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# Waste utilization of sapota for value addition

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**ABSTRACT**

The present investigation was conducted at the ASPEE College of Horticulture and Forestry Navsari, Gujarat to explore the possibility of utilization of sapota pulp residue for the preparation of value added products such as sapota powder and Instant Sapota Milkshake Mix (ISMM). The pulp residue left after juice extraction was dried, ground and then sieved through 150 mesh sieve to prepare fine sapota pulp residue powder. It was further mixed with powdered sugar to prepare Instant Sapota Milkshake Mix. Moisture and pH level in the residue products increased with decline in acidity, reducing and total sugar content during storage period of six months. Higher levels of moisture, acidity and reducing sugar were observed in sapota powder than ISMM; however, TSS, pH and total sugar content were maximum in ISMM. The sensory score for colour, flavour and taste of pulp residue products remained unchanged while texture acceptability of sapota powder and ISMM declined during storage period of six months. Milkshake prepared using ISMM recorded maximum sensory score for overall acceptability. In storage, overall acceptability of powder and ISMM declined significantly after six months of storage.

***Key words :*** *Sapota, Waste utilization, Manikara achras*

## Introduction

Sapota (*Manilkara achras* (Mill) Fosberg), a member of sapotaceae family, is a nutritious tropical fruit commercially cultivated in coastal states of India. Sapota fruit has pleasant flavour and sweet taste. It contains 73.7 g moisture, 21.49 g carbohydrates, 0.7 g protein, 1.1 g fat, 28 mg calcium, 27 g phosphorous, 2 mg iron and 6 mg ascorbic acid per 100 g (Bose and Mitra, 1990). Sapota fruit has good processing qualities and can be used for the preparation of jam, jelly, cheese, butter (Relekar *et al.*, 2011) and beverages like squash (Relekar *et al.*, 2013). During the preparation of sapota beverages, a large quantity of waste material in the form of pulp residue is left over after juice extraction. The recovery of fresh sapota pulp residue left after extraction of juice is almost one fourth of the total fruit weight which otherwise goes waste and that has to be utilized for the manufacture of value added products like sapota powder. The sapota pulp residue powder can be used in the preparation of milkshake (Raut, 1999). Hence, the possibility of utilization of sapota pulp residue needs to be explored to develop a newer category of product, i.e. instant sapota milkshake mix. Keeping this in view, the present investigation has been carried out to study the nutritional qualities and storage behaviour of sapota pulp residue products.

## Material and Methods

The well ripened fruits of Kalipatti sapota were peeled and sliced with stainless steel knife. The seeds as well as the central white core were removed and fruit pieces were chopped to obtain pulp

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and the sapota pulp residue was obtained after juice extraction which analyzed immediately for its chemical composition. The pulp residue was then dried in cabinet dryer at 60°C to a desirable moisture level and further converted into powder form by grinding in an electrically operated grinder. The powder, thus obtained was sieved through 150 mesh sieve to get finely textured powder and packed in aluminium foil laminated pouches. Instant milkshake mix was formulated by just mixing thoroughly sapota residue powder and powdered sugar in the ratio of 8: 10 on weight basis. It was then packed in aluminium foil laminated pouches and stored at a cool and dry place and ambient temperature conditions. For sensory evaluation, the sapota milk shake was prepared by mixing it with buffalo milk in the ratio of 8:100 thoroughly in the electrically operated mixer and served for sensory evaluation. The sapota pulp residue products were analyzed for chemical parameters at 0, 3 and 6 months of storage. Total soluble solids content was measured by using Atago hand refractometer. The moisture content, titratable acidity, pH, reducing and total sugars were estimated by methods suggested by Ranganna (1991). The products were also evaluated for sensory attributes like colour, flavour, taste and overall acceptability by a panel of 10 judges on 9 point hedonic scale during storage (Amerine *et. al.*, 1965).

## Results and Discussion

It is evident from the data presented in Table 1 that the pulp residue had high nutritive qualities and contained 57.86 per cent moisture, 18.38°B TSS, 0.045 per cent acidity, 8.06 per cent reducing sugar and 13.35 per cent total sugar. The per cent recovery of the sapota powder based on fruit weight was lower (6.54%) than that of based on dried residue (25.47%) (Table 2). This indicated that more than 6 per cent loss of fresh fruit could be avoided by utilizing the pulp residue in the form of fine sapota powder, which could be further used for the preparation of value added product like Instant Sapota Milkshake Mix (ISMM). Bawa and Saini (1988) reported 58 per cent recovery of residue after extraction of juice in kumquat and utilized the residue for the preparation of squash, pickle and marmalade. Rai and Misra (2001) reported yield of bael pulp powder ranging from 5.52 to 15.37 per cent in different clones of bael.

