

Development of an ice cream composite with canistel fruit (*Pouteria campechiana*).

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Abstract:

Desserts are meals that are traditionally served after the initial food meal in various cultures throughout the world. Rather than other food products, ice cream is becoming the most popular dessert item. Canistel fruits have more health benefits for the human body. However, due of the bitter taste and peculiar flavour, many fruit enthusiasts and children reject canistel fruit. Incorporating canistel fruit powder into ice cream is a great technique to improve the dessert's quality. The goal of this study was to find out how satisfied customers were with canistel ice cream. Canistel fruit powder and fresh milk in the ratios of 10:90 (T1), 20:80 (T2), 30:70 (T3), 40:60 (T4), and 100 percent fresh milk (T5) were used to make the composite ice creams. Physical parameters (melting rate, overrun), chemical parameters (moisture, protein, ash, fat, pH, acidity, calorie) and sensory properties (colour, mouthfeel, texture, taste, odour, overall acceptability) were determined. The data was examined at a significance level of 0.05. Between the samples, there was a substantial difference. The addition of canistel fruit powder to the samples improved the nutritional characteristics, according to the study. Energy, calcium, and carotene are just a few examples. However, based on sensory qualities, the T3 sample was chosen as the best.

Keywords: Canistel fruit, Canistel fruit powder, Fresh milk, Ice cream.

Introduction

The Canistel fruit is underutilized but economically important in the family of Sapotaceae. The canistel tree is native to the Central American region. In South Asian countries, this species is grown in home gardens and agroforestry systems [4]. In Sri Lanka, the wet and intermediate zones are the most promising areas for the production of canistel fruit [3]. As a fairly slow-growing, long-lived species, canistel is an ornamental tree and is used in tropical landscapes because of its compact crown and glossy leaves. The health benefits of canistel fruits are greater for the human body. Energy,

calcium, niacin, carotene (pro-vitamin A) and a fair level of ascorbic acid are all abundant in canistel [3].

Ice cream is a frozen product that is made by using milk, milk cream and also contains fruits, flavors and colors. The ice cream combination is an unfrozen compound of raw materials, containing all ingredients except air and flavoring materials. Ice cream consists of energy, carbohydrates, protein, minerals, vitamins, and fat [2]. At present, ice cream is the most common food product rather than other food products as a dessert. The composition of ice cream is typically expressed as a percentage of its components, such as the percentage of milk fat, non-fat milk solids, sugar, egg solids, stabilizers and the total solids. To attract consumers, the nutritional value and the physico-chemical characteristics of ice cream are important. Canistel fruit has a distinct flavor, therefore some fruit lovers hesitate to consume it. The canistels processing is also important during the season of surplus production. The objective of this study was to develop a fortified ice cream composite with underutilized canistel fruit.

Methodology

Procurement of raw materials. The homogenous ripen canistel fruits (*Pouteria campechiana*) were collected from a specific farmer in Balangoda city. And also, sugar, gelatin, raw milk and whipping cream were collected from supermarkets, Akkaripattu according to the SLS standards.

Experimental design.

Table 1. Composition of ice cream mixes.

Ingredients (g)	Treatments				
	T1	T2	T3	T4	T5
Canistel flour	10	20	30	40	0
Milk	375	365	355	345	385
Sugar	85	85	85	85	85
Gelatin	5	5	5	5	5
Whipping cream	25	25	25	25	25

Development of composite ice cream. Milk and cream were heated to 40°C until solid ingredients and stabilizers were added. The ice cream mixes were pasteurized at 85°C for 30 minutes. They were chilled and aged at 2–5°C for 24 hours. In a bench-top ice cream machine (Model:

GRT7DQLII2Y), the aged ice cream premixes were frozen for 9 minutes and hardened at -20°C for 24 hours.

Quality characteristics of canistel fruit ice cream.

Moisture, protein, fat and ash content were measured according to AOAC 2000 standards. The pH was determined using an Ionlab model pH meter (HP 9010) and the titratable acidity was measured by an automatic titrator. The calorific value of the sample was determined using the Bomb calorimeter (Motle-IKA C6000). Sensory analysis was done using a nine-point hedonic scale using 20 untrained panelists to check color, taste, appearance, texture, and overall acceptance. The findings of the sensorial acceptability design and other physiochemical parameters were examined statistically using the Analysis of Variance (ANOVA) and Tukey test at the 5% level of significance in SPSS 25 to compare the means.

Results and Discussion

1. Physicochemical properties of the composite ice cream. The physicochemical parameters of the sample changed based on the composition, as illustrated in Table 02. Furthermore, significant differences ($p < 0.05$) were observed in terms of moisture, protein, pH, acidity, fat and energy and no significant difference ($p < 0.05$) was observed in ash content. According to the statistical analysis results, protein, pH, acidity and calorie values are increasing ($p < 0.05$) with increasing canistel fruit content in the mixture. Canistel fruit is considered a good protein and carbohydrate-rich underutilized fruit [6]. So, it may be the reason for enhancing protein and calorie values of those treated samples. But moisture, ash and fat contents are decreasing ($p < 0.05$) with increasing canistel fruit content. Decreasing moisture and fat from milk may influence the decrease of total moisture and fat of the ice cream [7]. Typically, the pH value of the ice cream is 6 [5]. The pH range of the ice cream sample was near neutral condition, implying that each sample could have low shelf stability. Therefore, cold storage is required to increase the shelf-life of the product [5]. The pH did not affect the percentage of titratable acidity.

Table 2. Physicochemical properties of developed ice cream mixtures.

