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SHORT COMMUNICATION

Development of ready-to-serve pineapple juice with coconut milk

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Abstract

Background: Being available in Sri Lanka, Ready-to-serve drinks are more popular among Sri Lankan' consumers . Further, ready-to-serve organic fruit drinks are nowadays becoming more popular due to more concern about healthy living. **Aim:** To produce a ready-to-serve drink using pineapple juice with coconut milk. **Methods and Material:** Pineapple Juice (*Ananas comosus*) and Coconut milk were optimized to a blended ready to serve beverage which was mixed in four different predetermined ratios and stored for 14 days in glass bottles (200ml capacity). Physicochemical and sensory analysis were done according to the standards procedures. After 14 days of incubation period, four samples were tested for their sensory properties at CBL Natural foods laboratory. **Results:** The ratio of pineapple juice: coconut milk (71:29) was ranked as highest score (106) for sensory evaluation and content Total suspended solids (13 ºBrix), pH (4.25) and moisture (82.32). **Conclusions:** The formulation of mixed blend Pineapple juice beverage is possible to satisfy consumer tastes and preferences.

Keywords: Ready-to-serve drink, Pineapple juice, Coconut milk, Physicochemical, Sensory properties.

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1 Introduction

Several worldwide products are commercially accessible as ready-to-serve foods. A relatively simple and understandable interpretation to define ready-to-serve foods as prepared complete meals or menu items intended for sale other than on the premises where they were produced, primarily in retail stores, supermarkets or restaurants [1]. Ready-to-serve drinks are available all over the world even in Sri Lanka where they are more popular. Furthermore, ready-to-serve organic fruit drinks are currently becoming more popular due to more concern about healthy life. Pineapple (*Ananas comosus*) constitutes one of the most popular fruits of the non-citrus group tropical and subtropical fruits due to its attractive flavor and refreshing sugar-acid balance [2]. On the other hand, pineapple fruit contains high amounts of macro and micronutrients especially minerals and vitamins. Pineapple juice is frequently consumed around the globe, commonly as a canning industry, in the form of single strength, concentrated and in the blend composition to obtain new flavors in beverages and further products [3]. Popularly enjoyed in Sri Lanka as fresh fruit by the local consumer to fulfill their nutrient requirement and preference. In this country, the total extent of pineapple cultivation is about 4,750 hectares for producing a total of 35,000mt/year and production has progressively increased [4]. The fruit is available throughout the year and in some seasons, it is under-utilized fruit. However, more waste is generating in industrial scale production which can be used for further processing.

Coconut (*Cocos nucifera*), is however a distinguished widely consumed fruit containing some amount of sweet water inside. This fruit represents an excellent source of minerals, such as: potassium, copper, calcium, iron, magnesium, and zinc. B-complex vitamins are also found in coconut. In addition, some saturated fatty acids could be available, as lauric acid that can prevent atherosclerosis. Moreover, coconut being one of the multipurpose and vital food items for millions of inhabitants of the south and south-east Asia and the Pacific islands, it constitutes one of the most sought-after ingredients, when mixed in most recipes prepared in Sri Lanka [5]. Coconut milk is a milky liquid obtained by manual or mechanical extraction of fresh coconut kernel with or without the addition of water. This extracted liquid is a white opaque protein-oil-water

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emulsion [6] and defined as "functional food" since it's not only providing basic nutrients but other health benefits. A highest per capita consumption of coconut milk was recorded from Sri Lanka (30 to 36 kg) [7].

Fresh juices contain antioxidants, minerals, and vitamins that are essential to promote a healthy life among consumers and preventing several diseases. Juice making is one of the best techniques to improve the nutritional quality of several types of foods and can improve the vitamin and mineral content depending on the kind and quality of fruits used [8]. Apart from nutritional quality improvement, blended juice can be served as appetizers and making a new product as a ready-to-serve drink is timely important since they are more popular among consumers.

