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Research Article

PREPARATION AND PRESERVATION OF SAPOTA JUICE

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ABSTRACT
The investigation on processing of sapota fruits was conducted during the year 2005-06 in the Department of Post-harvest Technology, Kittur Rani Channamma College of Horticulture, Arabhavi, district Belgaum, Karnataka. The treatments consisted of pasteurisation at 60°C and 65°C for 10minutes, addition of preservatives, *viz*., sodium benzoate and potassium metabisulphite (KMS) at the rate of 700 and 600 ppm, respectively, with or without pasteurisation. The juice was stored in sealed bottles at ambient temperature.
Maximum scores for organoleptic characters like colour and appearance, taste, flavour and overall acceptability was recorded in fresh juice which could be compared with juice preserved with KMS @ 600 ppm and juice preserved with combination of pasteurisation at 60°C for 10 minutes and KMS @ 600 ppm.
There was an increase in TSS, sugars and decrease in titratable acidity and ascorbic acid content in treatments of pasteurisation. There was no much change in chemical composition of the juice preserved with chemical preservatives as compared to fresh juice. The KMS reduced the OD value whereas pasteurisation increased the OD value for non-enzymatic browning.

INTRODUCTION
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. Sapota is mainly valued for its sweet and delicious fruits. 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. The fruits have an appreciable amount of protein, fat, fibre, calcium, phosphorus, iron, carotene and vitamin C (Shanmugavelu and Srinivasan, 1973). It is also rich in bio-iron required for the formation of haemoglobin (Gursharan Singh, 2001). Fruit juices are refreshing and retain characteristic taste and aroma even after a few months of their preparation into a beverage. Compared to several other fruit products, fruit juices and ready – to –serve beverages are increasingly gaining popularity throughout the country. Even though, fruit juices are most popular, sapota juice and juice based beverages have not yet become popular mainly because of some inherent problems with processing of sapota juice viz., retention of flavour in the juice during storage, fermentation due to high sugar. Hence, there is a need to develop a low cost technology for processing of sapota fruits into value added products such as juice which have ready acceptability in the market.

MATERIALS AND METHODS
The investigation on processing of sapota fruits was carried out in the Department of Post-harvest Technology, Kittur Rani Channamma College of Horticulture, Arabhavi, district Belgaum, Karnataka during the year 2005-2006.
Kalipatti, a commercially important cultivar of this region was used for the study. The design of the experiment was completely randomised design (CRD) with nine treatments and three replications.
Fruits of uniform colour, size and shape were selected. Diseased and damaged ones were discarded. Fruits were washed in clean tap water and hand peeled with the help of stainless steel knife. Seeds and core were separated. The pulp was chopped into small pieces and squeezed in double layered muslin cloth to obtain juice. As per the treatments, the juice was pasteurised separately either at 60°C or 65°C for 10 minutes and cooled immediately. In case of treatments T_4 and T_5, sodium benzoate and in T_7 and T_8, potassium

metabisulphite were added at the rate of 700 and 600 ppm, respectively. In treatments T_3 and T_6, sodium benzoate (700 ppm) and potassium metabisulphite (600 ppm) were added respectively, to the extracted

Table 1. Effect of treatments on organoleptic quality of sapota juice (scores out of 5.0)

Treatments	Colour and appea-rance	Taste	Flavour	Overall accepta-bility
T_1 – Pasteurisation at 60°C for 10 minutes	4.25	4.60	4.60	4.50
T_2 – Pasteuriszation at 65°C for 10 minutes	4.50	4.50	4.45	4.45
T_3 – Addition of sodium benzoate @ 700 ppm	4.75	4.70	4.75	4.56
T_4 – Pasteurisation at 60°C for 10 minutes + sodium benzoate @ 700 ppm	4.30	4.50	4.55	4.46
T_5 – Pasteurisation at 65°C for 10 minutes + sodium benzoate @ 700 ppm	4.60	4.40	4.40	4.40
T_6 – Addition of potassium metabisulphite @ 600 ppm	5.00	4.75	4.75	4.65
T_7 – Pasteurisation at 60°C for 10 minutes + KMS @ 600 ppm	4.50	4.50	4.65	4.60
T_8 – Pasteurisation at 65°C for 10 minutes + KMS @ 600 ppm	4.25	4.40	4.60	4.55
T_9 – Sapota juice (untreated control)	4.75	4.80	4.90	4.75
Mean	4.54	4.57	4.63	4.55
S.Em±	0.006	0.005	0.005	0.006
C.D. at 1%	0.023	0.019	0.019	0.023

