

**Use of Ash Gourd and Other High Moisture
Cucurbites as Bases for Manufacture Ice Cream**

By

Ishika Priyanditha Edussuriya

A Thesis to the University of Sri Jayawardhanepura for the award of

the degree

Of

Master of Science

In

Food Science and Technology

Year 2006

Declaration

The work described in this thesis was carried out by me under the supervision of Prof. A. Bamunuarachchi and Dr. K.K.D.N.S. Ranaweera and a report on this has not been submitted in whole or in part to any University or any other institution for another Degree / Diploma.

.....I.P. Edussuriya.....

I. P. Edussuriya

Declaration

“We certify that the above statement made by the candidate is true and that this thesis is suitable for submission to the University for the purpose of evaluation”



Prof. A. Bamunuarachchi



Dr. K.K.D.N.S. Ranaweera

ACKNOWLEDGEMENT

I express my deepest appreciation to my Supervisors Prof. A. Bamunuarachchi and Dr. K.K.D.N.S. Ranaweera for all their guidance, assistance and encouragement given to me in making this research project success.

I express my heartiest gratification to Mrs. Indira Wickramasinghe and Mr. M.A Jagath Wansapala for all their guidance and assistance given to me in making this research project success.

I express my deepest pleasure to Mrs. R.P.D. Perera, Mr. Sisira Weerasinghe, Mr. D.P. Rupasinghe and other technical staff of the Food Science laboratory of University of Sri Jayawardenepura for their genuine assistance given me to complete my project.

My special ward of thank goes to Mr. Sanjaya Bathige and technical staff members of CARD laboratory in the Department of Chemistry, University of Colombo, for their support given me in analysis of mineral content of the Ice cream.

I wish to thank Mrs. Suraji Senanayake, for her valuable assistance given me in the Literature survey.

I also wish to thank the library staff of the University of Sri Jayawardenepura, ITI and the University Colombo.

I express my heartiest appreciation to my parents, husband, brother and sister for their interest, assistance and encouragement given to me throughout the period of my research project to make it success.

Finally I thank my colleagues for their valuable support given to me.

ABSTRACT

Ice cream may be defined as a whipped and frozen food made from a mixture of dairy products with the desired percentages of milk fat and milk solid non fat, together with sugar, flavouring, colouring and stabilizer. Fruit or vegetable ice cream is made from the same ingredients as basic ice cream but contains additionally fruit / vegetable puree.

The main objective of this research project was to formulate an ice cream, based on ash gourd. Ash gourd is a commonly available seasonal fruit in Sri Lanka. Although it is cheap in price post harvest processing of Ash gourd is very less among people. Main processed products are sweetener called "Puhul dosi", pickles and jams (used as a base for jam). Ash gourd is also used to prepare as a curry.

Ice cream is a product which is very popular among people and Ash gourd is rich in potassium content and it contains high nutritional value in addition to the medicinal value. Therefore producing a ice cream based on Ash gourd may have several benefits.

Vanilla, chocolate and strawberry flavoured ice creams products were formulated during this research project. For vanilla flavoured ice cream, pumpkin puree was used and for strawberry water melon puree was used as natural colouring agent.

Chemical and microbiological analysis were carried out to identify the content of the ice cream and to compare with SLSI standards for ice cream. Chemical analyses were carried out for Ash gourd puree and ice cream separately.

For ice cream analysis pH, Total Solid content, Milk Solid Non Fat content, fat content, Sugar content, Acidity as lactic acid, Vitamin C, Mass in g / l and over run. For Ash gourd puree pH, Sugar content, Vitamin C content and Moisture content were analyzed. For Microbiological analysis of ice cream aerobic plate count and test for coliform were carried out.

Sensory evaluation for 3 ice cream flavoured samples was done to identify the most acceptable product sample.

