

Studies on Different Treatments on Osmotic Dehydrated Allahabad Safeda Guava Slice (*Psidium guajava*)

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ABSTRACT

The aim of this study was to evaluate the effect of osmotic dehydration of guava slice. The present investigation entitled “Studies on different treatments on osmotic dehydrated Allahabad safeda guava slice (*Psidium guajava*)” was carried out in the Post Harvest Laboratory of Department of Horticulture, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad in 2013. The design of the experiment was Completely Randomized Design (CRD) with 10 treatments and 3 replications and stored for 90 days under ambient temperature. The variety of guava was Allahabad safeda. The experimental result was found significant and it may be concluded that T₅ (Dipping of blanched Guava slices in 60° Brix glucose for 12 hours followed by vacuum dehydration) gave the best result in total soluble solids (23.53⁰Brix), acidity (0.34%), non-reducing sugar (5.82%) and also excellent in organoleptic quality.

Key words: Guava, Osmotic Dehydration, Blanching, Slice.

INTRODUCTION

Guava (*Psidium guajava*) is an evergreen subtropical fruit crop and it belongs to the family Myrtaceae. It is originated in Tropical America region extending from Peru to Chile. It is also known as “Apple of tropics”. Guava is one of the common and major fruit crops of India and considered as fourth most important fruit in area and production. In India, it occupies an area of 1.62 million hectares with an annual production of 16.85 million tonnes accounting for 5.26 percent and 3.87 percent of area and production respectively (NHB,

2014). Though it is successfully grown all over the country, the most important guava growing states are Uttar Pradesh, Bihar, Madhya Pradesh and Maharashtra. Uttar Pradesh is by far the most important guava producing state of India, and Allahabad has the reputation of growing the best guava in the country as well as in the world. Guava is a rich source of ascorbic acid (300mg/100g) and pectin. The ripe fruits contain moisture (77.9-86.9%), dry matter (12.3-26.3%), ash (0.51-1.02%) crude fat (0.10-0.70 %), crude protein (0.82-1.45%) and crude fibre (2.0-7.2%).

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Guava fruit is relished when mature or ripe and freshly plucked from the tree. Excellent salad and pudding are prepared from the shell of the ripe fruit. It can be preserved by canning as halves or quarters, with or without seed core. Guava slices can be dehydrated by air drying or osmotic dehydration and the dehydrated slices are pulverized to obtain guava fruit powder which is a good source of vitamin C. It freezes exceptionally well and the frozen product is practically indistinguishable from fresh fruit.

Drying and dehydration is the removal of majority of water contained in the fruits or vegetables and is the primary stage in the preparation of dehydrated fruits and vegetables. In osmotic dehydration, the fruits are subjected to osmosis by dipping or spreading them in concentrated sugar syrup under specific condition, so that the water from the fruits migrates to sugar syrup. Major dehydration of the fruits takes place in this process step, the final dehydration of guava slices to make it suitable for marketing is carried out by cabinet drying.

MATERIALS AND METHODS

The present investigation entitled “Studies on different treatments on osmotic dehydrated Allahabad safeda guava slice (*Psidiumguajava*)” was carried out in the Post Harvest Laboratory of Department of Horticulture, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad during 2013. The experiment was carried out in the Completely Randomized Design (CRD) with 16 treatments and 3 replications and stored for 90 days under ambient temperature.

T₀ :Control

T₁ :Dipping of blanched Guava slices in 50⁰ Brix sucrose for 12 hours followed by osmotic dehydration

T₂ :Dipping of blanched Guava slices in 60⁰ Brix sucrose for 12 hours followed by osmotic dehydration

T₃ :Dipping of blanched Guava slices in 70⁰ Brix sucrose for 12 hours followed by osmotic dehydration

T₄ :Dipping of blanched Guava slices in 50⁰ Brix glucose for 12 hours followed by osmotic dehydration

T₅ :Dipping of blanched Guava slices in 60⁰ Brix glucose for 12 hours followed by osmotic dehydration

T₆ :Dipping of blanched Guava slices in 70⁰ Brix glucose for 12 hours followed by osmotic dehydration

T₇ :Dipping of blanched Guava slices in 50⁰ Brix sugar for 12 hours followed by osmotic dehydration

T₈ :Dipping of blanched Guava slices in 60⁰ Brix sugar for 12 hours followed by osmotic dehydration