Therefore, the present study aimed to produce pineapple juice with coconut milk since its richness of constant nutritional content. Coconut milk is a common supplementary beverage used by many Sri Lankans primarily in villages. Organic pine-coco milk is ready to drink natural fruit beverage with no added additives, preservatives, sweetening and coloring agents. This drink is 100% natural product and an appropriate source for both macro and micronutrients constituting a nutrient-dense fruit drink. In this introductory paper, we attempted to define this item and production technologies. However, the quality aspect of the product will be briefly discussed.

2 Material and Methods

The fully matured, freshly harvested pineapple fruits were obtained from the local market Sri Lanka and were brought to the CBL Natural Foods (pvt) ltd.

2.1 Pineapple juice preparation

Pineapple fruits were washed with potable water and outer peel was removed. Pineapple second peel and pineapple core were collected and underwent a crushing process. Then, crushed pineapples were feed to a pulping machine to get pineapple juice . After that, separated pineapple juice was filtered throughout vibration sieving machine (110 microns). Subsequently, clear pineapple juice was pasteurized at 80 ºC for 5 minutes and transferred to a stainless steel container. Total Soluble Solids (TSS) (ºBrix) and pH values were measured accordingly.

2.2 Coconut Milk preparation

Previously prepared sterilized coconut milk cans were used for the preparation of ready-to-serve fruit drinks.

2.3 Preparation of ready-to-serve fruit drink

Prepared natural pineapple juice and coconut milk were mixed in different ratios as summarized in Table 1. The mixture was then filled into clean, sterilized normal glass bottles and sealed manually. Afterward, sealed bottles were sterilized under 110 ºC and 1 bar for 60 minutes (Steritec Automation Sterilizer). Prepared samples were kept at room temperature (29 ºC) for 14 days (Figures 1 and 2).

2.4 Sensory analysis

The present study aimed to collect the maximum possible quantity of coconut milk in the juice mixture with higher sensory scores and adjustment of acidity to provide a suitable taste. Sensory analysis was carried out at the level of quality assurance department in CBL Natural Foods (pvt) ltd. A panel of 30 trained testers aged between 18 to 50 years old carried out the acceptance tests. Each of the four different combinations (juices) were presented as a 40 ml sample in transparent glass cups and were evaluated by testers [9]. The test was performed by the rating option (rank 1; lowest acceptance to 4; highest acceptance), requested the panelists to rate overall quality including flavor. The samples were monadically served.

Figure 1: Prepared four different ready-to-serve fruit drinks

Table 1: TSS and pH values for different mixing ratios and final sample mixtures

Samples	Pineapple juice			Coconut milk			Juice Mixture	
	Quantity (g)	TSS (°Brix)	pH	Quantity (g)	TSS (°Brix)	pH	TSS (°Brix)	pH
01	3010	14	3.76	405	4	6.20	13	3.90
02	3010	15	3.75	810	4	6.20	14	3.92
03	3010	16	3.97	1215	4	6.20	12	4.10
04	3010	16	3.97	200	4	6.20	15	4.10

Table 2: Sensory scores for sensory evaluation of four combinations

Final products	01	02	03	04
Total score	70	64	106	61

2.1 Physicochemical analysis

Total Soluble Solids (TSS) (°Brix) and pH values were measured with refracting photometer (ATAGO) and pH meter (EUTECH, Thermo Scientific) respectively. Moisture content (%) was measured with a moisture analyzer (MB 45, OHAUS) [10]. Each combination had three replicates and was measured for selected parameters and recorded average values.

2.2 Statistical Analyses

For physicochemical data including replicates tested and sensory evaluation data, one-way Analysis of Variance (ANOVA) served to determine whether significant differences ($p<0.05$) existed between four combinations of juice samples using MINITAB 15 version statistical software.

3 Results and Discussion

3.1 Sensory evaluation

An observable sensory difference was observed between prepared pineapple juices. Where, the results of this study have shown that on an overall basis, consumers prefer the sensory characteristics of prepared pineapple juices in four different ways mix with coconut milk, without product information. These results can only be attributed to the sensory characteristics associated with the pineapple juices since no information was provided to influence preference.