Elephant House vanilla ice cream was selected as representative ice cream sample available in the market and it was also analyzed to compare with the contents of Ash gourd ice cream

According to the results ash gourd ice cream nutritional content was high compare to the Elephant House vanilla ice cream. There was significantly high value for potassium, calcium and iron in ash gourd ice cream.

According to results of chemical and microbiological analysis, they were in the acceptable level according to the Sri Lankan standards for Ice cream.

Sensory evaluation results showed chocolate flavoured and strawberry flavoured ice creams (after storage) as most acceptable ice creams. There were no significant difference among the above two samples.

CONTENTS

	Page no.
Chapter 1	
1.0 Introduction	1
Chapter 2	
2.0 Literature Review	2
2.1 Definition of Ice Cream	6
2.2 Historical background	6
2.3.1 Ice Cream Categories	9
2.3.2 Ingredients	9
2.4 Requirements	11
2.5 Composition of Ice cream	12
2.4 Functionality of Ingredients and their sources	14
Chapter 3	
3.0 Experimental	22
3.1 Raw material preparation	22
3.2 Manufacturing process of basic ice cream	24
3.4 Manufacturing of Ash gourd Ice cream	30
3.5 Analysis of Ash gourd puree	32
3.6 Analysis of Ash gourd Ice cream	37

Chapter 4

4.0	Results and Discussion	54
4.1	Results	54
4.1.1	Ash Gourd Puree	54
4.1.2	Ash gourd Ice cream	54
4.1.3	Sensory Evaluation	55
4.2	Discussion	56
4.2.1	Ash Gourd Puree	56
4.2.2	Ash gourd Ice cream	56
4.2.3	Sensory Evaluation	58

Chapter 5

5.0	Conclusion	59
	Reference	60
	Appendix	61

LIST OF FIGURES

	Page No
Figure 1.1: Ice cream	1
Figure 2.1: Ash gourd fruit	2
Figure 2.2: Different flavours of Ice cream	8
Figure 3.1: Ash Gourd Puree	23
Figure 3.2: Schematic diagram of preparing Ash gourd puree	23
Figure 3.3: Schematic diagram of basic ice cream manufacturing process	23
Figure 3.4: Different flavours of Ash gourd Ice cream	27
Figure 3.5: Diagram of Ice Cream Processing adapted from the University of Guelph	29
Figure 3.5: Schematic diagram of preparing Ash gourd Ice cream samples	31
Figure 4.1 Average marks got for samples	55

LIST OF TABLES

	Page No
Table 2.1 : Composition of Ash Gourd	5
Table 2.2 : Demand for ice cream flavours in USA	8
Table 2.3: Average composition of Ice cream	13
Table 2.4: Average compositional Requirements of Ice cream for the Sri Lankan Standard	13
Table 2.5: Average microbiological limits of Ice cream for the Sri Lankan Standard	14
Table 3.1 : Contents of Ash gourd Ice cream	32
Table 4.1: Analyzed results of Ash Gourd Puree	54
Table 4.2 Analyzed results of Ice Cream	54
Table 4.3: Microbiologically Analyzed results of Ash gourd Ice Cream	55

Chapter 1

1.0 Introduction:

There are many types of ice cream products on the market today. Some of these novelty or impulse items include ice cream cakes, sorbets, frozen yogurts, and molded products such as popsicles or ice cream bars.

Ice cream produce based on fruits and vegetables are another novel production. For example mango based, water melon based, pumpkin based ice creams are available. In this research project the developing an ash gourd base ice cream was investigated.

Ash gourd is a seasonally available vegetable in Sri Lanka which is very common and low priced. As the post harvest processes of Ash gourd is limited and market demand for the ice cream is very high, formulating an ice cream should be beneficial. It gives additional nutrients to consumer, and also enables the enhancement of nutrition significantly high amount that is present the fruit.

Objective: Use of Ash gourd and other high moisture cucurbits as bases for the manufacture ice cream.



Figure 1.1: Ice cream.

