

RESEARCH PAPER

Development of value added products from sapota (*Manilkara achrus*) blended with jackfruit and avocado

■ 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 : 09.05.2014; Accepted : 17.05.2014

SUMMARY :

The present investigation on sapota blended with jackfruit and avocado for value addition was carried out at the Division of Horticulture, University of Agricultural Sciences, GKVK, Bangalore during 2007-08. The sapota blended with jackfruit and avocado nectar containing 20 per cent juice, 0.30 per cent citric acid and 20^o Brix was found to be acceptable with good organoleptic scores for appearance (3.75), aroma and flavour (3.70), taste (4.20) and overall acceptability (3.67). Sapota blended with jackfruit and avocado squash containing 30 per cent juice, 1.00 per cent citric acid and 50^o Brix was found to be acceptable with good organoleptic scores for appearance (4.16), aroma and flavour (3.98), taste (3.92) and overall acceptability (3.75). Sapota blended with jackfruit and avocado syrup containing 50 per cent juice, 1.50 per cent citric acid and 70^o Brix was found to be acceptable with good organoleptic scores for appearance (3.71), aroma and flavour (3.91) and taste (4.40), overall acceptability (3.96).

KEY WORDS : Value added products, Squash, Overall acceptability

How to cite this paper : Totad, Manjunath (2014). Development of value added products from sapota (*Manilkara achrus*) blended with jackfruit and avocado. *Internat. J. Proc. & Post Harvest Technol.*, 5 (1) : 48-53.

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 an evergreen tree, and native of tropical America. Sapota is mainly valued for its sweet and delicious fruits. The fruits have an appreciable amount of protein, fat, fibre, calcium, phosphorus, iron, carotene and vitamin C (Shanmugavelu and Srinivasan, 1973). 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).

EXPERIMENTAL METHODS

The investigation was carried out at processing, analytical and quality control laboratories in the Division of Horticulture, University of Agricultural Sciences, Bangalore.

Fully riped sapota, jackfruit and avocado were selected and fruits of sapota, avocado were thoroughly washed in clean water. Pulp was extracted by scooping the fruits manually and the jackfruit fruits were thoroughly washed in clean water and outer skin was removed using stainless steel knife. The fruit were cut into small pieces, blended in a mixer and passed through a 30 mesh sieve to remove the fibrous material. The juice was filtered separately by squeezing through the muslin cloth in different vessels. The extracted pulp was used for preparation of products namely sapota candy, sapota blended

jackfruit and avocado nectar, squash and syrup. The FPO minimum specification for nectar, squash and syrup is as follows: For nectar pulp 10 per cent, minimum per cent of TSS 10^oB and 0.25 per cent acidity, recipes were prepared with 15 per cent, 20 per cent and TSS 15^oB and 20^oB and 0.30 per cent acidity, for squash pulp 25 per cent, minimum per cent of TSS 40^oB and 1.00 per cent acidity, recipes were prepared with 25 per cent, 30 per cent and TSS 40^oB and 50^oB and 1.00 per cent acidity and for syrup pulp 45 per cent, minimum per cent of TSS 68^oB and 1.50 per cent acidity, recipes were prepared with 45 per cent, 50 per cent and TSS 68^oB and 70^oB and 1.50 per cent acidity.

Preparation of products and chemical analysis:

Jackfruit and avocado blended sapota nectar, squash and syrup:

The nectar, squash and syrup were prepared by blends like sapota pulp (75%), jackfruit pulp (20%) and avocado pulp (5%).

Blended fruit pulp and hot cane sugar syrup were mixed together prepared in the proportion of proposed recipe on volume basis. The mixture was heated on low heat by adding required amount of citric acid. Finally the product was preserved with potassium metabisulphate (KMS) (100 ppm)

was added to prevent spoilage during storage.

