Journal of Advances in Biology & Biotechnology

Volume 27, Issue 10, Page 1113-1118, 2024; Article no.JABB.124717
ISSN: 2394-1081

Influence of Storage Stability on Quality of Sapota Flakes

Sivakumar K.P [a++*], B.Nallakurumban [b#], A.Vijayakumar [c++], P.Veeramani [d++] and T.Balaji [e++]

[a] Department of Family Resource Management & Consumer Science, Community Science College & Research Institute, TNAU, Madurai, Tamil Nadu, India.
[b] ICAR-Krishi Vigyan Kendra, TNAU, Virudhunagar, Tamil Nadu, India.
[c] ICAR-Krishi Vigyan Kendra, TNAU, Ramanathapuram, Tamil Nadu, India.
[d] Tapioca and Castor Research Station, Yethapur, Tamil Nadu, India.
[e] Department of Soil Science and Agricultural Chemistry, Agrl. College & Res. Instt, Vazhavachanur, Tamil Nadu, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: https://doi.org/10.9734/jabb/2024/v27i101532

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/124717

Original Research Article

Received: 10/08/2024
Accepted: 12/10/2024
Published: 17/10/2024

ABSTRACT

Sapota, fruits are not only delicious and nutritious but also having good medicinal values. However, it is not possible to enjoy its taste throughout the year because of its seasonal and highly perishable nature. Moreover, in India, these fruits are sold in local market in fresh form. So value addition through product diversification should be the main theme in future. The present investigation was carried to know the effect of storage on quality of sapota flakes as influenced by different storage

---

[++]Assistant Professor;
[#]Associate Professor;
**Corresponding author: E-mail: sivakumar.kp@tnau.ac.in;*

Cite as: *K.P, Sivakumar, B.Nallakurumban, A.Vijayakumar, P.Veeramani, and T.Balaji. 2024. "Influence of Storage Stability on Quality of Sapota Flakes". Journal of Advances in Biology & Biotechnology 27 (10):1113-18. https://doi.org/10.9734/jabb/2024/v27i101532.*

methods. An On Farm Trial (OFT) carried out on the effect of storage stability on quality of sapota flakes was influenced the end product of sapota flakes. The flakes was prepared from uniformly ripened sapota fruit peeled, sliced and pretreated with citric acid solution. The pretreated sapota slices were dried in sun drying, and then the dried slices were packed in polythene bag and pet jars for storage studies. During storage period chemical composition and organoleptic tests were carried out. Qualitative changes exhibited the increasing trend in TSS, reducing sugar, total sugar and pH with decline in acidity of sapota flakes during the storage period of three months. Similarly in organoleptic qualities, except colour, the acceptability of all sensory parameters like flavour, texture and taste of flakes was declined significantly during storage period of three months. The chemical composition retention and organoleptic scores were high in stored at pet jars when compared to polythene bag during storage period (room temperature).

Keywords: Sapota flkes; citric acid; chemical composition and storage period.

1. INTRODUCTION

India is the largest producer of sapota followed by Mexico, Guatemala and Venezuela. Area under sapota in India is estimated to be 1.40 lakh hectares, with an annual production of 11.17 lakh tonnes [1]. Sapota fruit is a good source of sugar which ranges between 12 and 14 per cent [2]. Sapota, fruits are not only delicious and nutritious but also having good medicinal values. However, it is not possible to enjoy its taste throughout the year because of its seasonal and highly perishable nature. Moreover, in India, these fruits are sold in local market in fresh form. So value addition through product diversification should be the main theme in future. In recent years, consumers have become more health conscious in their food choices but have less time to prepare healthful meals. As a result the market demand for “minimally processed” or “lightly processed” foods has rapidly increased. This investigation was carried out with an objective to processing of the sapota candy with different syrup concentrations, to study the organoleptic evaluation and nutrient analysis of the developed sapota fruit candy.

2. MATERIALS AND METHODS

The cricket ball variety of sapota fruit (*Achras sapota* L.) was purchased from the farmer's field. Ripe, fresh firm texture sapota was selected, washed and surface dried. The outer skin of the ripened fruit was peeled off manually using a knife without damaging the pulp.

2.1 Preparation of Sapota Candy

The sliced fruit was osmosis for a day by different sugar syrup concentrations (different treatments such as 30°Brix (T_1), 40°Brix (T_2), 50°Brix (T_3), and 60°Brix (T_4), different percentage of citric acid (0.5%, 1% and 1.5%). The osmosed slices were then dried in sun drying upto the final moisture level. The process flow chart for preparation of sapota fruit candy is given in Fig. 1.