The data on the compositional changes in value added products of sapota pulp residue during storage are presented in Table 2 and 3. In general, instant sapota milkshake mix recorded minimum moisture content as compared to sapota powder. This has been due to high sugar to powder ratio and use of dried powdered sugar for the preparation of ISMM. The level of moisture increased with the advancement of storage period irrespective of the treatment and being highest in sapota powder after 3 and 6 months of storage. However, the per cent increase in moisture level was higher in ISMM than sapota powder. Moisture content in ISMM was increased by 1.73 folds as compared to only 1.30 folds in sapota powder during storage due to hygroscopic nature of the powdered sugar. A rise in moisture level from 5.23 to 5.80 per cent was also noticed by Devi *et al.* (2007) in Instant Tomato Rice Mix after 180 days of storage.

The level of TSS was higher in ISMM than sapota powder. It was only because of mixing of powdered sugar with sapota powder for the preparation of ISMM. Ejilearassane *et al.* (2001) reported the TSS of 20°B and 69°B in raw mango powder and instant mango chutney mix, respectively. In the present

**Table 1a.** Per cent recovery and chemical composition of sapota residue

| Particulars | Mean |
|---|---|
| **A. Sapota waste** | |
| Seed content (%) | 1.76 |
| Peel content (%) | 14.02 |
| Core content (%) | 10.9 |
| Total waste (%) | 26.68 |
| Recovery of pulp residue after juice extraction (%) | 24.69 |
| **B. Chemical composition of residue** | |
| Moisture content (%) | 57.86 |
| TSS (°B) | 18.38 |
| Acidity (%) | 0.045 |
| pH | 5.72 |
| Reducing sugars (%) | 8.06 |
| Total sugars (%) | 13.35 |

**Table 1b**. Per cent recovery of fine sapota powder

| Particulars | Mean |
|---|---|
| Recovery of dried residue (%) | 44.33 |
| Recovery of fine sapota powder based on fruit weight (%) | 6.54 |
| Recovery of fine sapota powderbased on dried residue (%) | 25.47 |

* Average of three observations

**Table 2.** Changes in chemical composition of sapota pulp residue products during storage

| Treatments | Storage period (Months) | | | Mean |
|---|---|---|---|---|
| | 0 | 3 | 6 | |
| | **Moisture content** | | | |
| T1 | 4.04 | 4.83 | 5.25 | 4.70 |
| T2 | 2.51 | 3.70 | 4.35 | 3.52 |
| Mean | 3.28 | 4.26 | 4.80 | |
| Effects | T | S | T x S | |
| S.Em.± | 0.05 | 0.06 | 0.08 | |
| CD at 5% | 0.13 | 0.16 | 0.23 | |
| | **TSS** | | | |
| **T1** | 42.03 | 40.35 | 40.45 | 40.94 |
| **T2** | 71.80 | 70.55 | 70.58 | 70.98 |
| **Mean** | 56.91 | 55.45 | 55.51 | |
| Effects | T | S | T x S | |
| S.Em.± | 0.35 | 0.43 | 0.61 | |
| CD at 5% | 1.01 | 1.24 | NS | |
| | **Titratable acidity** | | | |
| **T1** | 0.210 | 0.201 | 0.196 | 0.203 |
| **T2** | 0.089 | 0.081 | 0.076 | 0.082 |
| **Mean** | 0.149 | 0.141 | 0.136 | |
| Effects | T | S | T x S | |
| S.Em.± | 0.002 | 0.0022 | 0.003 | |
| CD at 5% | 0.005 | 0.006 | NS | |
| | **pH** | | | |
| **T1** | 5.09 | 5.23 | 5.30 | 5.20 |
| **T2** | 5.33 | 5.36 | 5.46 | 5.38 |
| **Mean** | 5.21 | 5.29 | 5.38 | |
| Effects | T | S | T x S | |
| S.Em.± | 0.03 | 0.04 | 0.05 | |
| CD at 5% | 0.09 | 0.11 | NS | |

**T1:** Sapota Powder **T2:** Instant Sapota milkshake mix

study, the TSS content of the product declined during storage, but the changes were non-significant. Firoz *et al.* (2004) reported slight decline in TSS level from 61.85 to 60.50 per cent in pulse based papaya powder packed in LDEP bags during storage period of six months. The sapota powder had significantly higher acidity than ISMM and it declined with corresponding increase in pH level during storage. This might be attributed to the increase in moisture level during storage. Similar decreasing trend in acidity from 2.1 to 1.8 per cent after six months storage was recorded by Evelin *et al.* (2007) in spray dried banana powder. The level of reducing sugar was highest in sapota powder and showed decreasing trend during storage irrespective of treatments. On the contrary, the maximum total sugar was recorded in ISMM and it also declined during storage. The decrease in reducing and total sugars during storage could be due to pick of moisture by both the products during storage. Analogous observations have been reported by Firoz *et al.* (2004) in pulse based papaya powder.