Separately prepared nectar, squash and syrup were filled into the pre-sterilized bottle of 200ml capacity and sealed airtight using crown caps with the help of crown corking machine. Then the product was processed in boiling water for 25 minutes, cooled immediately and stored at room temperature. Using 'Erma-hand refractometer' total soluble solids content was recorded, titrable acidity 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 results of the changes in chemical composition of sapota blended jackfruit and avocado nectar, squash and syrup show that, maximum increase was in total soluble solid level during the storage period of 120 days in treatment N₂T₂ (20% pulp, 20^oB and 0.30 % acidity), S₂T₂ (30% pulp, 50^oB and 1.00 % acidity) and S₂T₂ (30% pulp, 50^oB and 1.00 % acidity) in case of nectar, squash and syrup, respectively *i.e.* from 20-21.72, 50-53.05 and 70-72.05 as shown in Tables 1, 2 and 3. Similar results were obtained by Jain *et al.* (2006) in aonla

Table 1 : Changes in TSS, acidity and total sugars content of sapota blended jackfruit and avocado nectar during storage

Factors	TSS (^o B)		Acidity (%)		Total sugars (%)	
	I	II	I	II	I	II
Pulp (%)						
15 (N ₁)	17.50	19.07	0.30	0.22	15.10	15.22
20 (N ₂)	17.50	19.17	0.30	0.23	15.32	15.48
F-test	-	*	-	*	*	*
S.E.±	-	0.007	-	0.0004	0.003	0.002
C.D. (5%)	-	0.0217	-	0.0012	0.010	0.006
TSS (^oB)						
15 ^o B (T ₁)	15.00	16.57	0.30	0.23	14.30	14.44
20 ^o B (T ₂)	20.00	21.67	0.30	0.22	16.15	16.26
F-test	-	*	-	*	*	*
S.E.±	-	0.007	-	0.0004	0.003	0.002
C.D. (5%)	-	0.0217	-	0.0012	0.010	0.006
Interaction						
N ₁ T ₁	15.00	16.52	0.30	0.23	14.15	14.28
N ₁ T ₂	20.00	21.62	0.30	0.22	16.05	16.15
N ₂ T ₁	15.00	16.61	0.30	0.24	14.45	14.60
N ₂ T ₂	20.00	21.72	0.30	0.22	16.25	16.36
F-test	-	NS	-	*	*	*
S.E.±	-	-	-	0.0005	0.004	0.003
C.D. (5%)	-	-	-	0.0017	0.014	0.006

I - 0 days, II - 120 days after storage, * indicate significance of value at P=0.05, NS = Non-significant

Table 2 : Changes in TSS, acidity and total sugars content of sapota blended jackfruit and avocado squash during storage

Factors	TSS (^o B)		Acidity (%)		Total sugars (%)	
	I	II	I	II	I	II
Pulp (%)						
15 (N ₁)	45.00	46.53	1.00	0.83	38.75	40.84
20 (N ₂)	45.00	47.80	1.00	0.85	39.26	41.48
F-test	-	NS	-	*	*	*
S.E.±	-	0.00	-	0.000	0.024	0.086
C.D. (5%)	-	-	-	0.000	0.075	0.267
TSS (^oB)						
15 ^o B (T ₁)	40.00	42.54	1.00	0.85	36.40	38.94
20 ^o B (T ₂)	50.00	51.79	1.00	0.84	41.60	43.38
F-test	-	*	-	*	*	*
S.E.±	-	0.87	-	0.000	0.024	0.086
C.D. (5%)	-	2.70	-	0.000	0.075	0.267
Interaction						
N ₁ T ₁	40.00	42.53	1.00	0.85	36.25	38.51
N ₁ T ₂	50.00	52.53	1.00	0.82	41.25	43.18
N ₂ T ₁	40.00	42.55	1.00	0.85	36.56	39.38
N ₂ T ₂	50.00	53.05	1.00	0.84	41.96	43.58
F-test	-	*	-	*	*	*
S.E.±	-	1.24	-	0.000	0.034	0.122
C.D. (5%)	-	3.83	-	0.001	0.106	0.377

I - 0 days, II - 120 days after storage, * indicate significance of value at P=0.05, NS = Non-significant

Table 3 : Changes in TSS, acidity and total sugars content of sapota blended jackfruit and avocado syrup during storage