Treatment	Moisture (%)	Protein (%)	Ash (%)	Fat (%)	pH	Acidity (%)	Energy (KJ)
T1	54.953±0.389 ^b	6.526±0.092 ^b	0.007±0.001 ^a	11.353±0.353 ^b	6.433±0.012 ^c	2.513±0.009 ^c	15.491±0.041 ^a

T2	55.380± 0.699 ^b	6.596± 0.206 ^b	0.008±0 .001 ^a	10.976±0. 399 ^b	6.363±0 .008 ^b	1.663±0 .008 ^a	18.266±0 .039 ^c
T3	49.153± 0.439 ^a	7.333± 0.171 ^b	0.007±0 .003 ^a	9.726±0. 255 ^{ab}	6.310±0 .005 ^{ab}	2.070±0 .070 ^b	20.223±0 .065 ^e
T4	48.830± 0.697 ^a	8.350± 0.318 ^c	0.006±0 .001 ^a	.756±0. 322 ^a	6.266±0 .018 ^a	2.343±0 .098 ^c	20.383±0 .049 ^d
T5	59.750± 0.540 ^c	5.137± 0.089 ^a	0.007±0 .002 ^a	13.786±0 .556 ^c	6.446±0 .014 ^c	1.510±0 .011 ^a	15.779±0 .031 ^b

The values represent the mean ± standard error of the replicates, with a-b different superscript letters indicating variations between samples. (P<0.05).

2. Physical properties of the composite ice cream

The overrun and melting capacities of canistel fruit composite ice creams are given in Figure 01. Considering melting rate, the lowest value ice cream was for 100% fresh milk which significantly decreased (p<0.05) compared to other treatments. In this way, the melting rate significantly increased (p<0.05) when using canistel fruit powder mixed with fresh milk. The low overrun value in this investigation could be due to the ice cream maker's inefficiency in air incorporation and the lengthy freezing time individually [1]. However, combining canistel powder and fresh milk greatly decreased the overrun (p<0.05).

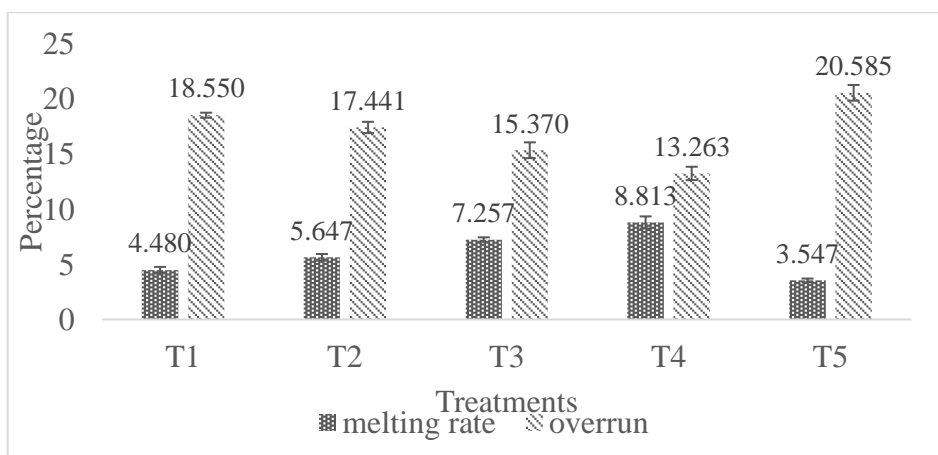


Figure 1. Physical properties of the developed ice cream mixture. The figure represents the average of four replicates. The standard error of the mean is represented by the vertical bars.

3. Sensory Analysis of composite ice cream.

Table 03 shows the sensory evaluations for the ice cream samples. The values of color, mouthfeel, texture, odor and overall acceptability were significantly different at 0.05. As the proportion of canistel powder was increased, the mean score for the taste of the ice cream sample increased.

Table 3. Sensory properties of developed ice cream mixture.

Treatment	Color	Mouthfeel	Texture	Taste	Odor	Overall Acceptability
T1	6.7±0.3a	6.2±0.3a	6.5±0.4ab	5.9±0.3a	6.4±0.3a	6.1±0.3a
T2	7.0±0.2a	6.8±0.2ab	6.8±0.2ab	6.7±0.2ab	7.1±0.2ab	6.9±0.2ab
T3	7.5±0.2a	7.7±0.2b	7.3±0.3b	7.9±0.2c	7.6±0.2b	7.7±0.2b
T4	6.7±0.2a	6.2±0.2a	5.7±0.3a	6.1±0.3a	6.1±0.4a	6.4±0.2a
T5	7.5±0.3a	7.8±0.3b	7.6±0.3b	7.6±0.3bc	7.6±0.3b	7.9±0.3b

The numbers reflect the standard error of the means of four replicates. T5 = Control sample).

The light-yellow colour of the ice cream transformed into a regular yellow colour. The darker colour could be attributed to the addition of more canistel powder to the ice cream mixture. The overall acceptability, which is an essential metric in the organoleptic estimate, includes several implications. In terms of general acceptability (including taste, texture, mouthfeel, odour, colour, and overall acceptance), the ice cream from T3 with 30% canistel powder and 70% fresh milk had the highest mean value compared to the other composites of ice cream.

Conclusion

Canistel fruit is the world's most nutritionally, underutilized natural source. As a result, using canistel powder for ice cream development might be nutritionally beneficial. With the incorporation of locally available fresh milk, ice cream was developed using canistel fruit powder as a key ingredient. This canistel fruit ice cream had physicochemical features that were very comparable to regular ice cream, however, it had potentially higher protein and energy properties than regular ice cream. When compared to other evaluated combinations, the ice cream developed with 30% canistel fruit powder was extremely satisfactory in the terms of nutritional and organoleptic properties.

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