

Development of a Sugar Free Two Bar Ice Palam by Incorporating 'Kothala Himbutu' (*Salacia reticulata*) Stem Extract

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Introduction

Salacia reticulata (Kothala Himbutu) is a woody climber native to Sri Lanka and it is a well known traditional medicinal plant used in Ayurvedic treatments (Anurakumara *et al.*, 2010). Researchers found that the aqueous extract of the roots and stems of *S. reticulata* has sugar reduction ability and used for treating type II diabetic. Moreover the decoction of *S. reticulata* is used in the treatment of gonorrhoea, rheumatism, skin diseases, hemorrhoids, itching, swelling, asthma, thirst, amenorrhoea and dysmenorrhoea (Anurakumara *et al.*, 2010). Therefore, it is used in functional food industry and there are several *Salacia* based preparations available in the market (Ryanghyok *et al.*, 2008). Current study aimed to develop a two bar ice palam which consists with two parts as shell and core. Shell of the product consisting with water ice incorporated with *S. reticulata* extract and the core comprises sugar free ice cream (lite ice cream). The objectives of this study was to find out the best method to prepare *S. reticulata* stem extract and to develop a sugar free two bar palam by incorporating *S. reticulata* extract.

Methodology

The current study was carried out at the Ceylon Cold Stores PLC, Kaduwela. First, the basic composition of the water ice was determined using preliminary trials. Then, water ice was prepared by incorporating *S. reticulata* stem extract. Several extraction methods were followed to find out the best method to prepare *S. reticulata* stem extract. The appropriate dosage of the extract was decided according to the Ayurvedic recommendations (Singh and Duggal, 2010) and recommendations of Industrial Technology Institute, Colombo, Sri Lanka. Total soluble solid content for the ice palam incorporated with *S. reticulata* were adjusted by adding Polydextrose (Litesse™) and Erythritol (Cargill™) in different combinations. Most compatible artificial sweetener combination was determined. Another trial was conducted to select the most compatible flavor of the final product. The best treatments were selected by evaluating the sensory attributes of the product using 7 trained panelists with five point hedonic scale. Then, the core of the palam was prepared with sugar free lite ice cream (Elephant House™) consisting with 6% fat, 30.7% total solid and with a density of 1.09 kg/L. Finally, product was formulated with the developed *S. reticulata* incorporated water ice as the outer shell and lite ice cream as the inner core. Final product was assembled by GSL machine (GSL wrapper/GSL 12) at -32 °C.

pH and the microbiological analysis were done to determine the Aerobic Plate Count (APC), *E. coli*, Coliform, Yeast and Mould counts of *S. reticulata* extract for 10 weeks of period under different storage temperatures. Physicochemical parameters and the microbiological analysis were done for the final product. Melting rate of the developed product was determined and compared with a commercially available water ice. A result of sensory evaluation was analyzed by Friedman non-parametric test using MINITAB 15 statistical software program and Microsoft Excel 2010.

Results and Discussion

According to the first sensory evaluation, ice cream prepared with 10% (v/w) *S. reticulata* extract was selected as the best treatment. There was a significant difference among four samples regarding color, aroma, taste, after-taste and overall acceptability ($p < 0.05$).

As given in figure 1, treatment consists with 7.15% Erythritol (w/w) and 0.03% (w/w) of sucralose was selected as the best in the second sensory evaluation ($p < 0.05$).

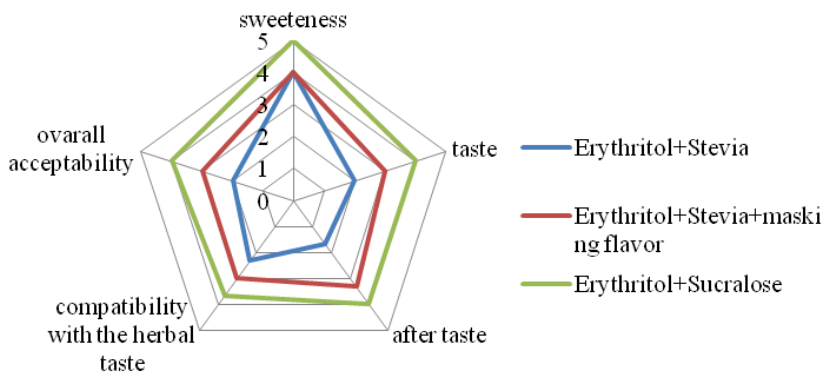


Figure 1. Web diagram for variation of sensory stimuli on different treatments – sensory 02

Pomegranates flavor (LA 05762, Expressions Aromatiques™) incorporated ice cream showed higher ($p < 0.05$) preference with vanilla flavor and selected as the most compatible flavor for the final product. There were no significant difference among the melting rates of two treatments ($p > 0.05$). Aerobic Plate Count (APC), *E.coli*, Coliform, Yeast and mould counts were within the SLS specification for ice cream (SLS 223: 1989) (Table 1).

Table 1. microbiological results of the final product

	APC (cfu/ mL)		Yeast and Mould (cfu/mL)	Coliform/ <i>E.coli</i> (cfu/mL)
	Diluted sample	Original sample	Original sample	Original sample
Beginning	7	70	Nil	Nil
After one week	5	50	Nil	Nil
After two weeks	1	10	Nil	Nil
After four weeks	1	10	Nil	Nil

According to the physiochemical and microbiological analysis, deep freezing condition ($-18\text{ }^{\circ}\text{C}$) can be suggested as the best storage condition. *Salacia reticulata* extract had pH of 6.4, but with storing under room temperature pH showed a reduction from 6.2 to 5.7 in two weeks period and the microbial count was beyond the limit. On the other hand samples kept at $-18\text{ }^{\circ}\text{C}$, ranges 6.4 to 6.2 of pH value. Also after 5th week it shows constant 6.4 of pH and no longer microbial count exists.

Table 2. Physiochemical composition of the final product

Nutrient	Percentage (w/w)
Moisture	76.8
Total fat	3.33
Crude protein	0.74
Ash	0.49
MSNF	4.54
pH	4.22
Titrateable acidity	0.9

Results of cost analysis showed that the unit cost of *S.reticulata* stem extract incorporated ice cream (60 mL) was calculated as 16.12 LKR.

Conclusions

A sugar free two bar ice palam could be successfully developed with the water ice incorporated with 10% (v/v) *S.reticulata* stem extract and pomegranate flavored (0.4 mL/L) as the shell and vanilla flavored 'lite' ice cream as the core. The final product was within the acceptable rage of microbiological limits and had an acceptable melting resistance compared to commercially available ice cream.

References

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