

# Development of a Naturally Flavored Ready to Serve (RTS) Fruit Beverage

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**Abstract**—Fruit based beverages are one of the foremost categories of beverages that are consumed globally. Since fruit beverages are easily digestible, health conscious, highly refreshing, thirst quenching, appetizing and nutritionally far superior to most of the synthetic beverages available in the market, consumption of fruit based beverages have been increased dramatically. Natural extracts of tropical fruits such as *Carica papaya* (papaya), *Passiflora edulis* (passion fruit), and natural flavor extract of *Camellia sinensis* (leaves) and *Cinnamomum verum* (Cinnamon barks) were extracted and used as the main ingredients of this product while sugar, Citric acid, pectin were used as the supplementary ingredients. The best fruit pulp ratio and the best natural flavoring agent out of tea and cinnamon was determined through structured sensory evaluations by participating 30 semi trained panelists. Further experiments were also performed to find the optimum amount of pectin to reduce hard packing and to determine the shelf life of the developed beverage and to develop the natural pectin extraction method by using unutilized parts of the *Passiflora edulis* fruit. Proximate analysis studies and microbiological studies were also carried out. Collected data were statistically analyzed using Kruskal-Wallis non parametric analysis and sample 293 which is containing 15% total fruit pulp with papaya to passion fruit ratio 2:1 and cinnamon as the flavoring agents was the best product formulae. According to the proximate analysis data, fat, protein, carbohydrates, fiber and the ash content were 0.41%, 0.11%, 13.13%, 0.052%, 3.028% and 83.27% respectively. The total plate count was 12 cfu/ml and yeast and molds were 0 cfu/ml of the product and Physico-chemical studies reveals that, the product can be preserved for 30 days under 4±1 °C condition. The average pectin percentage of *Passiflora edulis* and *Carica papaya* were 6.9 % and 4.5 % respectively.

**Index Terms**—Beverages, Tea, Cinnamon, Papaya, Passion Fruit, Pectin, RTS.

## I. INTRODUCTION

Consumption of fruit based beverages and drinks has been increased at a fast rate due to naturally flavoured ready to serve fruit drink will attract the health conscious consumers. But still the post- harvest losses are happening around 30-40% because of perishable nature of the fruits and lack of value addition. With a view to overcome the aforementioned concerns Papaya (*Carica papaya*) and Passion fruit (*Passiflora edulis*) have been used to develop RTS drinks by incorporating naturally available flavors such

as cinnamon, tea and plant based pectines, naturally extracted from passion fruit wastes. All the raw materials are readily available in Sri Lanka and less value addition are reported in the industry by considering the growing market demand.



## II. BACKGROUND/JUSTIFICATION

Since Sri Lanka is a south Asian tropical country, big diversity of fruits can be seen with different tastes but consists with many medicinal and nutrition properties [1]. And also those fruits are rich in antioxidants such as polyphenols and vitamin C., which can prevent burning diseases such as cancer [2].

According to the Department of censuses and statistics Sri Lanka most abundant fruits like Papaya, Passion fruit, Pineapple Banana, production are reported as 26874000, 6202000, 32626000, 3310600000 fruits per annum [3]. But due to use of inadequate and poor post production techniques serious quantitative and qualitative losses occur in these crops and the post-harvest losses were reported as the range between 30-40%. So there is a great need to adopt and develop simple technologies for loss prevention and value addition for Sri Lankan fruits [4].

In the other hand fruit flavoured soft drink consumption of the adolescents in the world is increasing by 8% annually and around 53% of the adolescents consumed natural fruit juice once weekly or more often [5]. So the demand for fruit and vegetable preserves and preparations is increasing yearly. Value addition to the fruits and development of marketable products from them would therefore be an ideal way to take them into the consumption successfully (Gunaseena et al., 2004). Furthermore, Central Bank of Sri Lanka also witnessed that Ready-to-serve (RTS) fruit drinks in standard packs are a popular and fast-moving product in the tropics in Sri Lanka. (Central Bank of Sri Lanka, 2005).