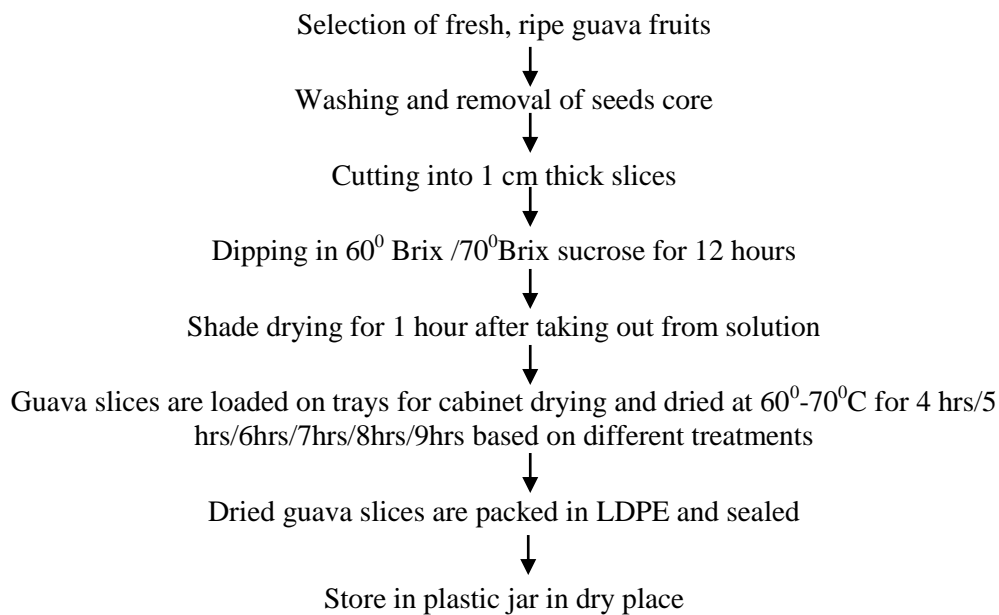
T₉ :Dipping of blanched Guava slices in 70⁰ Brix sugar for 12 hours followed by osmotic dehydration

Sensory evaluation

The sensory evaluation for assigning scores for the samples were conducted by a panel of five judges and the product was rated on a 9-point Hedonic scale Amerine² *et.al.*. The judges were kept same to all organoleptic tests.

The attributes considered in the score were given below:

Examine the colour and appearance, texture, flavor and taste and the overall acceptability of the sample.

Flow chart for the preparation of osmotic dehydrated guava slices**RESULTS AND DISCUSSION**

Moisture content (%): At initial reading, the minimum moisture content (23.88%) was noted with T₉ and maximum (29.40%) was in T₂. At 30 DAS, the minimum moisture content (23.99%) was determined with T₅ and maximum (29.53%) was found in T₂. At 60 DAS, an identical trend was achieved where T₅ again with lowest moisture content (24.11%) and highest (29.71%) was noted with T₂. At 90 DAS, T₅ remained with lowest moisture content (24.20%) and highest (29.89%) was found in T₂. The moisture content of dehydrated guava slices samples showed a gradually increased trend. This may be concluded to a simple fact that the dehydrated guava slices also went through the natural physiological process of respiration which has forced the slices to absorb moisture in the storage period. Similar observations were also reported by Vieira¹⁴ *et al.* and Khurdiya and Roy⁹ related to guava powder.

Total Soluble Solid (%): At initial reading, maximum TSS (23.10⁰ Brix) was noticed with T₅ while minimum (10.77⁰ Brix) was found with T₂. At 30 DAS, the maximum TSS (23.27⁰ Brix) was observed with T₅ and minimum with T₂ (11.03⁰ Brix) followed by T₄ (12.10⁰ Brix). A similar trend was found 60 DAS, where again the maximum TSS (23.43⁰

Brix) was noticed with T₅ followed by T₄ (22.07⁰ Brix) and minimum with T₃ (11.17⁰ Brix). Similar trend was also noticed at 90 DAS, where T₅ was with maximum TSS (23.53⁰ Brix) and minimum with the treatment T₂ (11.27⁰ Brix). Total soluble solids were found significantly increasing with the increase in the sucrose and honey percent. Similar findings were also reported by Ahmad and Choudhary¹ and Kumar³ *et al.*, in papaya.

