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FORMULATION AND QUALITY EVALUATION OF CORDIAL BASED ON *KIRALA* (*SONNERATIA CASEOLARIS*) FRUIT

WSS Abeywickrama* and MCN Jayasooriya
Department of Food Science & Technology, Faculty of Applied Sciences, Sabaragamuwa University of SriLanka

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ABSTRACT

***Kirala* (*Sonneratia caseolaris*) is one of the tropical fruits that has received less attention from the food industry. A large number of ripen fruits are wasted during the fruiting-season. The modern preservation technologies can be utilized to prepare cordial from ripened *kirala* fruits. This study was done to develop fruit cordial from ripen *kirala* fruits using techniques to prevent browning and astringency taste of final product. Well-ripened fruits were treated with 500ppm Sodium Meta-bisulphide (SMS) solution for 2 minutes at 60^0C to prevent enzymatic browning; fruit pulp was prepared by applying maximum precaution to prevent damages to seeds while blending as the fruits contain a large number of small seeds embedded in the fleshy part. Three cordial samples were prepared according to the Sri Lanka Standard only by changing the fruit pulp concentration i.e. 250g, 230g and 200g and labeled as 110, 911 and 308 respectively. Each sample contained 350g of sugar, 0.35g of Sodium Meta-bisulphide (SMS), 2g of carboxymethylcellulose (CMC) 1.1g of citric acid and water. Prepared samples were subjected to sensory evaluation through 35 untrained sensory panelists and best sample was selected by using Minitab software and freedman statistical analysis. The sample labeled as 911 rated as the best, with a pH 3.8, brix 52^O and titrable acidity 1.39. No deterioration observed within first 30 days. The product recorded a 6 month expected expiry period.**

***Keywords*:** Cordial, Kirala, *Sonneratia caseolaris*, Tropical Fruit, Browning

INTRODUCTION

"Kirala" (*Sonneratia caseolaris*) is literally a forest of a mangrove inherited fruit that grows well in brackish water bodies in Sri Lanka. Generally fruit bearing occurs from March to May. The ripened fruits of *S. caseolaris* have an appealing flavor and a taste that can be used to prepare a delicious fruit drink enriched with vitamins (Plate 1). At present this fruit is consumed only at domestic level.

The fruit contains a large number of small seeds embedded in the fleshy part; mechanical crushing with hard objects or blending of ripen fruits damages the seeds resulting a bitter taste and discoloration of the fruit-pulp. Ripen fruits cannot be stored under room temperature for more than a day as the fruit perishes rapidly and become vulnerable to insect damages. As a result no fruit products from *S. caseolaris* are available on commercial scale in Sri Lanka. This could be due to the technical difficulties in using machineries and the high labor cost involve in manual pulp making.

Hence, preservation techniques could be used to prevent enzymatic browning resulted by the action of polyphenol-oxydase on phenolic compounds in the presence of oxygen and prepare value added products from the ripened *Kirala.* This study was undertaken to develop a fruit cordial from ripened *kirala* fruits as a value added product.

METHODOLOGY

Kirala fruit pulp preparation

Harvested ripened fruits were sorted-out, washed with chlorinated water and kept for 12h under room temperature for further ripening. A heat treatment was then given at 60^OC in a 500ppm Sodium Meta-bisulphide (SMS) solution for 2 minutes to disinfect the fruit from micro-flora, inactivate indigenous enzymes that render the browning and to extend the shelf-life. Treated fruits were then divided into two portions manually, discarded insect damaged fruits visually and subjected to 6h freeze storage. Outer skin of fruits were peeled off after thawing of frozen fruits and the fruit-flesh was mixed with water in a ratio of 1:1 by weight. Fruit pulp was then stirred by using a blunt plastic stirrer to get a creamy mixture. The creamy mixture was filtered through a 2.5mm plastic mesh to remove seeds. The resulting thick creamy pulp was then kept in a refrigerator at 4^0C.

Preparation of kirala cordial

Prepared *Kirala* pulp was diluted by adding water to the ratio of 2:1, mixed well and subjected to boiling. Sugar, citric acid and Carboxy methyl cellulose

*Corresponding author:*niroshanmcn@gmail.com*

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Plate 1. Best maturity stage of *Kirala* fruits

Plate 2. *Kirala* Cordial Samples; code 110, 308 and 911

(stabilizer) were added while boiling the mixture up to 85^0C for 20 minutes to adjust the brix value. The cordial was then allowed to cooling and Sodium Meta-bisulphide was added as a preservative. Finally, the cordial was filled into pre-sterilized bottles and sealed immediately, cordial has a brix 52^0 and minimum 1.25 of acidity. When drinking, cordial has to dilute with water at a ratio of 1:4.

Three cordial formulas (110, 911 & 308) were developed according to the Sri Lanka Standards (SLS) guidelines by changing the fruit pulp concentration and water (SLS 1985) (Plate 2 & Table 1).

Sensory evaluation
Evaluation was carried out to select the best sample of cordial (3 samples) based on sensory attributes. The color, odor, appearance, flavor, texture and overall acceptability were evaluated by using 35 untrained sensory panelists. The total acceptability of the samples (110, 911 & 308) was evaluated using seven point hedonic scale subjectively. Collected data were statically analyzed using the MINITAB statistical analysis package according to the Freedman nonparametric test at 5% level of significance.

