

**MANUFACTURING OF
FROZEN VEGETABLES**

By

Roshani Henadeera

Thesis submitted in partial fulfillment of the
requirements for the degree of

Master of Science

In


Food Science and Technology

The faculty of Graduate studies
University of Sri Jayewardenepura
Sri Lanka

2006

DECLARATION

The work described in this thesis was carried out by me under the supervision of Professor Arthur Bamunuarachchi and Dr. K.K.D.S. Ranaweera and a report on this thesis has not been submitted to any university for another degree and has not been presented or accepted in any previous application for a degree.



Roshani Henadeera

We certify that the above statement made by the candidates is true and that this thesis is suitable for submission to the university for the purpose of evaluation.



(Signature)

28/11/06

(Date)

Supervisor

Prof. Athur Bamunuarachchi

CO-ORDINATOR FOOD SCIENCE &

TECHNOLOGY PROGRAMS,

DEPARTMENT OF FOOD SCIENCE &

TECHNOLOGY,

UNIVERSITY OF SRI JAYEWARDENEPURA

SRI LANKA



(Signature)

28/11-2006

(Date)

Supervisor

Dr. K.K.D.S. Ranaweera

HEAD,

DEPARTMENT OF FOOD SCIENCE &

TECHNOLOGY,

UNIVERSITY OF SRI JAYEWARDENEPURA

SRI LANKA

Affectionately dedicated

To

My loving Parents

And

Teachers

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LIST OF ABBREVIATIONS

- | | |
|--------------|---|
| 1. 2, 6-DCP | = 2, 6-Dichlorophenol-Indophenol |
| 2. Internet. | = Taken from Internet Reference section |
| 3. mth | = Months |
| 4. mins | = Minutes (time) |
| 5. std | = Standard |
| 6. S.B | = Steam Blanched |
| 7. N.B. | = Non Blanched |
| 8. H.W.B. | = Hot Water Blanched |
| 9. B.F./bf | = Blast Frozen |
| 10. S.F. /sf | = Slow Frozen |
| 11. d | = Diameter |
| 12. App1 | = Appendix-01 |
| 13. App2 | = Appendix-02 |
| 14. App3 | = Appendix-03 |
| 15. App4 | = Appendix-04 |
| 16. App5 | = Appendix-05 |
| 17. App6 | = Appendix-06 |
| 18. App7 | = Appendix-07 |
| 19. App8 | = Appendix-08 |

Acknowledgement

It is with pleasure that I express my affectionate and deeply felt gratitude to, advice, suggestion and given in numerous ways by my supervisors Prof. Athur Bamunuarachchi, Coordinator Food Science and Technology program, University of Sri Jayewardenepura and Dr. K.K.D.S. Ranaweera, Head of the Food Science and Technology Department, University of Sri Jayewardenepura.

I owe a deep debt of gratitude to Mr. Jagath Wansapala and Mrs. Indira Wicramasingha, Department of Food Science and Technology, University of Sri Jayewardenepura for the advice and support given me always.

I am greatly indebted to Mrs. Rupika Perera, Technical officer, Department of Food Science and Technology, University of Sri Jayewardenepura for given encouragement and guidance in numerous ways.

I offer my sincere appreciation and special thanks to Mr. Sisira Weerasinghe, Technical officer; Department of Food Science and Technology, University of Sri Jayewardenepura for give technical instruction and support to me during the tenure of my project.

I am grateful to Mr. Rupasingha, Laboratory Assistant; Department of Food Science and Technology University of Sri Jayewardenepura for supporting me always in my project work.

I wish to extend my thanks to Mr. Siripala Senadeera, Technical officer, Department of Chemistry, University of Sri Jayewardenepura for giving me chemicals and instruments throughout the project work.

I must acknowledge my debt to my friends for their support and encouragement given to me throughout the project work.

I offer my sincere appreciation and special thanks to my father who gave me assistance and constant encouragement to accomplish this project.

Manufacturing of frozen vegetables

By

Roshani Henadeera, Prof. A. Bamunuarachchi, Dr.K.K.D.S. Ranaweera

ABSTRACT

Leafy vegetables being rich in vitamins and minerals are one of the major constituents of our main meals. But due to their busy life, consumers cannot have access to fresh commodities and refrigerated vegetables may lose most of these nutrients and attributed sensory qualities.

A study was carried out to manufacture blast-frozen **Kankun** (*Ipomoea aquatica*) and **Mugunuwenna** (*Alternanthera sessilis*), which could retain nutrients, as do their fresh counterparts.

After blanching by using different heat treatment methods these vegetables were packaged by using LDPE appropriate for blast-freezing conditions. Subsequently, the food samples were subjected to blast-freezing as well as slow freezing. The temperature at the centre of the blast frozen samples reached -28°C. These frozen vegetables were stored and then analysed for vitamin C, carotene, chlorophyll, pathogens and sensory properties including colour, flavour and texture periodically.

It was found that the duration of steam blanching adequate to inactivate peroxidase enzyme varies from species to other being 5 ½ minutes for **Kankun** and 1 minute for **Mugunuwenna**. As for hot water- blanching, these figures were 5 minutes and 30 second respectively.

However, among non-blanching, steam-blanching and hot water blanching vegetables, non-blanching samples were characterized by containing the highest contents of vitamin C and carotenes immediately after blast freezing. The reduction of these compounds in steam blanching has stopped while that of other samples continued longer. In addition, non-blanching blast-frozen samples were found to have less drip losses compared with steam blanching blast frozen; hot water blanching blast frozen and steam blanching slow frozen samples having the highest value. It may be possible to subject these vegetables to commercial scale blast- freezing.

CHAPTER-01

INTRODUCTION

Competition and development have become the main targets in the modern world. As a result the world is busier than ever before. As a matter of fact consumer time and devotion for food preparation from buying to consumption are being deliberately reduced to utilize more time in working places and to create leisure time. Especially as more and more women are working out side their homes, this trend is very common in developed countries and fast spreading to the developing countries as well.

Compared to meat and fruits, vegetable preparation for meals has been more time consuming and troublesome. Because of this reason demand for convenient, minimally and fully processed vegetables has been in the ascend. Consumers are looking for more convenient ways for food preparation.

People being particular about taste, often prefer to cook their own food rather than buying cooked foods. Therefore minimally processed foods are often preferred to fully processed foods.

Research and development on freezing of vegetables is being done all over the world mainly for western vegetables. Very less work has been found on the indigenous types of vegetables in Sri Lanka. As such, representing Sri Lanka's leafy vegetables, the domestically common "Kankun (*Ipomoea aquatica*) and Mugunuwenna (*Alternanthera sessilis*) were examined for the possibility of manufacturing it as a frozen vegetable.

Blanching has been significant in vegetable freezing. Despite its beneficial effects, blanching can reduce the colour, flavour and texture of the vegetables. Determination of appropriate blanching time is crucial for all vegetables (Jayasekara, 2000). Among enzymes that could deteriorate vegetables, peroxidase is the most heat stable enzyme that cause off flavours, discolouration and textural damage (Jayasekara, 2000). Because of this reason, traditionally the blanching time determination is recommended to find the inactivation time of peroxidase enzyme for different blanching methods. Therefore