Factors	TSS (^o B)		Acidity (%)		Total sugars (%)	
	I	II	I	II	I	II
Pulp (%)						
15 (N ₁)	68.00	71.23	1.50	1.34	61.50	63.27
20 (N ₂)	70.00	71.39	1.50	1.35	62.17	63.38
F-test	-	NS	-	NS	*	*
S.E.±	-	-	-	0.00	0.176	0.012
C.D. (5%)	-	-	-	-	0.544	0.038
TSS (^oB)						
15 ^o B (T ₁)	68.00	70.26	1.50	1.34	61.15	62.64
20 ^o B (T ₂)	70.00	72.37	1.50	1.35	62.52	64.05
F-test	-	*	-	*	*	*
S.E.±	-	0.072	-	0.001	0.176	0.012
C.D. (5%)	-	0.222	-	0.003	0.544	0.038
Interaction						
N ₁ T ₁	68.00	70.24	1.50	1.34	60.91	62.62
N ₁ T ₂	70.00	72.23	1.50	1.35	62.10	63.92
N ₂ T ₁	68.00	70.28	1.50	1.34	61.40	62.65
N ₂ T ₂	70.00	72.50	1.50	1.35	62.94	64.10
F-test	-	NS	-	NS	NS	*
S.E.±	-	-	-	0.00	0.00	0.017
C.D. (5%)	-	-	-	-	-	0.53

I - 0 days, II - 120 days after storage, * indicate significance of value at P=0.05, NS = Non-significant

squash, Chowdhary *et al.* (2006) in guava RTS, Kannan Thirumaran (2002) in Jamun syrup.

Acidity of nectar, squash and syrup gradually decreased after storage period of 120 days (Tables 1, 2, 3). Maximum reduction of acidity was noticed in treatment of N₂T₂ M in nectar, SQ₂T₁ in squash and S₂T₂ in syrup. This might also be due to hydrolysis of polysaccharides and non-reducing sugars where acid is utilised for converting it into reducing. Analogous results were reported by Gajanana (2002) in amla juice.

Maximum increase in total sugars level was noticed in N₂T₁ (20% pulp, 15^oB) which recorded about 14.45-14.60 in nectar, SQ₂T₂ (30% pulp, 50^oB) which recorded about 41.96-43.58 in squash and S₂T₂ (50% pulp, 70^oB) which recorded about 62.94-64.10 in syrup (Fig. 1, 2 and 3). Similar results were also observed by Gajanana (2002) in amla juice. Jain *et al.* (1984) in orange, Bael and lemon squash, vanilla and Sambandamurthi (1997) in coconut syrup.

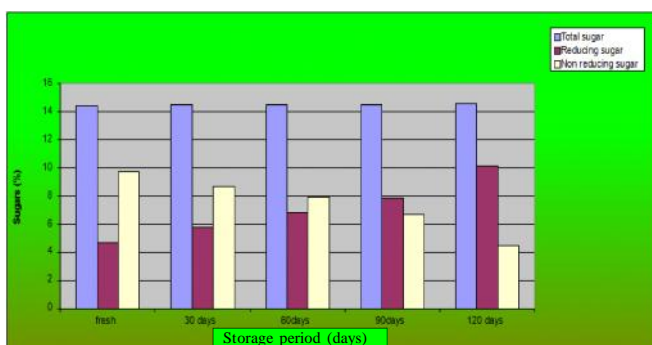


Fig. 1 : Changes in sugars content of sapota blended with jackfruit and avocado nectar (20% pulp, ratio of 70:25:05 and 50 B TSS) during storage period of 120 days

Organoleptic qualities of sapota blended jackfruit and avocado nectar, squash and syrup:

These products prepared with different recipes were subjected to organoleptic evaluation after 120 days to assess the quality attributes. Appearance, aroma and flavour, taste and