**Table 3.** Changes in chemical composition of sapota pulp residue products during storage

| Treatments | Storage period (Months) | | | Mean |
|---|---|---|---|---|
| | 0 | 3 | 6 | |
| | **Reducing sugars** | | | |
| **T1** | 29.61 | 29.00 | 27.68 | 28.76 |
| **T2** | 13.11 | 12.90 | 12.48 | 12.83 |
| **Mean** | 21.36 | 20.95 | 20.08 | |
| Effects | T | S | T x S | |
| S.Em.± | 0.11 | 0.14 | 0.19 | |
| CD at 5% | 0.32 | 0.39 | 0.55 | |
| | **Total sugars** | | | |
| **T1** | 31.81 | 31.04 | 30.65 | 31.17 |
| **T2** | 65.32 | 65.00 | 64.07 | 64.80 |
| **Mean** | 48.57 | 48.02 | 47.36 | |
| Effects | T | S | T x S | |
| S.Em.± | 0.15 | 0.19 | 0.26 | |
| CD at 5% | 0.44 | 0.53 | NS | |

**T1:** Sapota Powder **T2:** Instant Sapota milkshake mix

All the sapota pulp residue products did not exhibit variation (Table 4) in respect of colour acceptability and a decline in sensory score for colour was noticed, but the changes were statistically non-significant. The colour of the products remained highly acceptable throughout the period of six months. Among the various value added products of sapota pulp residue, milkshake prepared using ISMM had highest flavour acceptability score, followed by ISMM and lowest by sapota powder. This indicates that adding powdered sugar to sapota powder and milk to ISMM improves the flavour of the product. All the pulp residue products remained acceptable throughout the storage period without any significant changes in flavour acceptability scores during storage. The textural acceptability of milkshake prepared by using ISMM was very poor due to low solubility of sapota powder as a result particles settle down affecting the texture of the milkshake. In the present study, the milkshake recorded the highest sensory score for taste and being lowest by sapota powder whereas taste acceptability remained unchanged during storage period of six months.

Among all the residue products, milkshake recorded the maximum sensory score for overall acceptability. In storage, the overall acceptability of

**Table 4.** Changes in sensory score for colour of sapota pulp residue products during storage

| Treatments | Storage period (Months) | | | Mean |
|---|---|---|---|---|
| | 0 | 3 | 6 | |
| | | **Colour** | | |
| **T1** | 7.55 | 7.55 | 7.45 | 7.52 |
| **T2** | 7.75 | 7.65 | 7.55 | 7.65 |
| **T3** | 8.05 | 8.00 | 7.70 | 7.92 |
| **Mean** | 7.78 | 7.73 | 7.57 | |
| Effects | T | S | T x S | |
| S.Em.± | 0.14 | 0.14 | 0.24 | |
| CD at 5% | NS | NS | NS | |
| | | **Flavour** | | |
| **T1** | 7.35 | 7.05 | 7.00 | 7.13 |
| **T2** | 7.65 | 7.45 | 7.50 | 7.53 |
| **T3** | 8.30 | 8.10 | 8.00 | 8.13 |
| **Mean** | 7.77 | 7.53 | 7.50 | |
| Effects | T | S | T x S | |
| S.Em.± | 0.12 | 0.12 | 0.21 | |
| CD at 5% | 0.35 | NS | NS | |
| | | **Texture** | | |
| **T1** | 7.70 | 7.30 | 6.90 | 7.30 |
| **T2** | 7.65 | 7.00 | 6.30 | 6.98 |
| **T3** | 6.30 | 6.15 | 6.40 | 6.28 |
| **Mean** | 7.22 | 6.82 | 6.53 | |
| Effects | T | S | T x S | |
| S.Em.± | 0.12 | 0.12 | 0.21 | |
| CD at 5% | 0.34 | 0.34 | 0.60 | |
| | | **Taste** | | |
| **T1** | 7.35 | 7.15 | 7.20 | 7.23 |
| **T2** | 7.75 | 7.55 | 7.60 | 7.63 |
| **T3** | 8.30 | 8.25 | 8.10 | 8.22 |
| **Mean** | 7.80 | 7.65 | 7.63 | |
| Effects | T | S | T x S | |
| S.Em.± | 0.13 | 0.134 | 0.23 | |
| CD at 5% | 0.38 | NS | NS | |
| | | **Overall acceptability** | | |
| **T1** | 7.49 | 7.26 | 7.14 | 7.30 |
| **T2** | 7.70 | 7.41 | 7.24 | 7.45 |
| **T3** | 7.75 | 7.63 | 7.55 | 7.64 |
| **Mean** | 7.65 | 7.43 | 7.31 | |
| Effects | T | S | T x S | |
| S.Em.± | 0.06 | 0.06 | 0.11 | |
| CD at 5% | 0.18 | 0.18 | NS | |

**T1:** Sapota Powder **T2:** Instant Sapota milkshake mix
**T3:** Sapota milkshake

sapota powder as well as ISMM declined significantly due to decline in sensory score for texture of the product. All the sapota pulp residue products were acceptable throughout the storage period of six months.

## Conclusion

Sapota pulp residue could be utilized for the preparation of fine sapota powder and instant sapota milkshake mix. These products could be stored for a period of six months in aluminium foil laminated pouches without any deterioration in sensory qualities. The sapota powder could easily be converted into a value added inexpensive Instant Sapota Milkshake Mix (ISMM) for the preparation of highly acceptable milkshake with excellent sensory qualities.

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