

## Development and Quality Evaluation of value added Mangrove Apple (*Sonneratia caseolaris*) Ice cream.

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### Abstract

The demand for Ice cream(IC) in the Sri Lankan market has increased tremendously over the recent years. Mangrove apple (Kerala,*Sonneratia caseolaris*), which is not yet exposed to the commercial market, has a large potential to be used as a fruity base due high nutritional value, medicinal value, cheese like taste and year-round bearing habit. In addition Mangroves are highly productive ecosystems, but are on the verge of destruction, as they do not yield direct economic benefits to people. Therefore the objectives of this study were to conserve mangroves indirectly by adding an economic value to mangrove products through formulation of a value added mangrove apple IC using different treatments.

Four treatments were used for the experiment; kirala flavoured IC (Trt C) according to the recipe of a commercially available IC (Ingredients - Sugar, Skim milk powder, Whey powder, -Vegetable Fat, Stabilizer, Vanilla, Colouring and Water). And three types of Kirala ripple IC - with 45 Brix brown sauce (Trt A), with 50 Brix brown sauce (Trt B) and with 50 Brix green sauce (Trt D). They were tested to comply with SLS requirements (SLS 223: 1989) and their storage stability were tested with respect to physicochemical and microbiological aspects for two months. Sensory evaluation was done to find out the best formulation and organoleptic quality of the product.

The results of the sensory evaluation revealed that Trt D had significant difference in preference when analysed for sensory attributes (Flavour, body and texture, melting quality, overall acceptability) and Trt C had the highest preference where the flavour was concerned. It was also found that the green colour sauce had improved the appearance of the ripple ice cream than the natural brown colour. From sensory evaluation combined with the physicochemical and microbiological evaluations after the initial storage period, it could be concluded that all treatments comply with the SLS standards. Milk and Mangrove apple flavour had a complementary effect on the flavour of IC. This study reveals that the mangrove apple can be utilized to make a high value ripple IC. Further development is necessary not only in the

production process but also in environmentally safe harvesting of mangrove apples and in constant supply of quality fruit.

## **Introduction**

Ice cream (IC) is one of the most popular and most demanded frozen dessert all around the world. Mangrove apple was selected, as it is one of the major species found in most of the mangroves of Sri Lanka and yet not exposed to the commercial market. In spite of the high nutritional value, medicinal value, cheese like taste, year-round bearing habit, Its production potential has not yet been well understood. Milk and Mangrove apple flavours have complementary effect on the flavour of ice cream. Therefore the objectives of this study were to formulate a value added mangrove apple ice cream, to determine the physicochemical and microbiological quality of products of mangrove apple fruit and to determine the storage stability in the final product using physicochemical, micro biological and sensory evaluation procedures at an initial storage period.

## **Methodology**

Well ripened, pest free mangrove apple fruits were collected from marshy areas of Ambalantota. Fruits were cut and peeled after removing the fruit base, crushed and mixed with measured amount of water. Finally seeds and other fibrous matter were separated using a strainer. For the preparation of mangrove apple flavoured ice cream (Treatment C) –The flavour was prepared by adding appropriate amount of sugar and preservatives to the pulp. This flavour with vanilla boost was added to the Ice cream mixture prepared according to Elephant house recipes (Ingredients - Sugar, Skim milk powder, Whey powder, Vegetable Fat, Stabilizer, Vanilla, Colouring, Water). For the preparation of Mangrove apple sauce and Ripple Ice Cream, Water, Sugar, preservatives, Colourings were added to the pulp and the appropriate sauces were prepared according to treatments (Trt A= 45 brix brown ripple IC, Trt B = 50 brix brown ripple IC, Trt D = 50 brix green ripple IC) The vanilla ice cream mix was taken before hardening. Fifteen – 20 % mangrove apple sauce was added in to the ice cream mixture layer wise using a mechanical ripple feeder and frozen for quick hardening and stabilization.

SLS standards methods were used to analyze the chemical and microbiological parameters of the ice cream. Shelf life studies and sensory evaluation were done to select the best formula. Another sensory evaluation was carried out after two months of storage to find out whether there was a change in organoleptic properties of the stored products.

## Results and discussion

Pulp extraction was the most difficult step during the processing and as a solution to that more and more water was added. But this led to the formation of ice crystals during hardening. Brix value was brought up to about 50 level by adding sugar so that the free water in the pulp was controlled and this had no significant effect on the flavour.