2.2 Storage Study of Sapota Candy

Out of different candies prepared, the best one based on texture of candy and sensory scores were selected for storage study. Among the sapota candy samples, 40°Brix sugar syrup containing one percent citric acid sample was best and it was selected for shelf life study of the candy. The candy stored at ambient temperature were analyzed at monthly intervals for four months for moisture, ascorbic acid, total sugars reducing sugar, ascorbic acid, and titrable acidity.

List 1. Methods of bioactive components analysis

S.NO.	Nutritional components	Method adopted	Reference
1.	Moisture	Hot air oven	AOAC [3]
2.	Titrable acidity	Titrating against 0.01 N NaOH using phenolphthalein	Ranganna [4]
3.	pH	pH meter	Hart and Fisher [5]
4.	TSS	Hand refractometer	Saini et al.[6]
5.	Reducing sugar and total sugars	Shaffer somogyi micro method	McDonlad and Foley [7]
6.	Vitamin – C	2,6 dichlorophenol indophenol visual titration	Sadasivam and Manickam [8]

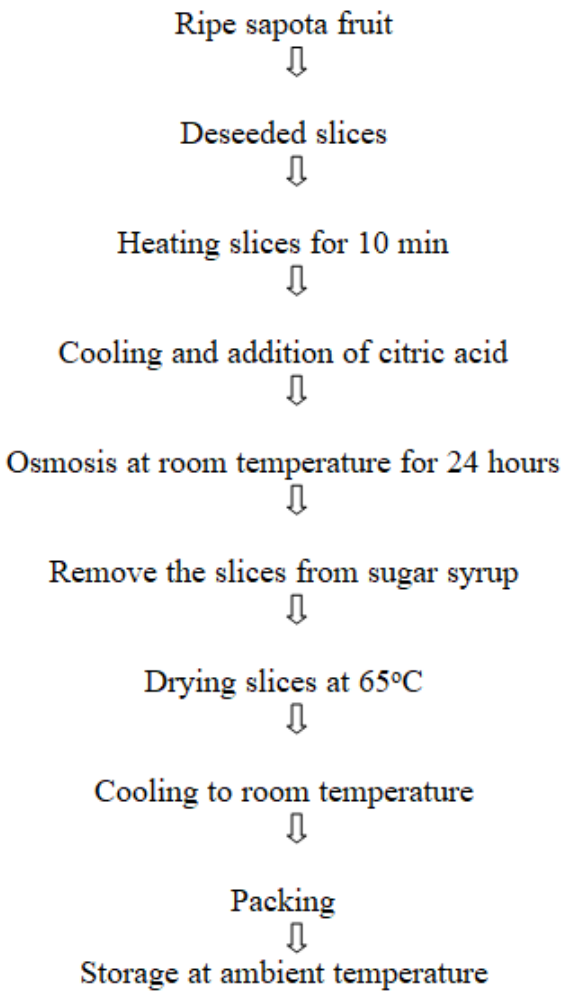

Fig. 1. Flow Chart for preparation of sapota candy

2.3 Nutritional Quality Analysis

The methods adapted to analysis the various nutritional components of the sapota candy during storage at regular intervals are given List 1.

3. RESULTS AND DISCUSSION

The sapota candy was stored at ambient temperature for 120 days at ambient temperature.

Table 1 summarises the changes observed in the moisture content of sapota candy during storage. A gradual decrease in the moisture content was noted in sapota candy during storage irrespective of treatments and different percentages of citric acid. The initial moisture content of T_1 was 4.92 per cent, which had increased to 4.33 per cent after storing for four months. Similarly 4.25 per cent in T_2, 4.27 per cent in T_3 and 4.28 per cent in T_4 respectively. The moisture content retention was observed in T_2 when compared to other candy samples. Sagar et al. [9] observed changes in the moisture content of mango powder up to two months of storage at ambient and low temperatures. This may be due to changes in weather conditions during storage. Mishra et al. [10] reported the moisture absorption of apple powder during storage at different temperatures and in different types of packages.

There was a declining trend (Table 2) in the acidity of sapota candy during storage. The initial acid content of T_1 was 0.312 g/100g, which decreased to 0.254, 0.238 in T_2, 0.417 in T_3 and 0.408g/100g in T_4 respectively at the end of the storage period. The decrease in acidity was reported due to chemical interaction between the organic constituents of the fruits induced by

temperature and the action of enzymes [11]. Firoz et al. [12] observed that the total acid content of pulse-based papaya powder was decreased up to second month of storage packed in glass bottles.