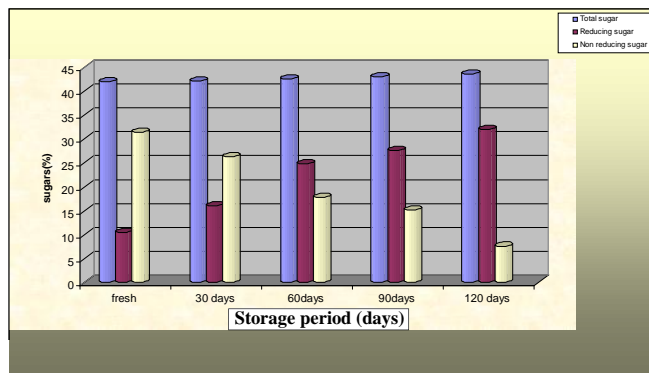


Fig. 2 : Changes in sugars content of sapota blended with jackfruit and avocado squash (30% pulp, ratio of 70:25:05 and 50 B TSS) during storage period of 120 days

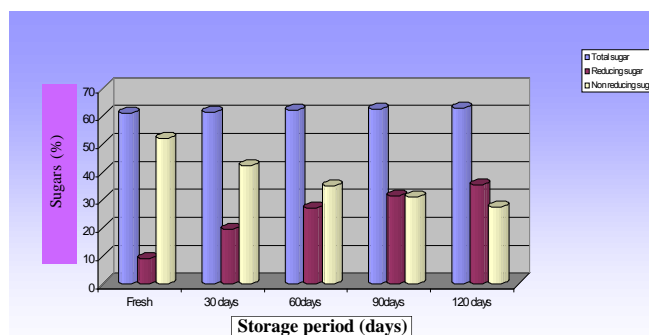


Fig. 3 : Changes in sugars content of sapota blended with jackfruit and avocado syrup (50% pulp, ratio of 70:25:05 and 70 B TSS) during storage of 120 days

overall acceptability of product prepared with 20 per cent pulp and TSS levels of 20^oB (N₂T₂) in nectar, 30 per cent pulp and TSS levels of 50^oB (SQ₂T₂) in squash and 50 per cent pulp and TSS levels of 70^oB (S₂T₂) in syrup were given more points and best than other levels of juices as shown in Tables 4, 5 and 6.

Table 4 : Organoleptic scores of sapota blended jackfruit and avocado nectar during storage

Factors	Appearance	Aroma and flavour	Taste	Over all acceptability
Interaction				
N ₁ T ₁	3.40	3.40	3.80	3.26
N ₁ T ₂	3.45	3.35	3.65	3.20
N ₂ T ₁	3.55	3.45	4.15	3.60
N ₂ T ₂	3.75	3.70	4.20	3.67
F-test	*	*	*	*
S.E.±	0.004	0.004	0.018	0.014
C.D. (5%)	0.012	0.013	0.056	0.045

* indicate significance of value at P=0.05, NS = Non-significant

N₁T₁ : 15% pulp, 15^oB, N₁T₂ : 15% pulp, 20^oB, N₂T₁ : 20% pulp, 15^oB, N₂T₂ : 20% pulp, 20^oB.

Table 5 : Organoleptic scores of sapota blended jackfruit and avocado squash during storage

Factors	Appearance	Aroma and flavour	Taste	Over all acceptability
Interaction				
SQ ₁ T ₁	3.90	3.90	4.06	3.75
SQ ₁ T ₂	3.93	3.80	3.92	3.70
SQ ₂ T ₁	4.06	3.95	3.87	3.60
SQ ₂ T ₂	4.16	3.98	3.83	3.75
F-test	*	*	NS	*
S.E.±	0.052	0.007	-	0.003
C.D. (5%)	0.161	0.021	-	0.011

* indicate significance of value at P=0.05, NS = Non-significant

SQ₁T₁: 25% pulp, 40^oB, SQ₁T₂: 25% pulp, 50^oB, SQ₂T₁: 30% pulp, 40^oB, SQ₂T₂: 30% pulp, 50^oB**Table 6 : Organoleptic scores sapota blended jackfruit and avocado syrup during storage**

Factors	Appearance	Aroma and flavour	Taste	Over all acceptability
Interaction				
S ₁ T ₁	3.51	3.80	4.20	3.71
S ₁ T ₂	3.46	3.90	4.30	3.66
S ₂ T ₁	3.56	3.80	4.15	3.91
S ₂ T ₂	3.71	3.91	4.40	3.96
F-test	*	NS	*	*
S.E.±	0.012	-	0.004	0.012
C.D. (5%)	0.039	-	0.012	0.039

