Food Packer*, 42:94-99.

Veda, S.K., Patel and Srinivasan, K. 2008. Influence of food acidulants and antioxidant spices on the bio-accessibility of Bita- carotene from selected vegetables. Journal of Agricultural and Food Chemistry, 56(18): 8714-8719.

Vejayanand, P., Yadav, A.R., Balasubarmanyam, N. and Narasimham, P. 2000. Storage stability of guava fruit bar prepared using a new process. LebensmWiss Technology, 33: 132-137.

Vejayanand, P., Yadav, A.R., Balasubarmanyam, N. and Narasimham, P. 2000. Storage stability of guava fruit bar prepared using a new process. Lebensm Wiss Technology, 33: 132-137.

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