

RESEARCH PAPER

Preparation of sapota (*Manilkara achrus*) candy

■ MANJUNATH TOTAD*

Department of Horticulture, University of Agricultural Sciences, G.K.V.K. BENGALURU (KARNATAKA) INDIA (Email: manjubtotad@rediffmail.com)

*Author for Correspondence

Research chronicle : Received : 28.10.2013; ; Revised : 20.05.2014; Accepted : 28.05.2014

SUMMARY :

The present investigation on preparation of sapota candy was carried out at the Division of Horticulture, University of Agricultural Sciences, GKVK, Bangalore during 2007-08. Recovery per cent of sapota candy was highest (60.45%) in candy prepared with initial syrup concentration of 40° Brix closely followed by 40° Brix syrup containing one percent citric acid (59.27%). The mean maximum scores for appearance (3.74), taste (4.25), aroma and flavour (3.42), and overall acceptability (3.63) were recorded in the candy prepared with initial syrup strength of 50° Brix containing one per cent citric acid.

KEY WORDS : Sapota, Candy

How to cite this paper : Totad, Manjunath (2014). Preparation of sapota (*Manilkara achrus*) candy. *Internat. J. Proc. & Post Harvest Technol.*, 5 (1) : 82-85.

Sapota (*Manilkara achras* (Mill.) Fosberg (Syn: *Achras zapota* L.) is one of the most important tropical fruits belonging to the family Sapotaceae. It is popularly known as 'chikku'. It is one of the delicious fruits of humid tropical and subtropical regions. It is primarily used as dessert fruit. Sapota fruit is a good source of digestible sugar, which ranges from 12 to 20 per cent and it is virtually a treasure of minerals such as iron and calcium.

Sapota fruits are used for making sapota jam or mixed fruit jam and they provide valuable sources of raw material for the manufacture of industrial glucose, pectin and natural fruit jellies. They are also canned as slices (Sulladmath and Reddy, 1985). Dehydrated sapota slices can also be prepared (Vaghani and Chundawat, 1986). Certainly sapota is a cheaper fruit with a delicious honey flavour, which is relished by one and all.

EXPERIMENTAL METHODS

The investigation on preparation of sapota candy value addition was carried out at processing, analytical and quality control laboratories in the Division of Horticulture,

University of Agricultural Sciences, Gandhi Krishi Vignana Kendra, Bangalore, during the year 2007-08.

Healthy, uniform sized and fully matured fruits (skin colour was orange/potato brown with little or no scurf on the fruit surface) were harvested and brought to laboratory immediately and ripened. The fruits of sapota thoroughly washed in clean water. The skin was removed by hand peeling using stainless steel peeler. The fruit was cut into four slices, seeds and cores were removed. Required quantity of sugar syrup should be kept ready in steel vessel.

Preparation of candy and chemical analysis:

The slices of sapota were steeped in syrup of 40 and 50° Brix with or without citric acid as per the treatment details. After 24 hours of steeping in each treatment, the syrups were drained and their concentrations were increased by adding sugar and heating. The quantity of sugar to be added to obtain the required strength of syrup was calculated by Pearson's square method (Giridharalal *et al.*, 1986). The syrup concentration was increased by 10° Brix daily until the syrup concentration reached 70° Brix in all the treatments. The slices were kept in

70°Brix syrup for a period until the equilibrium was reached between the slices and the syrup concentration (70°Brix), *i.e.*, there was no decrease in syrup concentration. The slices in each treatment were drained free of syrup, rinsed immediately with tap water and shade dried for 24 hours. The candy were packed in 250 gauge polythene bags and stored under ambient condition.

The recovery (%) was analysed by recovery percentage formula, titrable acidity, ascorbic acidity, ascorbic acid and total sugars were estimated by using Ranganna (1977) and Somogyi (1945) method, respectively. Organoleptic evaluation of the product was done by a panel of 10 judges by numerical scoring method (Amerine *et al.*, 1965).

EXPERIMENTAL FINDINGS AND ANALYSIS

The data on yield of candy revealed that there was highly significant difference in the recovery per cent of different treatments. Significantly highest recovery was observed in T₁ (60.45%) followed by T₃ (59.27%) and the lowest yield was observed in T₄ (52.60%) as shown in Table 1.

Acidity (%) and ascorbic acid (mg /100g):

The data recorded on acidity of sapota candy revealed that there was decreasing trend where as ascorbic acid content of sapota candy increased throughout the storage periods in

all the treatments.

Significantly maximum acidity was recorded in treatment T₄ [50°-70° Brix + 1% citric acid] from 0.77, 0.74, 0.73, 0.72, 0.72 at 0, 30, 60, 90 and 120days after storage, respectively. Where as minimum acidity (0.31, 0.30, 0.29, 0.28 and 0.27 at 0, 30, 60, 90 and 120 days after storage, respectively) was recorded in treatment T₁ (40°-70°Brix) as furnished in Table 2.