Acidity (%): At initial stage, the minimum acidity (0.11%) was noticed in T₅ and maximum (0.38%) was found in T₂ followed by T₃ (0.37%). At 30 DAS, the minimum titrable acidity was found in the treatment T₅ (0.13%) and maximum was found in T₃ (0.54%) by T₁ (0.53%). At 60 DAS, minimum acidity (0.23%) was found in T₅ and maximum (1.34%) in T₁ followed by T₃ (1.27%). After 90 DAS, a similar trend was found, where minimum acidity was with T₅ (0.34%) and T₃ was with maximum acidity (1.85%) followed by T₈ (1.74%). The increased acidity in dehydrated guava slices in storage period may be the combined effect of physiological reactions and storage duration. The lower acidity value observed in osmotic dehydration due to leaching of acids from the prepared fruits by osmosis as studied by Chaudhari⁵ *et al.*

Ascorbic acid (mg/100gm): At initial stage, the maximum ascorbic acid (175mg/100g) was found with the treatment T₈ followed by T₉ (166.52mg/100g) and minimum in T₂ (140.17mg/g). 30 DAS, similar trend was recorded as the maximum ascorbic acid (173.26mg/100g) was recorded with the treatment T₇ followed by T₆ (163.16mg/100g) and minimum in T₂ (135.20 mg/100g). After 60 DAS, again T₈ was with highest ascorbic acid (171.56mg/100g) followed by T₉ (161.22mg/100g) and lowest in T₂ (130.83mg/100g). Similar trend was found at 90 DAS where the maximum ascorbic acid (169.52mg/100g) was reported in T₈ followed by T₉ (161.11mg/100g) and minimum in treatment T₂ (124.43mg/100g). It was clearly shown that the samples treated with honey were with high content of ascorbic acid and T₁₁ emerged as superior among all treatments. Henmaker⁸ *et al.*, also reported the trend of reducing ascorbic acid from mango guava sheets stored under ambient conditions during a period of 6 months.

Reducing sugar (%): At initial stage, the maximum reducing sugar (6.09%) was found in T₃ followed by T₇ (5.91%) and minimum in T₆ (3.06%). After 30 DAS, T₃ was again with highest reducing sugar (6.18%) followed by T₇ (6.03%) and lowest in T₆ (3.16%). At 60 DAS, same trend was found where T₃ was with maximum reducing sugar (6.23%) followed by T₇ (6.12%) and minimum in T₆ (3.25%). An identical trend was again achieved at 90 DAS, where the highest reducing sugar (6.30%) was reported in T₃ followed by T₇ (6.20%) and lowest in T₆ (3.34%). This may be due to the breakdown of polysaccharides into simple sugars as reported by Siddappa and Bhatia¹² in orange juice. A similar report was observed by Kumar and Khurdiya¹¹ in mango slices.

Non reducing sugar (%): At initial stage, the highest percentage of non-reducing sugar (5.63%) was with T₆ followed by T₅ (5.53%), T₈ (5.43%) and lowest (4.42%) was with T₃ and T₄. At 30 DAS, T₆ was again with maximum non-reducing sugar (5.71%) followed by T₉ (5.60%) and minimum with T₃ (4.48%). A similar trend was found after 60

DAS where the highest non-reducing sugar (5.78%) was with T₆ followed by T₉ (5.66%) and lowest with T₃ (4.56%). After 90 DAS, again T₆ remained significantly superior with highest non-reducing sugar (5.82%) followed by T₈ (5.73%) and minimum in T₃ (4.64%). Similar results of increased sugar levels in fruits treated with sugar syrup have been reported by Nagaraju and Shooman⁷ in ber and Kustagi¹⁰ and Chandan⁴ in aonla.

Total sugar (%): At initial stage, the maximum total sugar (10.87%) was noticed with the treatment T₇ followed by T₈ (10.72%) and minimum with T₂ (8.22%). After 30 DAS, the highest total sugar (11.15%) was noticed with T₇ followed by T₈ (10.93%) and lowest was noticed with T₂ (8.42%). An identical trend was reported at 60 DAS, where T₇ was again with maximum total sugar (11.37%) followed by T₈ (11.13%) and minimum was in T₂ (8.58%). After 90 DAS, a similar trend was noticed where again the highest percentage (11.54%) of total sugar was with T₇ followed by T₈ (11.37%) and lowest with T₂ (8.86%). This clearly showed that T₇ remained superior among all the treatments of dehydrated guava slices during 90 days of storage. The samples of dehydrated guava slices treated with sucrose emerged superior as compared to that of honey. A similar report was observed by Thakur and Sawant¹³ in osmotic dehydrated pineapple slices.