Chapter 2

2.0 Literature Review

Ash gourd [*Benincasa hispida*], belonging to the family *Cucurbitaceae*, is an underexploited vegetable in spite of having considerable economic and medicinal importance. It was originated in South East Asia and Indonesia. Ash gourd has annual growth habit.

Ash gourd creeping plant has thick, wrinkled stems with coarse hairs, tendrils, and somewhat triangular, irregularly lobed leaves up to 10 inches long. The flowers are golden yellow, 2-1/2 to 3-1/2 inches wide. The fruits, hairy when young, range from oblong to cylindrical and reach 16 inches in length. The mature fruit has a thick, tough, green skin which coated with a layer of white chalky wax. In some varieties, pale gray, minute hairs are present even on full-grown fruit. The thick flesh is white, crisp, juicy, and mild. Seeds are oval, flat, and light brown.

Fruits may weight up to 35 kg and consist of more than 96% water. They are usually sold whole in domestic markets, but are commonly displayed and sold by the slice in Asian markets.



Figure 2.1 : Ash gourd fruit

❖ Other names

It is also known as white gourd, Ash pumpkin, white pumpkin, tallow gourd, ash gourd, gourd melon, winter melon, Chinese watermelon, and Chinese preserving melon.

Alu puhul (Sri Lankan)

Tougan (Japanese);

Doongua, cham kwa, tung gwa, mo kwa, fa kwa (Chinese);

Tankoy, kundol (Filipino);

Petha, kaddu (Indian).

❖ Climatic requirements.

Benincasa hispida grows best in temperate climates with adequate but not excessive rainfall. Grown best at 75° to 80° F. Susceptible to cold but can tolerate drought.

❖ Propagation and care.

Seeds planted for spring and fall crops in the southern desert valleys, or as a summer crop in the rest of the state. At UC Davis, May plantings grew very slowly for 2 months, but

after 4 months had spread to cover the ground. Very late fruiting and maturation could complicate harvest. In Sri Lanka, the plant produces fruit from seed in two months during the rainy season. The distribution of staminate and pistil late flowers is influenced by temperature and day length. Plants may be grown recumbent or trellised.

❖ **Use:**

The fruit is used as a vegetable when young and in making preserves, jams and sweet pickles when ripe. It is considered a delicacy in soups. Somewhat bland in flavor when eaten fresh, the flesh is often used to make soup stock. Canned ash gourd soup and dehydrated ash gourd slices represent two of the processed products made from this species.

❖ **Medicinal Importance:**

Benincasa hispida (*B. hispida*) is recommended in Ayurveda for the management of peptic ulcers. The anti-ulcerogenic effect is claimed to be dose-dependent in stress induced model of ulcer and not in other models. *B. hispida* probably has a CNS component in prevention of stress induced ulceration. However, antihistaminic, anti-cholinergic effects and prevention of disturbance in gastric micro-circulation as possible modes of action cannot be ruled out. *B. hispida* can be considered to be a drug of natural origin possessing anti-ulcer activity. The juice of *Benincasa hispida* (BH) has showed significant activity against

symptoms of morphine withdrawal, such as jumping response and diarrhea, in mice. These results seem to indicate that BH may prevent the development of morphine addiction and also suppress symptoms of opioid withdrawal in animals.

(Source: <http://www.pfaf.org/index.html>)

❖ **Current production :**

Grown in Southeast Asia, China, Sri Lanka and India.

Composition of Ash Gourd

Composition	Content (per 100g weight of food)
Water	96.1 g
Protein	0.4 g
Fat	0.2 g
Carbohydrate	3 g
Fibre	0.5 g
Ash	0.3 g
Calories	13.0 g
Calcium	19.0 mg
Phosphorus	19.0 mg
Iron	0.4 mg
Sodium	6.0 mg
Potassium	111.0 mg
Thiamine	4.0 mg
Riboflavin	0.11 mg
Niacin	0.4 mg
Vitamin C	13 .0 mg

Table 2.1 : Composition of Ash Gourd (Source: <http://www.pfaf.org/index.html>)