Significantly maximum ascorbic acid (18.65, 18.42, 18.24, 18.02 and 17.48 (mg/100g) at 0, 30, 60, 90 and 120 days after storage, respectively) was recorded in treatment T₃ (40°-70°Brix+1% citric acid). The minimum ascorbic acid (18.32,18.05, 17.85,17.51,16.81(mg/100g) was recorded at 0, 30, 60,90and 120 days storage, respectively) in treatment T₂ (50°-70°Brix) as shown in Table 2.

Total sugars (%), reducing sugars (%) and non-reducing sugars (%):

Slight increase in total sugars content was observed during storage periods. Total sugars content were dependent on TSS levels. The maximum total sugars 80.15, 80.75, 81.28, 81.55 and 81.82 per cent of sapota candy showed in treatment T₁ (40°-70°Brix) at 0, 30, 60 90 and 120 days of storage, respectively.

Whereas, minimum total sugars (%) of 79.06, 79.32, 79.58, 80.02, and 80.19 per cent were recorded in treatment T₄ [50°-70° Brix + 1% citric acid] at 0, 30, 60 90 and 120 days of storage, respectively as shown in Table 3 and Fig. 1.

Table 1 : Sapota candy slices recovery (%) as influenced by treatments

Treatments	Recovery (%)
T ₁ – Steeping in 40°B syrup and increased daily by 10°B upto 70°B	60.45
T ₂ – Steeping in 50°B syrup and increased daily by 10°B upto 70°B	53.70
T ₃ – Steeping in 40°B syrup + 1% citric acid and increased daily by 10°B upto 70°B	59.27
T ₄ – Steeping in 50°B syrup + 1% citric acid and increased daily by 10°B upto 70°B	52.60
S.E.±	0.561
C.D. at 5%	1.731

* indicate significance of value at P=0.05,

NS = Non- significant

Table 2: Changes in acidity (%) and ascorbic acid (mg/100g) content of sapota candy during storage

Treatments	Acidity (%)					Ascorbic acid (mg/100g)				
	Fresh	30	60	90	120	Fresh	30	60	90	120
T ₁	0.31	0.30	0.29	0.28	0.27	18.49	18.01	17.65	17.03	16.51
T ₂	0.36	0.33	0.33	0.31	0.30	18.32	18.05	17.85	17.51	16.81
T ₃	0.74	0.70	0.70	0.70	0.69	18.65	18.42	18.24	18.02	17.48
T ₄	0.77	0.74	0.73	0.72	0.72	18.59	18.41	18.15	18.00	17.39
F-test	*	*	*	*	*	*	*	*	*	*
S.E.±	0.012	0.009	0.009	0.006	0.007	0.006	0.008	0.009	0.014	0.016
C.D.@5%	0.037	0.029	0.029	0.020	0.021	0.019	0.026	0.029	0.045	0.052

Treatments details : T₁ -Steeping in 40°B syrup and increased daily by 10°B up to 70°B,

T₂ -Steeping in 50°B syrup and increased daily by 10°B up to 70°B, T₃– Steeping in 40°B syrup + 1% citric acid and increased daily by 10°B upto 70°B

T₄ – Steeping in 50°B syrup + 1% citric acid and increased daily by 10°B upto 70°B, * indicate significance of value at P=0.05, NS = Non-significant

The reducing sugar showed an increasing trend and non-reducing sugar decreasing trend throughout the storage period in all the treatment combinations.

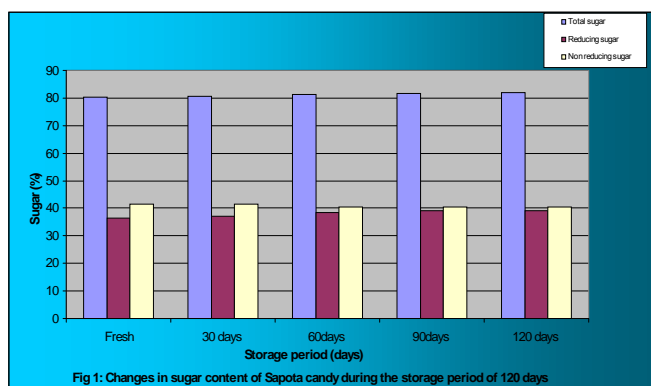


Fig. 1: Changes in sugars content of sapota candy during the storage period of 120 days

Significantly maximum-reducing sugars (36.33, 37.27, 38.34, 39.01 and 39.29 per cent was recorded at 0, 30, 60, 90 and 120 days after storage, respectively) was recorded in sapota candy in treatment T₁ [40°-70°Brix] whereas, minimum reducing sugars was noticed (36.28, 36.75, 37.06, 37.51 and 38.09 %) at 0, 30, 60, 90 and 120 days after storage, respectively in treatment T₃ (40°-70°Brix+1% citric acid) as shown in Table 3.