## III. OBJECTIVES OF THE RESEARCH STUDY

-  To develop a flavoured and blended RTS fruit beverage using locally available raw materials and study its keeping qualities in storage conditions.
-  To identify an optimum formula for a flavored papaya-passion fruit blended RTS beverage and study the compositional changes (pH, TSS, acidity, vitamin C) of the beverage during storage.

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#### IV. METHODOLOGY

##### A. Product formulation and sensory evaluation

Initially raw material preparations were performed and several product formulations were designs and tested through semi trained sensory panelist (30 members) at Department of Food Science & Technology, Faculty of Applied Sciences, University of Sri Jayewardenepura, Sri Lanka. Those sensory evaluations were five-point hedonic scale tests. Two-stage sensory method was used to select the best product formula and four treatments were performed for each sensory. After selecting the best two products, the optimum amount of pectin to be added to prevent from the hard packing determination was performed. Six RTS beverage samples were prepared in 1:1 ratio and 2:1 ratio of fruit pulp and six different amount of pectin were added into each sample and kept for observing hard packing. Table I reveals the product formulations intended to sensory analysis stage 01 and stage 02.

TABLE I: RAW MATERIAL PROPORTIONS OF THE PRODUCTS DESIGN FOR SENSORY 01 & 02.

Ingredients	Sensory 01				Sensory 01			
	Quantity (g) per 500g sample				Quantity (g) per 500g sample			
	<b>342</b>	<b>469</b>	<b>293</b>	<b>675</b>	<b>304</b>	<b>436</b>	<b>584</b>	<b>622</b>
Papaya pulp	37.5	37.5	50	50	50	50	66.6	33.3
Passion fruit pulp	37.5	37.5	25	25	50	50	25	25
Sugar	62.5	62.5	62.5	62.5	58.8	58.8	58.8	58.8
Water	361	361	361	361	340	340	340	340
Cinnamon Extract	8	-	8	-	8	-	8	-
Tea Extract	-	8	-	8	-	8	-	8
Citric acid	0.63	0.63	0.63	0.63	0.6	0.6	0.6	0.6

##### B. Proximate analysis

After developed the products proximate analysis were performed in order to the standard methods such as Moisture Content (AOAC (Association of Analytical Communities): 925.10), Total Fat (AOAC: 922.06), Crude Protein Content (AOAC: 960.52), Crude Fiber Content (AOAC: 978.10) and Total Ash (AOAC: 923.03).

In addition to that nutrition profile, Vitamin C content and pH value of the developed product were analyzed by following standard analytical methods.

##### C. Statistical analysis

Kruskal-Wallis non-parametric analysis was used to analyze the data regarding the sensory evaluation to determine whether any significant difference in the mean degree of liking scores exists between selected samples (Under the confidence interval of 95%) and Minitab statistical software version 15 was used for this analysis.

##### D. Analysis of microbial quality and shelf life of the product

Yeast and Mould (Reference Standard: SLS 516 Part 2-1991), Total Plate Count (Reference Standard: SLS 516 part 1-1991) were analysed to determine the microbiological quality and shelf life of the developed product.

#### V. RESULTS AND DISCUSSIONS

##### A. Sensory I:

According to the results of sensory evaluations, all the parameters have higher  $H_{stat}$  values than  $H_{table}$  values and there is a significance difference for among 4 samples in sensory 01 and all four parameters including colour, taste, odour, consistency and overall acceptability of the sample 293 gained the highest consumer preference than 675, 342 and 469 samples.

