J. Hort. Sci.
Vol. 2 (1): 50-52, 2007

Pilot scale processing of red flesh guava RTS beverage

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ABSTRACT

Pilot scale studies on production of ready-to-serve (RTS) beverage from red flesh guava were done using 100 kg of the fruit. Pulp yield was more (73.68 %) in lye peeling than in hand peeling (58.68 %). RTS beverage was prepared by mixing fruit pulp with syrup to an optimum level of acidity and sugar, as standardized on a laboratory scale. Blending RTS beverage by using colloidal mill improved the colour, consistency and overall quality. From 100 kg of red flesh guava, 247 litres of RTS beverage could be obtained. The cost:benefit ratio and value addition from this process were worked out at 1.79 and Rs. 5.45/kg of fruit, respectively.

Key words: Exotic red flesh guava, RTS beverage, pilot scale, colloidal mill, cost:benefit ratio, value addition

INTRODUCTION

Guava is one of the most important fruits, valued for its high vitamin C content. It is widely grown in India under an area of approximately 0.15 Million hectares producing 1.8 MT (Anon. 2000). Use of guava fruits in processed products such as jam, jelly, nectar (Kalra and Tandon, 1984), beverage (Kalra *et al,* 1987), blended RTS beverage and cheese (Singh *et al,* 1983) is well established and several commercial products are being marketed.

In general, both white and pink flesh guava fruits have good market value for fresh consumption. However, these fruits can also be used for processing. Pink varieties are better suited for beverage preparation owing to their attractive colour. An exotic red flesh guava variety, with high acidity, attractive colour and good flavour was earlier identified as the raw material for production of RTS beverage (Tiwari and Dinesh, 2001).

Fruit juice based RTS beverages have the distinct advantage of higher nutritional value over synthetic aerated waters. Hence, pilot scale studies on preparation of RTS beverage from the high acid red flesh guava were undertaken as this is a prerequisite for commercialization of the product. Results of the pilot scale production trial are detailed in this paper.

MATERIAL AND METHODS

Fully ripe, exotic red flesh guava, harvested from the IIHR orchard was used for scale-up trial. RTS beverage was prepared by subjecting 100 kg fruits to the following unit operations.

Washing and preparation

Fruits were manually washed thoroughly using a jet of clean, running water. Hand - peeling with a stainless-steel knife and lye peeling using 3% NaOH solution were carried out.

Pulping and sieving

Peeled guava slices were pulped using a Wareing blender (Make: KenStar Excellence) @ 10 kg/h. The pulp was sieved using a rectangular sieve of size 33 cm x 27.5 cm x 15 cm with 1/32" thick stainless-steel wire mesh to separate seeds from the pulp.

RTS beverage preparation

RTS beverage was prepared by using 15% pulp and adjusting TSS to 18^{o} Brix with sugar syrup and 0.3% acidity. Thorough blending of RTS beverage was done using a colloidal mill (Make: CM 305/94).

Bottling and pasteurization

The RTS beverage was pasteurized at 80^{o}C and bottled in 200ml sterilized, dry bottles using a power-operated bottle filling machine @ 300 bottles/h. Bottles were corked manually, using a hand-operated crown corking

Table 1. Peeling characteristics of exotic red flesh guava

Parameters	Hand peeling	Lye peeling
Weight of fruit (kg)	50	50
Number of persons	2	1
Time required for peeling (min.)	180	90
Peel content- fruit basis (%)	26.88	17.98
Average peeling rate (kg/person/h)	12	20
Pulp yield- fruit basis (%)	58.68	73.68
Pomace recovery- fruit basis (%)	13.44	7.46

machine @ 240 bottles/h. Filled bottles were batch - pasteurized and stored at room temperature (28 – 30°C).

Quality evaluation in RTS beverage

Total Soluble Solids (°Brix) was determined using Erma Hand Refractrometer. Acidity(%) and ascorbic acid (mg/100ml) content were determined using standard procedures (Ranganna 2000). Viscosity (cps) was measured using Brookefield Viscometer fitted with spindle No.18 and at a spindle speed of 60 rpm. Non-enzymatic browning was measured using a spectrophotometer by measuring absorbance at 440nm (Ranganna, 2000).

Sensory evaluation

Sensory evaluation of RTS beverage was done by a panel of 25 semi-trained judges using a 9-point hedonic scale with scores from 'Like extremely" to "Dislike extremely"(Ranganna, 2000).

Storage quality

RTS beverage was stored at room temperature (25°C-30°C) for 6 months and samples were analyzed for their composition at monthly intervals during the storage period.