Remarkable changes in the total sugar content of the sapota candy were observed throughout the storage periods (Table 3). The freshly processed sapota candy contained slightly more total sugar content than the others. The initial total sugar contents of sapota candy were 16.42, 16.48, 16.47 and 16.45 in T_1, T_2 ,T_3 and T_4 respectively. The corresponding values were noted after storing the sapota candy for four months in T_1 (15.10), T_2 (15.79), T_3 (15.25) and T_4 (15.19). Kalsi and Dhawan [13] observed a decrease in the total sugar content from 33.80 to 29.74 percent in guava powder during storage. Increase in reducing sugar during storage of products (Table 4) is a general phenomenon as observed by many workers, Vijay Jain et al. [14] in amla, squash and Vanilla. Gupta et al. [15] studied the physico-chemical and organoleptic changes candy prepared from Ber during storage at room temperature. The less reducing sugar increases was observed in T_2 (6.24 to 6.68g/100g). The candy prepared from 40°Brix sugar syrup containing one percent citric acid showed least changes in reducing sugar during storage period.

The ascorbic acid values of sapota candy during storage are shown in Table 5. The ascorbic acid content of candy declined during the storage period. The loss of ascorbic acid was found to be less in T_2 when compared to others. The initial ascorbic acid content of T_1, T_2 T_3 and T_4 were 2.21, 1.85, 1.18 and 1.46 mg/100g respectively. At the end of the storage, T_2 had higher ascorbic acid retention was observed at the end of the storage. The reduction of ascorbic acid was due to the destructive effect of the prolonged thermal treatment, which caused oxidation of the ascorbic acid [16]. Dabhade and Khedkar [17] found that 30.88, 20.45 and 11.24 per cent loss of ascorbic acid occurred during zero, three and six months of storage in sun-dried raw mango powder.

Table 1. Changes in the moisture content (%) of sapota candy during storage

Treatment	Storage period (in months)				
	Initial	1	2	3	4
T_1	4.92	4.66	4.59	4.38	4.33
T_2	4.54	4.43	4.36	4.28	4.25
T_3	4.59	4.50	4.42	4.33	4.27
T_4	4.61	4.50	4.47	4.35	4.28

Table 2. Changes in the acid content (%) of sapota candy during storage

Treatment	Storage period (in months)				
	Initial	1	2	3	4
T_1	0.312	0.295	0.274	0.261	0.254
T_2	0.256	0.251	0.247	0.242	0.238
T_3	0.455	0.443	0.434	0.422	0.417
T_4	0.453	0.438	0.427	0.416	0.408

Table 3. Changes in the total sugar (%) of sapota candy during storage

Treatment	Storage period (in months)				
	Initial	1	2	3	4
T_1	16.42	16.17	16.00	15.59	15.10
T_2	16.48	16.35	16.20	16.00	15.79
T_3	16.47	16.20	15.92	15.65	15.25
T_4	16.45	16.20	15.89	15.60	15.19

Table 4. Changes in the reducing sugar (%) of sapota candy during storage

Treatment	Storage period (in months)				
	Initial	1	2	3	4
T_1	7.20	7.70	8.05	8.10	8.27
T_2	6.24	6.35	6.48	6.55	6.68
T_3	5.22	5.48	5.69	5.81	5.89
T_4	5.21	5.69	5.99	6.10	6.21

Table 5. Changes in the ascorbic acid (%) of sapota candy during storage

Treatment	Storage period (in months)				
	Initial	1	2	3	4
T_1	2.21	2.13	2.00	1.89	1.73
T_2	1.85	1.74	1.60	1.52	1.27
T_3	1.18	1.25	1.45	1.55	1.65
T_4	1.46	1.25	1.12	1.04	0.92

3.1 Organoleptic Evaluation of the Sapota Candy

Sapota candy of was organoleptically evaluated by a panel of 10 untrained judges during storage. The initial and final scores obtained by hedonic scale rating (9-1) for the sapota powders were discussed with respect to quality attributes such as colour, flavour, texture, taste and overall acceptability. Colour is an important visual attribute which has been used to judge the overall quality of foods for a very long time. The score value for colour was decreased during storage. The initial colour score of control and foam mat dried sapota candy was 8.4 and 8.9 to 9.0 respectively. During the storae, it was observed the significant effect on the flavour quality of candy. Sapota candy had acceptable texture throughout storage period. Taste is the major attribute, which determines the acceptability of food materials. The sapota candy secured more taste scores (8.8 to 9.0) during storage period. The overall acceptability score found to be decreased with increase in the period of storage. The initial scores for was 8.9 and it was decreased 8.8 at the end of storage period [18].