##### B. Sensory II

Thereafter sensory II performed and results have been mentioned in Fig. 1;

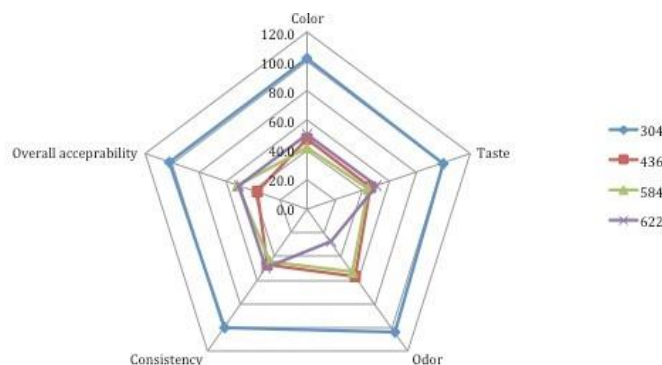


Fig. 1. Descriptive rating chart for sensory evaluation for selection of the best formula for RTS beverage (Sensory II)

When considering all the sensory parameters for all four samples the sample 304 gained the highest ranking value for consumer preference and the least preferred sample was 436 among all the sensory parameters in order to Fig. 1.

Finally, a sensory evaluation was carried out by participating the aforesaid sensory panel and results are shown in Fig. 2,

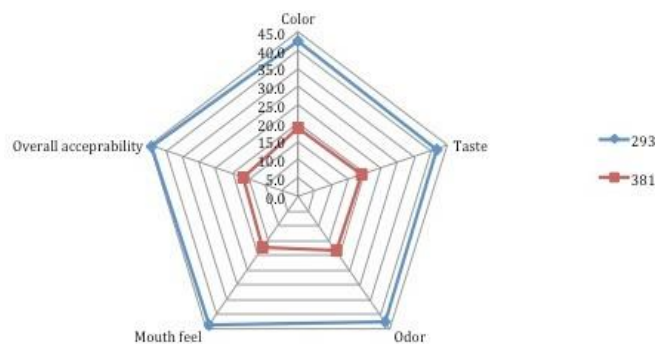


Fig. 2. Descriptive rating chart of sensory evaluation for select the best recipe for the RTS drink

Finally, Kruskal-Wallis non parametric analysis reveals that the sample 293 which is containing 15% total fruit pulp with papaya to passion fruit ratio 2:1 and cinnamon as the flavoring agents is the best product formulae among all the samples. And also the proximate analysis data cited that the final product contained fat, protein, carbohydrates, fiber and ash, 0.41%, 0.11%, 13.13%, 0.052%, 3.028% and 83.27% respectively.

Moreover, physical parameters of the product were studied and recorded as following table II,

TABLE II: PHYSICAL PARAMETERS OF THE DEVELOPED RTS PRODUCT FOR 30-DAYS' TIME PERIOD

Nutrients	Storage days		
	0 Days	15 Days	30 Days
pH	3.70	3.82	3.95
TSS ( <sup>o</sup> Brix)	15.0	16.0	16.5
Ascorbic acid (mg/100g)	9.12	8.89	8.68

In order to Table: II, initial pH value of the RTS has been increased from 3.70 to 3.95 continuously and the brix value also increase from 15.0 to 16.5 while the ascorbic acid content decreased from 9.12 to 8.68 within said 30 days. Furthermore, total plate count was observed as 12 cfu/ml and yeast and molds were 0 cfu/ml of the final product and Physico-chemical studies reveals that, the product can be preserved successfully for 30 days under 4±1 °C condition without any commotion of the RTS. The production cost for the above RTS was around LKR 78.00 per 1litre.

## VI. CONCLUSION

1. A naturally flavoured RTS beverage was developed using papaya, passion fruit, cinnamon, tea and sugar which is having 30 days' shelf life as a positive

remedial action to reduce post-harvest losses and value addition of Sri Lankan fruit as well as Ceylon tea and cinnamon.

2. The developed RTS is contained 0.11% crude protein, 0.41% Total fat, 0.052% Ash, 13.13% Crude fiber and 3.028% carbohydrate. Also 100g of final product contained average vitamin C (antioxidant) content of 9.12 mg.

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