* indicate significance of value at P=0.05, NS = Non-significant

S₁T₁: 45% pulp, 68^oB, S₁T₂: 45% pulp, 70^oB, S₂T₁: 50% pulp, 68^oB, S₂T₂: 50% pulp, 70^oB

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.
- Ahamad, M., Chaudhary, M.A. and Khan, I. (1986).** Studies on the standardisation and storage stability of citrus and other fruit based drinks. *Nucleus*, **23**(1-2): 41-45.
- Amerine, M.D., Pangborn, R.M. and Roesster, E.B. (1965).** *Principles of sensory evaluation of foods*, Academic press, LONDON, UNITED KINGDOM.
- Anonymous (1975). Fruit product order (1955) (as amended upto 31st December 1974). *Indian Food Packer*, **29**(1): 46-70.
- Attri, B.L., Lal, B.B. and Joshi, V.K. (1991).** Physico-chemical characteristics, sensory quality and storage behaviour of sand pear juice blended with temperate fruit juices/pulps. *Indian Food Packer*, **52** (2) : 36-40.
- Bhatia, B.S., Siddappa, G.S. and Lal, G.S. (1956).** Physico-chemical changes in jackfruit squash during storage. *Indian J. Agric. Sci.*, **26**(4): 403-414.
- Bobby, B. and Radhaishi, S. (2003).** Processing and quality evaluation of citrus (*Citrus reticulata* and *Citrus sinensis*) squashes. *Proceedings of 5th International Food Convention*, Mysore, pp. 182.
- Choudhary, Madan Lal, Houdhary, Dikshit, S.N. and Sharma, H.G. (2006).** Studies on preparation and biochemical changes in guava RTS beverage during storage. *Indian J. Arid. Hort.*, **1** (1): 78-79.
- Gajanana, K. (2002).** Processing of Aonla (*Emblica officinalis* Gaerth.) fruits, M.Sc. Thesis, University of Agricultural Sciences, Dharwad, KARNATAKA (INDIA).
- 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.

- Jadhav, V.S., Awaz, H.B., Patil, G.R. and Thombre, B.M. (2002).** Studies on preparation of milk shake. *J. Maharashtra Agric. Univ.*, **27**(3): 306-308.
- Kannan, S. and Susheela, T.A. (2002).** Studies on the syruping and drying methods of ber (*Ziziphus mauritiana* Lamk) candy. *Beverage & Food World*, **29**(2): 39-40.
- Kannan, S. and Thirumaran, A. (2002).** Studies on storage behaviour of jamun products. *Beverage & Food World*, **29**: 34-36.
- Ranganna (1977).** *Manual of Analysis of fruit and vegetable products*, 2nd Ed. Tata Mc Graw-Hill publishing company Ltd., NEW DELHI, INDIA.
- Sanjeev Kumar and Singh, I.S. (1998).** Studies on processing of papaya (*Carica papaya*). *Prog. Hort.*, **30** (3-4): 139-147.
- Srivastava, R.P. and Sanjeevkumar (1998).** In: *Fruit and Vegetable Preservation Principles and Practices*. International Book Distributing Co., Lucknow, pp. 64-98.
- Sudhir, K.S. and Kilara, A. (1983).** Temperature response of frozen peas to di-thermal regimes. *J. Food Sci.*, **48** (1) : 77-83.
- Sulladmath, U.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.
- Tandon, D.K., Yadav, R.C., Sushma Sood, Sanjaykumar and Abhay, D. (2003).** Effect of blanching and lye peeling on the quality of aonla candy. *Indian Food Packer*, **57**(11): 147-152.
- Vijay, S. (1985).** A simple and low cost preservation of litchi juice. *Indian Food Packer*, **39**(4): 42-48.
- Vijay Sethi (1993).** Changes in physicochemical characteristics of litchi squash during storage at different temperatures. *Indian J.Hort.*, **50** (4):327-332.
- Waskar, D.P. and Khurdiya, D.S. (1987).** Processing and storage of 'Phalsa' beverages. *Indian Food Packer*, **41** (4) : 7-15.


 ★ ★ ★ ★ ★ of Excellence ★ ★ ★ ★ ★