4. CONCLUSION

The present study concluded that sapota is a significant small fruit crop that is a medium-sized tree. It may be regarded as one of the fruits that is healthy because it contains a variety of healthful nutrients like macro- and micronutrients, sugars, amino acids, and bioactive compounds. The sapota fruit has numerous health benefits and it is a perishable fruit that has played a significant part in traditional Indian medicine that treats various diseases. Additionally, sapota fruits are used to make a variety of food products. Sapota candy is a long shelflife product and most of the childerns and all age group people are preferred one.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that generative AI technologies such as Large Language Models, etc. have been used during the writing or editing of manuscripts. This explanation will include the name, version, model, and source of the generative AI technology and as well as all input prompts provided to the generative AI technology Details of the AI usage are given below:

1. Chat GPT
2.Statistical tools used

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Available: www.apeda.com
2. Bose TK, Mitra SK. Fruits: Tropical and subtropical, Naya Prakash, Calcutta. 1990;565-591.
3. AOAC. Official methods of analysis. 14th edn. Association of official analytical chemists, Artington, USA; 2020.
4. Ranganna S. Hand book of analysis and quality control for fruits and vegetable

products. 2nd ed. Tata Mc. Graw Hill Publishing Co., Ltd., New Delhi. 2022;3-11,18-25 and 859.
5. Hart AM, Fischer HJ. Modern Food analysis. Springer Veslay Berlin Heidelberg. New Delhi. 2014;64-66.
6. Saini RS, Sharma KD, Dhankhar OP, Kaushik RA. Laboratory manual of analytical techniques in horticulture. Agrobios (India). 2021;5-6:63.
7. Mc Dohald EJ, BY Foley. J. Assoc. Offi. Agri. Chem. 2015;43:645.
8. Sadasivam B, Manickam A. Biochemical methods. Wiley Eastern Ltd and Tamilnadu Agricultural University, Coimbatore. 2022;184-185.
9. Sagar VR, Khundiya DS, Maini SB. Quality of ripe mango powder as affected by storage temperature and period. J. Food Sci. Technol. 2000;37(2):165-168.
10. Mishra HN, Jacob JK , Srinivasan N. Preparation of apple powder and evaalution of its shelflife. Beverage and Food world. 2002;29(1):49-52.
11. Nath A, Yadav DS, Pranabjyoti Sarma, Dey B. Standardization of ginger-kinnow squash and its storage. J. Food Sci. Technol. 2005;42(6):520-522.
12. Firoz BS, Ahmed M, Srivastava AK. Development and quality evaluation of pulse based papaya powder during ambient temperature storage. Beverage and Food World. 2003;11(2):33-35.
13. Kalsi H, Dhawan SS. Preparation of guava powder by osmo-air drying and its storage studies. Beverage and Food World. 2001;28(11):33-34.
14. Vijay Jain, Prabhakar Singh, Singh AK. Scereening of aonla cultivars for making squash. Indian J. Arid Hort., 20051(1): 44-46.
15. Gupta OP, Kainsa RL, Chauhan, Post harvest studies on ber fruits and preparation of candy. Haryana agric. Univ. J. Res. 1980;10(2):163-165.
16. Levi A, Gagel S, Juven B. Intermediate moisture tropical fruit products for developing countries. I. Technological data on papaya. J. Food Technol. 1983;18(6):667-685.
17. Dabhade RS, Khedkar DM. Studies on drying and dehydration of raw mangoes for preparation of mango powder (Amchur). Part –VI. Changes in chemical constituents of raw mango powder during storage. Indian Food Packer. 1980; 34(3):48-54.
18. Mansi Chaudhary, Ridhima Singh, Ekta Singh Chauhan. A short review on sapota (*Manilkara zapota* l.) Fruit: nutrition profile, ethnomedicinal values, and utilization in the food industry. International Journal of Create Thoughts. 2023;11(7).

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of the publisher and/or the editor(s). This publisher and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.

© Copyright (2024): Author(s). The licensee is the journal publisher. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/124717