Physico-chemical properties
pH of the samples was measured by a calibrated electronic pH meter (model CT-6020A) and calibrated refractometer (model RM-131 Hand Held) was used to determine the total suspended solid content of the samples. Titrable acidity of the samples were measured by titration with 0.1N NaOH solution with Phenolphthalein indicator.

Shelf-life evaluation
Shelf life evaluation was done only with the selected best sample, through a continuous assessment method. The sample was examined for any gas formation, discoloration, acid development, mould growth and other physio-chemical properties for a 30 day of storage period.

RESULTS AND DISCUSSION

Formulated natural *"Kirala"* fruit cordial appeared with uniform consistency free from seeds, course particles of pulp and extraneous matter.

Sensory evaluation
Sensory data obtained through the seven point Hedonoic evaluating tests, revealed that there were significance differences in color (p=0.0000) and texture (p=0.0050) characteristic among the three *"Kirala* cordial" samples. However, there were no significant difference in the aroma (p=0.125), appearance (p=0.0700) and flavor (p=0.8190) among the samples. The sample code 911 gained the highest sum of rank for the color, appearance, texture and overall acceptability (Table 2). Therefore code 911 sample was selected as the best sample for further studies.

Table 1. Three recipes used in the preparation of *Kirala* cordial

Ingredients	Sample code 110	Sample code 911	Sample code 308
Pulp	250g	230g	200g
Sugar	350g	350g	350g
Water	395ml	416ml	445ml
Carboxy methyl cellulose (CMC)	3g	3g	3g
Sodium Meta-bisulphide (SMS)	0.35g	0.35g	0.35g
Citric acid	1.1g	1.1g	1.1g

Table 2. Sensory attributes of the *kirala* cordial preparations

Sensory Attribute	P value	Sum of ranks			Best sample
		110	308	911	
Color	0.0000	48.0	67.5	94.5	911
Smell	0.1250	77.0	60.5	72.5	110
Appearance	0.0700	66.0	63.0	81.0	911
Flavors	0.8190	72.0	67.0	71.0	110
Texture	0.0050	65.0	59.5	85.5	911
Overall acceptability	0.0000	62.5	54.0	93.5	911

Physico-Chemical properties of the best sample (code 911)

The best cordial sample had the following Physico-Chemical properties - pH 3.8, brix 52^0, and titrable acidity 1.39 (Table 2).

Shelf-life

The sample did not show any gas formation, discoloration, acid development, mould growth and any changes of other Physico-chemical properties for the 30days of shelf-life (Table 3).

DISCUSSION

"Kirala" (*Sonneratia caseolaris*) is one of the tropical fruit crops that has gained less attention from the society. Large amount of ripen fruits are wasted during the season without having any commercial benefits. Therefore, we propose to use preservation techniques to make value added product from this fruit.

Browning and an astringent taste develop within 12h in the fruit pulp prepared according to the conventional methods. The mechanical crushing or blending the fruits accelerates this enzymatic browning reaction of fruit pulp.

Harvesting of "*Kirala*" fruits and peeling off the outer skin are highly labor-consuming task. Fruits are heavily infested with a larval stage of an insect and hence fruits with no pest damages need to be selected for processing. Precautions are needed to prevent enzymatic browning and development of an astringent taste during the processing. The fruit pulp needs to be stored under refrigerated condition or used immediately to prepare cordial to minimize the enzymatic browning with the rising temperature.

Table 3. Physiochemical properties of the *kirala* cordial preparations 911 during first 30 days

Storage	Sample code 911		
	pH	Brix ^{0}	Acidity
0	3.8	52	1.39
1	3.8	52	1.39
2	3.8	52	1.39
3	3.6	52	1.42
4	3.6	52	1.42

CONCLUSION

Natural *"Kirala"* fruit cordial can be produced from ripened *Kirala* fruit pulp, as a value added product having 52^0 brix and 22-24% fruit content. *Kirala* fruits should be stored under refrigeration condition after harvesting to minimize perishing. Mechanical crushing with hard objects or blending ripen fruits damage seeds resulting a bitter taste and discoloration of the pulp. Therefore, processing method is required to develop the fruit pulp under low temperature. The manufacturing cost for 1L bottle of cordial is Rs 70/ (0.63 USD).

REFERENCES

David A and Ashurst PR 1996 fruit processing Nutrition, products and Quality Management, pp19-21

John G 1997 Essentials of food microbiology, pp100-213.

Larmond E1987 Labourratory Method od sensory evaluation of foods, Canadian government publishing center, pp73-86

Reineccius G 1997 Source book of flavours, CBS publishers, 2nd edition, pp928-978.

SLS 1985 Specification for fruit squashes, Fruit syrups & fruit cordial (1st revision) SLS 214; Gr.8, Sri Lanka Standard Institute, pp.5-14.

www.eecssrilanka.com/Mangove%20project%20-20Ittapana.-Environment and economical consultancy service, "creating market opportunities for mangrove forest communities as an initiative of sustainable management of tropical forest in southern coast of Sri Lanka".

www.mangroveactionproject.org/map-programs/resource.../kiralakele-mangrove- conservation-resource-center-Mangrove action project, "Kiralakele Mangrove Conservation Resource Center & Biological Garden", October 27, 2001