

**FORMULATION OF VALUE ADDED  
NUTRITIOUS VEGETABLE RELISH USING**

*Moringa oleifera*

By

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This thesis submitted in partial fulfillment of the requirements for  
the Degree of Masters of Food Science and Technology,  
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## DECLARATION

The work described in this thesis was carried out by me at the Department of Food Science & Technology, University of Sri Jayewardenepura under the guidance & supervision of Dr. M. A. Jagath Wansapala, Senior Lecturer, Department of Food Science and Technology, University of Sri Jayewardenepura, Mr. Errol Berman, Managing Director of Ceylon 2U Foods (Pvt) Ltd and Mr Sarath Alahakoon Managing Director of country style foods (Pvt) Ltd, Kadawatha, Sri Lanka .

This thesis and any part of this have not been submitted for any other university or to any other institution for another degree / diploma.

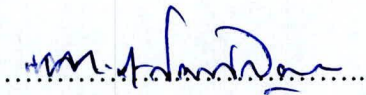
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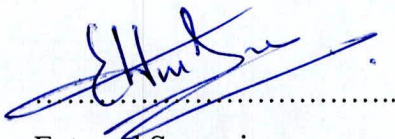
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**AFFECTIONATELY DEDICATED TO**

**My**

**FATHER, MOTHER**

**AND**

**EVER LOVING TEACHERS**

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## LIST OF ABBREVIATIONS

AOAC- Official Methods of Analysis of Association of Official Analytical Chemists

CFU- Colony Forming Unit

Conc. - Concentrated

Di. - Diluted

FAO- Food and Agricultural Organization

HACCP- Hazard Analysis of Critical Control Point

HCl- Hydrochloric

HDPE- High Density PolyEthylene

PET- PolyethyEthylene Terapthalate

PDA- Potato Dextrose Agar

PPM- Parts Per Million

SLS- Sri Lanka Standards

TPC- Total Plate Count

USDA- United States Department of Agriculture

WHO- World Health Organization

Wt. - Weight



## **Formulation of value added nutritious vegetable relish using *Moringa oleifera***

**By N.P.Chandrasekara**

### **ABSTRACT**

There are different types of vegetable relishes available in local and export markets. Unleisured life style of modern society today has unintentionally encouraged people to consume fast foods and readymade foods without a second thought of the subsequent impacts on health. Non communicable diseases such as High Blood Pressure, Diabetes mellitus and Cholesterol may cause due to bad food habits. People could not fulfill their nutritional requirement properly due to busy lifestyle. Therefore nutritionally rich, value added and affordable product could play an important role in their life. The objective of the study was to develop a relish with Sri Lankan flavors using locally available vegetable verities and add the economical value to the underutilized Sri Lankan agricultural produces. The findings of the study can be used to improve the healthy life style of a person and minimize the risk of non communicable diseases. In the study: the relish was produced by using moringa flesh, brinjal paste, coconut butter, and red onion, garlic, salt, with a non caloric sweetener. Final formulation of the relish was determined through sensory evaluation. The results of the sensory analysis were analyzed using Kruskal Wallis test in MINITAB software. There were significant difference ( $P = 0.05$ ) reported for the sensory parameters, for color, flavor, taste, after taste and overall acceptability for the samples and sample 325 showed the best sensory properties when compare with the other samples.

Proximate analysis and shelf life analysis was carried out for the final formulae. The final formulae was consisted 85.66 % moisture, 4.34 % crude protein, 0.51 % total fat, 1.63% Ash, 4.35% crude fiber, 3.52% carbohydrate and 36.03kcal of calories. The shelf life analysis for the final product was carried out for six weeks using PET and glass containers by testing the sensory attributes and microbial counts. The sensory attributes had not deviated from the initial status and microbiology counts were also within acceptable levels in 6 weeks for the product packed in the glass bottle. Therefore, it can be concluded that the product can be kept for six weeks without any change under the natural environment. Finally the product can be considered as a well balanced and low cost food to fulfill nutritional requirements of people.

**Key words-relish, vegetable, chemical composition, sensory evaluation**



# CHAPTER 1

## INTRODUCTION

A relish is a cooked, pickled or chopped vegetable or fruit food item typically used as a condiment in particular to enhance a staple (Trust, National ,2007). It can be smooth or chunky, sweet or savory, hot or mild. A culinary definition is much wider cut fruit or vegetable in acids, with the aid of spices which emphasize food flavour. This is an exceptional quality product made by modern technology which enables keeping the high valuable compounds. They can be served as cold supplements, coating dressing addition. Relishes are eaten in small amounts, along with main dishes to stimulate appetite with its contrast texture and palatable flavour. It is a food that is literally spread, generally with a knife, on to bread, crackers, or other food products. Most of the relishes consist of beet roots, green beans, cabbage, sweet pepper, hot pepper, carrot, onion, garlic, sweet corn celery, cucumber and tomato along with the water, sugar, acids, salt and spices such as cinnamon, cloves, turmeric and mustard seeds (<http://en.wikipedia.org/wiki/Relish>).

Modern food processing and farming methods have robbed much of the nutritive qualities that make it healthy for bodies. With the advent of big agribusiness combines that reap bountiful crop which are increasingly less and less nutritious for body. The use of pesticides ,fungicides, herbicides and chemical fertilizers have significantly increased crop yields ,but this heavy use of chemicals has produced fruits and vegetables that are not as high in nutrients as they have been historically. The fact that food is less nutritious is made worse by what happens to foods once it leaves the farm. For convenience, safety and marketing purposes, food is subjected to all kinds of preservative that changed the nature of the foods from its natural state. Most companies involving in the food business much more concern about the packaging and marketing except the product nutritional value tends to under nourish the society.

### **Market opportunity for relish in Sri Lanka.**

Since the phenomenon of globalism and its contribution to a larger availability of formerly location restricted food there has emerged a rather powerful culture centered on food, the latest trends, and the most popular ingredients.

Relish is a relatively new concept to most Sri Lankans. However, it is gaining popularity along with consumers increased exposure to international cuisines and culture. The concept