RESULTS AND DISCUSSION

In guava, fruit skin constitutes a minor portion of the fruit and loss due to peeling the skin varies with the method applied. Use of lye solution in peeling several fruits and vegetables is common (Khurdiya and Srivastava, 1994). Hence, fruits were subjected to lye-peeling and were compared hand-peeling. Peeling loss and pomace recovery was lower in lye-peeling when compared to hand-peeling. Time required for peeling was reduced by 50 % in lye peeling when compared to hand-peeling. In lye-peeling, pulp yield (73.68 %) and peeling rate (20kg/person/h) was higher when compared to hand-peeling (58.68 %) and (12kg/person/h), respectively (Table 1). From the results it is obvious that lye peeling is advantageous over hand peeling in terms of pulp yield and peeling rate.

Table 2. Quality parameters of red flesh guava RTS beverage

Parameter	Manual mixing	Blending in colloidal mill
TSS (°Brix)	18	18
Acidity (%)	0.30	0.30
Ascorbic Acid (mg/100ml)	4.55	5.85
pH	3.48	3.48
Viscosity (cps)	12.80	16.70
Overall Sensory Score(9 points)	6.17	7.35

Pulping and blending of RTS beverage

In a pilot scale preparation of RTS beverage, manual mixing is laborious and time- consuming. Hence, blending of ingredients was attempted using a colloidal mill. Quality of the final product was compared to that from the manual method. From these studies, it was found that viscosity, ascorbic acid content and colour retention in the RTS beverage was more when colloidal mill was used for blending as compared to manual mixing (Table 2). It was also observed that blending in colloidal mill improved the colour, consistency and ascorbic acid content in the final product. This may be due to re- circulation of the juice which could have resulted in the reduction of particle size in the pulp thereby improving product quality. These results are similar to studies on homogenized tomato juice by Thakur *et al* (1995) .

Storage studies of red flesh guava RTS beverage

Change in composition of the red fleshed guava RTS beverage over 6 months storage period at ambient conditions is shown in Fig 1. TSS and acidity ranged between 16 –18.2 °Brix and 0.26-0.3 %, respectively. There was a gradual increase in viscosity Optical density of the juice indicating non-enzymatic browning increased with storage period Similar results were observed

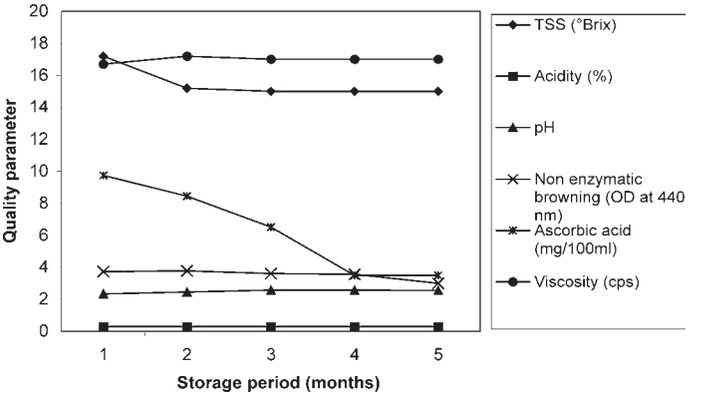

Fig 1 Storage studies on red flesh guava RTS beverage

by Shrestha and Bhatia (1982) during apple juice storage. Ascorbic acid content decreased from 9.75 to 3.5 mg/100ml during 6 months of storage. Reduction in ascorbic acid content during storage has been reported in amla (Mehta and Rathore, 1976), lemon (Palaniswamy and Muthukrishnan, 1974) and in citrus juices (Mehta and Bajaj, 1983).

Cost economics of pilot scale production of red flesh guava RTS beverage

Guava fruit @ Rs. 10/kg	Rs.	1000.00
Sugar @ Rs. 20/kg	Rs.	700.00
Bottles @ Rs.2 / bottle (200ml)	Rs.	2000.00
Labour charges @ Rs.107/day	Rs.	1950.00
Chemicals	Rs.	100.00
Total	Rs.	5750.00
Overhead charges (Electricity, operation of equipment and machinery) @ 20 % of total	Rs.	1150.00
Grand Total	Rs.	6900.00
RTS beverage output (litres)		247.0
Cost of production/litre	Rs.	27.95
Selling price of RTS beverage @ Rs. 50/litre	Rs.	12, 350.00
Selling price of guava @ Rs. 10/kg	Rs.	1000.00
Profit/litre	Rs.	22.05
Cost:Benefit		1: 1.79
Value addition/kg guava	Rs.	5.45 / kg

Cost economics was worked out based on actual expenditure incurred during production

ACKNOWLEDGEMENT

The authors are thankful to the Director, IIHR, Bangalore and project leader Shri. E. R. Suresh for encouragement and providing facilities to carry out the research. Help rendered by Dr. T. M. Gajanana, Sr. Scientist (Agril. Economics), in working out cost economics is gratefully acknowledged.

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(MS Received 21 February 2007, Revised 29 June 2007)