Sensory scores for sensory evaluation of the four combinations were recorded in Table 2. The intention was to incorporate the maximum possible quantity of coconut milk in the juice mixture with higher sensory scores. Some researchers have shown that taste is the main driver for food selection, followed by health considerations [11,12]. However, Bower *et al.* [13] documented that, consumers were willing to pay more, and were more accepting of taste when the information was provided about the benefits of health and the price of the product. In the present study, it was observed that the highest sensory score (106) was obtained with maximum incorporation of 29% coconut milk in the juice mixture. Therefore, the ingredient compositions having 71% pineapple juice and 29% coconut milk were selected as optimum and used for storage study. Overall quality evaluation of statistical analysis showed a significant difference at a 95% confidence level (F-value > F-listed value) for four different juice mixers (cf. Electronic Supplementary Material).

As an overall evaluation, the average values of the sensory analysis were kept in the acceptance range. No alteration in the average values at the final storage period was found. Therefore, product acceptance can be considered good.

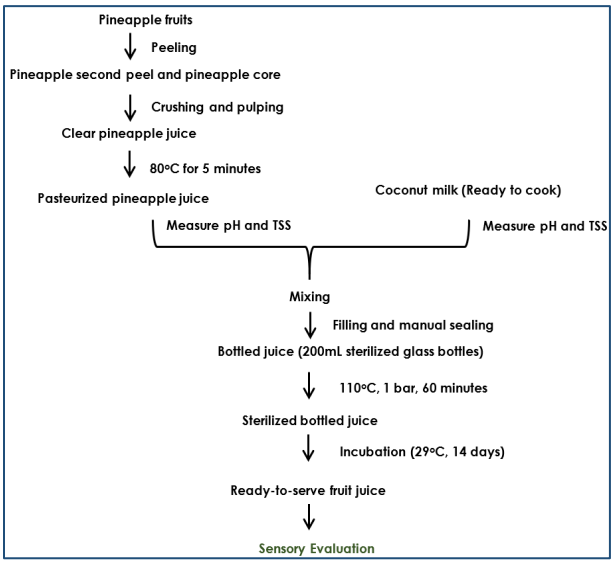

Figure 2: Processing flow chart

3.2 Physicochemical Analysis

pH was slightly increased in the final products except for the 4th sample (Tables 1 and 3). This might be due to the high percentage of Coconut milk. Decrease in pH was due to the increase in acidity of juice which affects the quality of juice. It

was noticed that coconut milk was a major factor to increase pH in the final product. Further, it was observed that the maximum pH (4.25) was recorded in the pineapple juice blended with coconut juice sample 03 which was taken the highest sensory score for sensory analysis. Statistical analysis of pH values showed a significant difference at a 95% confidence level (F-value > F-listed value) for four different juice mixers.

According to our results, sample number two was recorded the lowest TSS value (11 ^{0}Brix) where sample number four recorded the highest Brix value (15.6 ^{0}Brix). High Brix value may due to the high content of Pineapple juice in number four sample mixture. Further, the TSS was increased with the storage time; this may be due to the hydrolysis of polysaccharides into monosaccharides and oligosaccharides (Tables 1 and 3). Statistical analysis of ^{0}Brix values showed a significant difference at a 95% confidence level (F-value > F-listed value) for four different juice mixers.

Table 3: TSS, pH and moisture values in final sample mixtures

Sample category	Chemical parameter		
	TSS (^{0}Brix)	pH	Moisture content (%)
01	15.0	4.14	82.02
02	11.0	4.12	85.26
03	13.0	4.25	82.32
04	15.6	4.02	82.91

The highest moisture content was recorded from sample number two (85.26%) and statistical analysis of moisture content in juice mixtures were showed significant difference at 95% confidence level (F-value > F-listed value).

4 Conclusion

It was concluded that the ratio of pineapple juice: coconut milk (71:29) which was ranked as highest score for sensory evaluation and most effective juice blend for minimum change in TSS (13 ºBrix), pH (4.25) and moisture (82.32%). Therefore, the present study results revealed that the formulation of mixed blend juice beverage is possible to satisfy consumer taste and preferences.

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