Significantly maximum non-reducing sugars was

observed (41.64, 41.37, 40.57, 40.32 and 40.39) at 0, 30, 60, 90, 120 days after storage, respectively in treatment T₁ [40°-70°Brix]. Where as minimum non-reducing sugars was recorded in treatment T₄ [50°-70° Brix + 1% citric acid] i.e., at 0, 30, 60 90 and 120 days after storage, respectively (Table 3).

Organoleptic evaluation of sapota candy:

Sapota candy with different recipes subjected to organoleptic evaluation at 120 days of storage to assess the quality attribute like appearance, aroma and flavour, taste and over all acceptability. The scores for these parameters are furnished in Table 4.

Sapota candy recorded significantly maximum scores for appearance (3.74) in treatment T₂ [50°-70°Brix] whereas as minimum appearance score (3.42) was recorded in treatment T₃ [40°-70°Brix+1% citric acid], sapota candy recorded significantly maximum scores of aroma and flavour (3.42) in treatment T₂ [50°-70°Brix]. Minimum aroma and of flavour (3.16) was recorded in T₃ [40°-70°Brix+1% citric acid], significantly maximum taste scores (4.25) of sapota candy was recorded in treatment T₂ [50°-70°Brix]. The minimum scores for taste (3.82) recorded in treatment T₄ [50°-70° Brix + 1% citric acid] and significantly maximum overall acceptability scores (3.63) of sapota candy was recorded in treatment T₂ [50°-70°Brix]. The minimum scores for overall acceptability (3.33) was recorded in treatment T₄ [50°-70 Brix + 1% citric acid] as shown in Table 4.

Treatments	Total sugars (%)														
	Total sugars (%)					Reducing sugar (%)					Non-reducing sugar (%)				
	Fresh	30	60	90	120	Fresh	30	60	90	120	Fresh	30	60	90	120
T ₁	80.15	80.75	81.28	81.55	81.82	36.33	37.27	38.34	39.01	39.29	41.64	41.37	40.57	40.32	40.39
T ₂	80.06	80.64	81.09	81.33	81.64	36.32	37.29	38.26	38.81	39.13	41.54	41.28	40.64	40.27	40.21
T ₃	79.27	79.61	79.90	80.06	80.14	36.28	36.75	37.06	37.51	38.09	40.87	40.89	40.63	40.17	40.13
T ₄	79.06	79.32	79.58	80.02	80.19	36.30	37.00	37.28	37.71	38.09	40.62	40.24	40.25	40.14	40.10
F-test	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
S.E.±	0.017	0.015	0.024	0.023	0.020	0.011	0.017	0.019	0.109	0.021	0.016	0.134	0.175	0.017	0.018
C.D.@5%	0.053	0.048	0.076	0.072	0.615	0.036	0.054	0.058	0.338	0.064	0.050	0.415	0.053	0.053	0.055

Treatments details : T₁ – Steeping in 40°B syrup and increased daily by 10°B up to 70°B, T₂ – Steeping in 50°B syrup and increased daily by 10°B up to 70°B, T₃– Steeping in 40°B syrup + 1% citric acid and increased daily by 10°B upto 70°B, T₄ – Steeping in 50°B syrup + 1% citric acid and increased daily by 10°B upto 70°, * indicate significance of value at P=0.05, NS = Non-significant

Treatments	Appearance	Aroma and flavour	Taste	Over all acceptability
T ₁	3.58	3.33	4.04	3.48
T ₂	3.74	3.42	4.25	3.63
T ₃	3.42	3.16	3.89	3.44
T ₄	3.47	3.28	3.82	3.33
F-test	*	*	*	*
S.E.±	0.019	0.018	0.022	0.024
C.D. (5%)	0.060	0.057	0.070	0.075

Treatments details : T₁ -Steeping in 40°B syrup and increased daily by 10°B up to 70°B T₂ -Steeping in 50°B syrup and increased daily by 10°B up to 70°B, T₃- Steeping in 40°B syrup + 1% citric acid and increased daily by 10°B upto 70°B T₄ -Steeping in 50°B syrup + 1% citric acid and increased daily by 10°B upto 70°, * indicate significance of value at P=0.05, NS=Non-significant

Microbial spoilage: was found completely free from microbial spoilage throughout
Sapota candy prepared with different treatment recipes the storage periods.

