

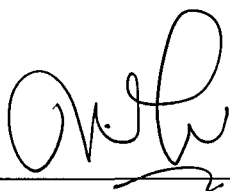
**CHARACTERIZATION AND PURIFICATION OF PROTEASE  
EXTRACTED FROM “NONI” (*MORINDA CITRIFOLIA* L.) AT  
TWO MATURITY STAGES**

**NURULAIN BINTI ABD RAZAK**

**BACHELOR OF SCIENCE (Hons.)  
FOOD SCIENCE AND TECHNOLOGY  
FACULTY OF APPLIED SCIENCES  
UNIVERSITI TEKNOLOGI MARA**

**JUNE 2014**

This Final Year Project Report entitled “**Characterization and Purification of Protease Extracted from “Noni” (*Morinda Citrifolia L.*) at Two Maturity Stages**” was submitted by Nurulain Binti Abd Razak, in partial fulfillment of the requirements for the Degree of Bachelor of Science (Hons.) Food Science and Technology, in the Faculty of Applied Sciences, and was approved by



Dr Normah bt Ismail  
Supervisor  
B. Sc. (Hons) Food Science and Technology  
Faculty of Applied Sciences  
Universiti Teknologi MARA  
40450 Shah Alam  
Selangor

Dr Fadhilah bt Jailani@Lamun  
Project Coordinator  
B.Sc. (Hons) Food Science  
and Technology  
Faculty of Applied Sciences  
Universiti Teknologi MARA  
40450 Shah Alam  
Selangor

Dr Aida Firdaus bt Muhammd Nurul Azmi  
Programme Coordinator  
B.Sc. (Hons) Food Science  
and Technology  
Faculty of Applied Sciences  
Universiti Teknologi MARA  
40450 Shah Alam  
Selangor

Date: 22/7/2014

## **ACKNOWLEDGEMENTS**

In the name of Allah, the Most Gracious and the Most Merciful Peace and blessing of Allah and al Mighty to our beloved final Prophet Muhammad S.A.W and his relatives, all his companions and those who have followed. Alhamdulillah all praise and thanks to Allah S.W.T., the Most Glorious and Omnipotent, His willingness has allowed me to complete this research project.

First of all, I would like to thank Universiti Teknologi MARA especially the Food Science Programme, Faculty of Applied Sciences for the research facilities. My special appreciation goes to my project supervisor, Dr. Normah Ismail for her full guidance and for spending precious time in helping me to finish this project. I also would like to thank the lab staff, Miss Hariyah Hashim, Mdm. Siti Mahani bt Mardi, Mdm. Norahiza bt Mat Soheh and Miss Suhada bt Mat Samri for their kindness in guiding me to use the equipment and helping me to understand the method.

Finally this research is dedicated to my beloved parents, who have always given me the freedom to explore my own path, encouragement and support to succeed. May Allah bless all of you.

Wassalam.

Nurulain Bt Abd Razak

## TABLE OF CONTENTS

	Page
ACKNOWLEDGMENTS	iv
TABLE OF CONTENTS	v
LIST OF TABLES	vii
LIST OF FIGURES	viii
LIST OF ABBREVIATIONS	ix
ABSTRACT	x
ABSTRAK	xi
<b>CHAPTER 1 INTRODUCTION</b>	
1.1 Background and Problem Statement	
1.2 Significance of study	3
1.3 Objectives	4
<b>CHAPTER 2 LITERATURE REVIEW</b>	
2.1 Noni	5
2.1.1 The Plant	5
2.1.2 Chemical Compositions	7
2.2 Plant Protease	8
2.3 Purification	11
2.4 Previous Study on Plant Protease	14
2.5 Industrial Applications	16
<b>CHAPTER 3 METHODOLOGY</b>	
3.1 Materials	18
3.1.1 Plant materials	18
3.1.2 Chemical and Reagents	19
3.2 Methods	19
3.2.1 Protein Content	19
3.2.2 Proteases Extraction	19
3.2.3 Proteases Purification	20
3.2.4 Protein Concentration	20
3.2.5 Proteolytic Activity	20
3.2.6 Molecular Weight Determination	22
3.2.7 Proteases Stability at Different pH	23
3.2.8 Proteases Stability at Different Temperature	23
3.2.9 Protease Storage Stability	23
3.2.10 Statistical Analysis	23

## **ABSTRACT**

### **CHARACTERIZATION AND PURIFICATION OF PROTEASE EXTRACTED FROM “NONI” (*MORINDA CITRIFOLIA* L.) AT TWO MATURITY STAGES**

Protease was extracted from two maturity stages of noni fruits (*Morinda citrifolia* L.), unripe (stage 1) and ripe (stage 5) and then purified using acetone precipitation, dialysis, gel filtration (Sephadex G-25) and freeze drying. Protease obtained from each of purification step was analysed for protein concentrations, proteolytic activity, yield and molecular weight distribution (SDS-PAGE). Freeze dried protease were analysed for pH stability, temperature stability and storage efficiency. Protein content in unripe (stage 1) noni fruit was higher than those in the ripe (stage 5) fruit. Protein concentration for protease for unripe (stage 1) noni fruit was higher for protease purified from crude extract until dialysis step. Molecular weight distribution of purified proteases for both stages was approximately at 3 to 28 kDa. The optimum activity of purified proteases was at pH 7 and 6 at 40 and 50 °C for unripe (stage 1) and ripe (stage 5) noni fruit respectively. Protease from noni fruit could be an alternative source of plant protease based on its high proteolytic activity and stability during storage.