juice (without pasteurisation). In case of T_1 and T_2, no preservative was added to the pasteurised juice. The juices treated as per the treatments were filled in to clean, sterilised crown bottles of 200 ml capacity, sealed with crown caps using crown corking machine and stored at ambient condition.

RESULTS

The organoleptic evaluation of sapota juice was done and the data are expressed in terms of scores on a 5 point hedonic scale and are presented in Table 1. The results indicated that the treatments differed significantly with respect to all the sensory parameters.

The scores with respect to colour and appearance of sapota juice indicated significant differences between the treatments. Among the treatments, T_6 recorded highest score of 5 followed by T_3 and T_9 (4.75), whereas significantly lowest score was observed in T_1 and T_8 (4.25). Significantly highest score for taste was observed in T_9 (4.80) followed by T_6 (4.75). The treatments T_5 and T_8 recorded significantly lowest score (4.40) for taste.

Significantly highest score for flavour was observed for T_9 (4.90) followed by T_3 and T_6 (4.75), whereas the lowest score was recorded in T_5 (4.40). The treatment T_9 (4.75) recorded significantly highest score for overall acceptability, whereas lowest was recorded in T_5 (4.40).

The data pertaining to the chemical composition of sapota juice as influenced by the treatments are presented in Table 2. The data reveals that all the chemical parameters of sapota juice differed significantly due to the treatments.

The treatment T_8 recorded significantly highest TSS content of 24.30 per cent, while least TSS was noticed in T_6 and T_9 (21.60%). Maximum titratable acid content was noticed in treatments T_3, which was on par with T_6 (0.241%) and T_9 (0.249), whereas the lowest titratable acid content was found in treatments T_2 and T_8 (0.195%) which was on par with T_5 (0.196%).Significantly highest values for non-reducing and total sugars were recorded in T_5 and T_8 (5.57% each) and in T_8 (13.90%), respectively.Ascorbic acid content of juice was significantly influenced by treatments. Significantly highest ascorbic acid content was recorded in T_9 (26.40 mg/100 g), which was on par with T_6 (26.36) and T_3 (26.37), wherein the juice was preserved with preservation. But lowest ascorbic acid content was observed in treatments T_8 (22.21 mg/100 g).

Significantly highest per cent reducing sugar was observed in T_8 (8.06%), whereas lowest reducing sugar content was recorded in T_6 (7.67%).

However, treatments did show significant differences with respect to non-enzymatic browning. Significantly lowest OD value was observed in T_6 (0.231), whereas highest OD value was recorded in T_2 (0.392).

DISCUSSION

Preservation of fruit juice is very important so that the preserved juice can be further used for preparation of juice based beverages. But preservation of fruit juices at ambient temperature without addition of any chemical preservatives or pasteurisation is not possible due to high nutritional composition of fruit juices. The fruit juices are rich source of sugars, minerals, vitamins, organic acids, *etc*., which act as a good source of food for spoilage microorganisms. The enzymes present in juices are also responsible for deterioration of the quality. Thus, any of the preservation method, either alone or in combination is a prerequisite for extending the shelf life of fruit juices at ambient temperature. Sapota juice is a rich source of sugars (13.54%), acids (0.24%), *etc*., which favours the development of microorganisms within a short period. Thus, sapota juice is found to ferment within few hours of its extraction due to the enzymatic reactions and microbial fermentation. Therefore, an attempt was made to preserve the sapota juice at ambient temperature.