LITERATURE CITED

- Agarwal, S. and Chopra, C.S. (2004). Studies on changes in ascorbic acid and total phenols in making aonla products. *Beverage & Food World*, 31(5): 32-34.
- Anjali, M., Ranote, P.S. and Bawa, A.S. (2005). Processing of kandi lemon (Galgal) peel waste for candy making. *Indian Food Packer*, 59(1): 67-74.
- Amerine, M.D., Pangborn, R.M. and Roesster, E.B. (1965). *Principles of sensory evaluation of foods*, Academic press, LONDON, U.S.A.
- Awasthi, R.K. and Pandey, I.C. (1979). Screening of sucking mango (*Mangifera indica* L.) varieties for juice production. *Indian Food Packer*, 33(2): 40-43.
- Banik, D., Dhua, R.S., Gosh, S.K. and Sen, S.K. (1988). Studies on extension of storage life of sapota (*Achras sapota* L.). *Indian J. Hort.*, 45 (3 & 4) : 241-248.
- Bhondave, B.U. (1995). Studies on sapota candy and powder. B.Tech. Thesis, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahmednagar, M.S. (INDIA).
- Bhupinder, K., Gurupreet, S., Harinder, K., Tejinder, S. and Gurusharan, K. (2003). Study of the development of value added sugar coated papaya candy. *Proceedings of 5th International Food Convention*, Mysore, pp. 188.
- Burhan, U.M. and Swamy, A.M.N. (1981). Preparation of preserves and candies from watermelon rind. *Bangladesh J. Agric. Sci.*, 8(2): 211-215.
- Chadha, K.L. (2001). Horticulture industry in India. In: *Handbook of Horticulture*. Ed. Chadha, K.L., Directorate of Information and Publication of Agriculture, Indian Council of Agricultural Research, New Delhi, pp. 4-7.
- Giridharilal, Siddappa, G.S. and Tandon (1986). *Preservation of Fruits and Vegetables*. Revised Edition, Indian Council of Agricultural Research Publication, New Delhi, pp. 69-80.
- Gupta, O.P., Kainsa, R.L. and Chanhan, K.S. (1980). Preparation of candy from ber fruits. *Haryana Agric. Univ. Res. J.*, 10(2): 163-165.
- Raghuramaiah, B. and Ranganna, S. (1970). Citrus beverages: Manufacture and quality control. *Indian Food Packer*, 24(4): 25-27.
- Ramajayam, D. and Jaganath (2001). Studies on the value added simarouba-kokum and simarouba squash blends. *South Indian J. Hort.*, 51(1-6):122-125.
- Ranganna (1977). *Manual of analysis of fruit and vegetable products*, 2nd Ed., Tata Mc grow-Hill Publishing company Ltd. NEW DELHI, INDIA.
- Singh, J., Chopra, C.S. and Srinarayan (2004). Screening of carambola (*Avrroha carambola* L.) germplasm for candy making. *Beverage & Food World*, 31(9): 61-62.
- Sulladmath, V.V. and Reddy, M.M. (1985). Sapota In: *Handbook of Science Technology*, Eds. Salunkhe, P.K. and Kadam, S.S. Marcel Deskker, Inc., New York, pp.475-484
- Unde, P.A., Kanawade, V.L. and Jadhav, S.B. (1998). Effect of syruling and drying methods on quality of ber candy. *J. Food Sci. & Technol.*, 35(3): 259-261.
- Upasana Rani and Bhatia, B.S. (1985). Studies on pear candy processing. *Indian Food Packer*, 39 (5) : 40-46.
- Vijay Jain, Prabhakar Singh and Singh, A.K. (2006). Screening of aonla cultivars for making squash. *Indian J. Arid Hort.*, 1 (1): 44-46.
- Vishal, V. and Sharma, R.K. (1998). Screening of aonla (*Emblca officinalis* Gaertn) cultivars for processing. *Prog. Hort.*, 30(1-2): 76-79.
- Waskar, D.P., Gawade, M.H., Joshi, V.R. and palande, A.L. (2005). Post-harvest management and processing of aonla. *National Consultation Meet on Underutilised Fruits – Kokum, Aonla and Tamarind*, 2nd December, Pune, pp. 51-53.
- Waskar, D.P. (2000). Standardization of method of juice extraction from Kokum fruit. *Indian Food Packer*, 122-124.
- Waskar, D.P. and Khurdiya, D.S. (1987). Processing and storage of 'Phalsa' beverages. *Indian Food Packer*, 41: 26-32.
- Zaghol, H.A., Elohamy, I.M., Moustafa, S.M.I. and Eloemy, M.M. (1983). Chemical composition of jackfruit, *Sci.Pharm*, 51(1-2):391-396.

5th
Year
★ ★ ★ ★ ★ of Excellence ★ ★ ★ ★ ★