Sensory evaluation: The panel of judges was kept same for all organoleptic tests. At initial test, T₅ was with highest score for colour and appearance (9.00) followed by T₄ (8.90). Highest score (9.00) for texture, flavour and taste and overall acceptability were obtained in T₅ and T₄ followed by T₉ (8.60). At 30 DAS, T₅ was again with maximum score (9.00) for colour and appearance followed by T₅ (8.80). For texture, flavour-taste and overall acceptability, the highest score was found in T₅, i.e (9.00), (8.70), (9.00) followed by T₅ (8.95), (8.50), (8.90) respectively. After 60 DAS, for colour and appearance and texture, T₅ was again with highest score (8.70), (8.75) followed by T₄ (8.50), (8.65) respectively. For flavour and taste and overall acceptability, the

highest score was with T₅ (8.55), (8.70) followed by T₄ (8.45), (8.60) respectively. After 90 DAS, an identical trend was again noticed where T₅ remained significantly superior with highest score for colour and appearance (8.50) followed by T₄ (8.35). For texture, T₅ was reported with highest score (8.60) followed by T₄ (8.50). The highest score

for flavour-taste (8.40) was again with T₅. An identical trend was found at 90 DAS where the highest score for overall acceptability (8.65) was again with the treatments T₅ followed by T₈ (8.55). Duangmal and Khachonsakmetee⁹ observed similar report in osmotic dehydrated guava.

Table 1: Effect of different treatments on various parameters of dehydrated guava slices during storage

Treatment	Moisture				Total Soluble Solids				Acidity (%)				Ascorbic acid (mg/100g)			
	Initial Reading	30 Days	60 Days	90 Days	Initial Reading	30 Days	60 Days	90 Days	Initial Reading	30 Days	60 Days	90 Days	Initial Reading	30 Days	60 Days	90 Days
T ₀	26.17	26.42	26.75	27.31	14.53	14.77	14.87	15.07	0.26	0.31	0.54	0.65	144.73	139.54	135.58	129.45
T ₁	24.23	24.34	24.46	24.66	14.80	15.07	15.20	15.30	0.23	0.27	0.49	0.60	140.17	135.20	130.83	124.43
T ₂	29.40	29.53	29.71	29.89	10.77	11.03	11.17	11.27	0.38	0.54	1.27	1.74	163.56	161.14	158.88	129.45
T ₃	27.21	27.39	27.53	27.62	12.03	12.10	12.20	12.30	0.37	0.53	1.34	1.85	160.52	158.28	152.18	124.43
T ₄	25.57	25.93	26.19	26.48	18.80	18.97	19.13	19.23	0.15	0.19	0.30	0.38	148.52	145.11	140.66	157.30
T ₅	23.90	23.99	24.11	24.20	23.10	23.27	23.43	23.53	0.11	0.13	0.23	0.34	142.66	140.18	136.55	147.16
T ₆	27.79	27.92	28.06	28.16	12.67	12.80	12.90	13.13	0.27	0.32	0.45	0.56	160.57	156.27	152.46	137.65
T ₇	26.99	27.16	27.31	24.45	15.03	15.20	15.33	15.43	0.24	0.34	0.46	0.61	155.67	152.42	148.28	132.62
T ₈	25.30	25.45	25.57	25.63	20.90	21.07	21.13	21.33	0.15	0.22	0.35	0.42	158.65	156.58	155.34	151.19
T ₉	23.88	24.02	24.17	24.25	21.13	21.23	21.37	21.50	0.13	0.20	0.29	0.37	157.56	155.82	152.66	144.62
F- test	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
S. Ed. (±)	0.99	0.99	0.98	1.342	0.1	0.01	0.00	0.00	0.00	0.00	0.04	0.00	0.205	0.16	0.18	0.12
C. D. at 5%	2.04	2.03	2.02	4.82	0.16	0.15	0.13	0.14	0.05	0.04	0.08	0.12	2.925	0.839	0.881	0.718

Table 2: Effect of different treatments on various parameters of dehydrated guava slices during storage