Pasteurisation and use of chemical preservatives are well known methods for preservation of juices. However, correct pasteurisation temperature and duration and suitable chemical preservatives and their concentrations need to be worked out for specific fruit juices as their composition and pH varies. Hence, in the present investigation, two temperatures of pasteurisation and two chemical preservatives were employed in order to know their effect on the organoleptic quality and physico-chemical characteristics of the juice. Organoleptic evaluation and chemical composition of sapota juice was significantly affected by the treatments. The organoleptic scores for colour, taste, flavour and overall acceptability of the juice preserved by addition of KMS at 600 ppm was found to be statistically on par with the fresh juice indicating that the organoleptic quality was unaffected by addition of KMS at 600 ppm. In case of juice treated with sodium benzoate at 700 ppm, the score for taste, flavour and overall acceptability were unaffected as compared to that of fresh juice. However, in treatments wherever pasteurisation of juice was done at 60 and 65°C, reduction in scores for colour, taste, flavour and overall acceptability was observed. This may be due to slight browning, loss of flavour, cooked taste and loss of acids due to heating. Similar findings were also reported by Masoodi *et al*. (1992) in kinnow juice and Ranote and Bains (1982) in Perlette grape juice. The KMS at the rate of 600 ppm improved the colour and appearance of juice. This may be attributed to the inactivation of enzymes like polyphenol oxidase responsible for browning reaction. The results were in conformity with the findings of Masoodi *et al*. (1992) in Perlette grape juice, Panesar *et al*. (2000) in kinnow juice and Ranote *et al*. (1993) in case of kinnow juice.

Table 2. Effect of treatments on chemical composition of sapota juice

Treatments	TSS (%)	Titratable acidity (%)	Ascorbic acid (mg/100 ml)	Reducing sugar (%)	Non-reducing sugar (%)	Total sugar (%)	Non-enzymatic browning (OD at 440 nm)
T_1 – Pasteurisation at 60°C for 10 minutes	23.30	0.221	23.56	7.91	5.45	13.75	0.346
T_2 – Pasteuriszation at 65°C for 10 minutes	24.21	0.195	22.34	8.02	5.56	13.86	0.392
T_3 – Addition of sodium benzoate @ 700 ppm	21.62	0.252	26.37	7.69	5.54	13.53	0.305
T_4 – Pasteurisation at 60°C for 10 minutes + sodium benzoate @ 700 ppm	23.32	0.222	23.57	7.92	5.46	13.76	0.334
T_5 – Pasteurisation at 65°C for 10 minutes + sodium benzoate @ 700 ppm	24.22	0.196	22.42	8.04	5.57	13.87	0.389
T_6 – Addition of potassium metabisulphite @ 600 ppm	21.60	0.249	26.36	7.67	5.52	13.51	0.213
T_7 – Pasteurisation at 60°C for 10 minutes + KMS @ 600 ppm	23.34	0.221	23.55	7.91	5.46	13.62	0.294
T_8 – Pasteurisation at 65°C for 10 minutes + KMS @ 600 ppm	24.30	0.195	22.21	8.06	5.57	13.90	0.315
T_9 – Sapota juice (untreated control)	21.60	0.241	26.40	7.69	5.55	13.54	0.304
Mean	23.06	0.221	24.09	7.88	5.52	13.70	0.321
S.Em±	0.015	0.006	0.008	0.013	0.012	0.005	0.004
C.D. at 1%	0.059	0.023	0.031	0.051	0.048	0.019	0.015

Chemical composition of juice in different treatments was affected by the treatments (Table 2). The TSS, reducing, non-reducing and total sugars were found to increase significantly in treatments of pasteurisation of juice at 60 and 65°C which might be attributed to the concentration of juice due to loss of moisture during heating. These findings corroborate with that reported by Ranote and Bains (1982) in kinnow juice, Masoodi *et al*. (1992) in case of Perlette grape juice. The addition of chemical preservatives, KMS and sodium benzoate at the rate of 600 and 700 ppm, respectively, did not alter the TSS and sugar content. The results are in conformity with the findings reported by Masoodi *et al*. (1992). The ascorbic acid content of juice was marginally reduced in treatments of pasteurisation which may be attributed to oxidation of ascorbic acid during heating process (Raghuramaih and Ranganna, 1970). The non-enzymatic browning was lower in case of juice added with KMS @ 600 ppm, whereas maximum in pasteurised juices, which might be due to bleaching effect of KMS and browning of juice due to heating process. Similar results were reported in case of kinnow fruit juice by Ranote and Bains (1982).

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