Table 01 - The Chemical Composition of mangrove apple ice cream

| Component            | (Treatment C) | (Treatment B and D) | (Treatment A) |
|----------------------|---------------|---------------------|---------------|
| Total Soluble Solids | 33.79         | 36.79               | 37.79         |
| Acidity              | 0.321         | 0.295               | 0.304         |
| Fat                  | 5.715         | 6.415               | 6.315         |

According to the above results the product complies with the SLS standards under complex ice cream category except fat content but fat level can be adjusted using vegetable fat.

Sensory Evaluation results were analyzed using Kruskal-Wallis one-way nonparametric ANOVA test. When considering the flavour Trt C was significantly different from others. Trt D was significantly different from Trt B and C for colour. Green colour was preferred over the natural brown colour with the Mangrove apple flavour. For body and texture and melting quality Trt C had the lowest mean rank. Overall acceptability was significantly high in Trt D.

Shelf life studies were carried out on the treatment D and mangrove apple flavored ice cream using chemical and microbiological analysis. There was a slight increase in pH and acidity of mangrove apple sauce under refrigeration and other chemical parameters comply with SLS standards. Chemical studies in mangrove apple ripple IC and flavored IC revealed that TS has decreased slightly opposed to the slight increase in the acidity but chemical properties during the initial storage period had no deviation from the SLS standards.

A microbial analysis was carried out to ensure the sanitary and hygienic conditions during storage and determine the storage stability in the final product. Aerobic plate count, Coliform count, yeast and mold counts were obtained during initial storage but all values were in an acceptable range defined by SLS standards.

After 2 months of storage, another sensory analysis was carried out but there were no any significant differences in each sensory attribute, at the time of preparation and after the storage.

### Conclusion

The results of the sensory evaluation revealed that Trt D had the highest overall acceptability and Trt C had the highest preference where the flavour was concerned. It also revealed that the green colour sauce had improved the appearance of the ripple ice cream than the natural brown colour. From sensory evaluation combined with the physicochemical and microbiological evaluations after initial storage period, it could be concluded that all treatments comply with the SLS standards. It could also be concluded that Milk and Mangrove apple flavour had a complementary effect on the flavour of ice cream. Further development is necessary not only in the production process but also in environmentally safe harvesting of mangrove apples and availability of a constant supply of quality fruit.

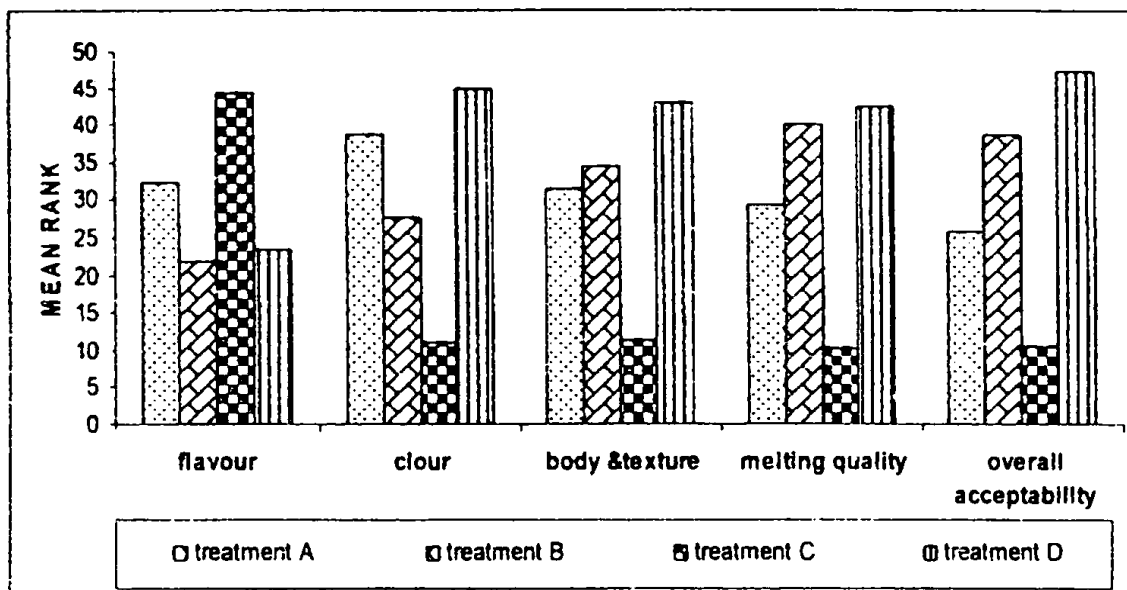


Figure-01 General preferences for different treatments