Treatment	Reducing Sugar (%)				Non-Reducing sugar (%)				Total sugar (%)				Colour and Appearance			
	Initial Reading	30 Days	60 Days	90 Days	Initial Reading	30 Days	60 Days	90 Days	Initial Reading	30 Days	60 Days	90 Days	Initial Reading	30 Days	60 Days	90 Days
T ₀	3.37	3.43	3.52	3.60	4.96	5.12	5.25	5.36	8.33	8.55	8.77	8.96	7.20	7.10	7.05	6.90
T ₁	3.16	3.26	3.34	3.50	5.06	5.16	5.24	5.36	8.22	8.42	8.58	8.86	7.40	7.35	7.20	7.05
T ₂	6.09	6.18	6.23	6.30	4.42	4.48	4.56	4.64	9.74	9.88	10.13	10.48	6.35	6.25	6.20	6.00
T ₃	5.22	5.28	5.42	5.75	4.42	4.52	4.62	4.71	9.64	9.80	10.04	10.46	6.45	6.30	6.15	6.05
T ₄	3.43	3.49	3.61	3.68	5.42	5.50	5.59	5.65	8.85	8.99	9.20	9.33	8.90	8.80	8.50	8.35
T ₅	3.06	3.16	3.25	3.34	5.63	5.71	5.78	5.82	8.68	8.95	9.14	9.36	9.00	9.00	8.70	8.50
T ₆	5.91	6.03	6.12	6.20	4.97	5.13	5.25	5.34	10.87	11.15	11.37	11.54	7.50	7.35	7.25	7.10
T ₇	5.73	5.83	5.92	6.07	4.99	5.11	5.21	5.30	10.72	10.93	11.13	11.37	7.25	7.10	7.08	7.00
T ₈	3.24	3.36	3.44	3.53	5.47	5.55	5.64	5.72	8.71	8.91	9.08	9.25	8.20	7.75	7.20	7.10
T ₉	3.17	3.26	3.39	3.48	5.53	5.60	5.66	5.73	8.70	8.86	9.05	9.21	8.30	7.50	7.25	7.20
F- test	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
S. Ed. (±)	0.0	0.00	0.00	0.12	0.0	0.00	0.00	0.00	0.09	0.00	0.13	0.09	0.00	0.00	0.00	0.00
C. D. at 5%	0.06	0.07	0.10	0.72	0.08	0.04	0.05	0.04	0.62	0.04	0.75	0.61	0.05	0.04	0.04	0.04

Table 3: Effect of different treatments on various parameters of dehydrated guava slices during storage

Treatment	Texture				Flavour and Taste				Overall Acceptability			
	Initial Reading	30 Days	60 Days	90 Days	Initial Reading	30 Days	60 Days	90 Days	Initial Reading	30 Days	60 Days	90 Days
T ₀	7.15	7.05	7.00	7.00	7.90	7.75	7.50	7.30	8.60	8.60	8.30	8.25
T ₁	7.25	7.05	7.00	6.90	7.95	7.80	7.60	7.45	8.70	8.70	8.45	8.30
T ₂	6.65	6.45	6.30	6.25	6.50	6.30	6.25	6.05	7.20	7.05	6.70	6.05
T ₃	6.45	6.30	6.20	6.05	6.65	6.40	6.20	6.00	7.30	7.00	6.65	6.00
T ₄	9.00	8.95	8.65	8.50	9.00	8.50	8.45	8.30	9.00	8.90	8.60	8.50
T ₅	9.00	9.00	8.75	8.60	9.00	8.70	8.55	8.40	9.00	9.00	8.70	8.65
T ₆	7.50	7.35	7.20	7.05	8.30	8.20	8.15	8.05	8.40	8.40	7.85	7.50
T ₇	7.45	7.25	7.05	7.00	8.40	8.25	8.20	8.10	8.45	8.45	7.90	7.60
T ₈	8.60	8.45	8.25	8.15	8.60	8.55	8.40	8.30	8.80	8.80	8.60	8.55
T ₉	8.45	8.30	8.15	7.95	8.75	8.60	8.45	8.35	8.85	8.85	8.70	8.65
F- test	S	S	S	S	S	S	S	S	S	S	S	S
S. Ed. (±)	0.00	0.18	0.05	0.05	0.06	0.10	0.00	0.00	0.05	0.06	0.00	0.00
C. D. at 5%	0.03	0.87	0.44	0.44	0.51	0.64	0.07	0.12	0.45	0.50	0.13	0.12

CONCLUSION

Analysis of both physical and chemical characteristics of osmotic dehydrated of guava suggests that the inclusion of glucose has a strong impact on the changes in both texture and colour. It is concluded from the present investigation that the treatment T₅ (Dipping of blanched Guava slices in 60⁰ Brix glucose for 12 hours followed by osmotic dehydration) was found most suitable in terms of quality and sensory scores in 3 months of storage.

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