

**UNIVERSITI TEKNOLOGI MARA**

**DETERMINATION OF PATULIN RESIDUES IN APPLE  
BY LIQUID CHROMATOGRAPHY-MASS  
SPECTROMETRY (LCMS-ESI-MS/MS) FOR  
CONSUMER RISK ASSESSMENT**

**NUR ALIYA BINTI HAMDANI**

**Project paper submitted in partial fulfilment of the requirements for  
the degree of Bachelor in Environmental Health and Safety (Hons.)**

**Faculty of Health Sciences**

**JULY 2014**

Declaration by Student

Project entitled "Determination of Patulin Residues in Apple by Liquid Chromatography-Mass Spectrometry (LC-MS/MS) For Consumer Risk Assessment" is a presentation of my original research work. Wherever contribution of others are involved, every effort is made to indicate this clearly, with due references to the literature, and acknowledgment of collaborative research and discussions. The project was done under the guidance of Dr. Mehdi Sameni as Project Supervisor. It has been submitted to the Faculty of Health Sciences in Partial fulfilment of the requirement for the Degree of Bachelor in Environmental Health and Safety (Hons.).

Student's Signature:

.....

(Name)  
Matric number  
I/C number

Date:.....

## ACKNOWLEDGEMENT

I cannot express enough thanks to my supervisor for his continued support and encouragement: Dr Mehdi Sameni. I offer my sincere appreciation for the learning opportunities provided by my supervisor.

My completion of this project could not have been accomplished without the support of my mates, Nur Fayadhdah, Aisyah Warshaf, Natasha Shamsusah, Eleena Norsin, Juizza, Azma, Iskandar.

We gratefully acknowledge support from Environmental Health Department and analytical unit at Pharmacy Faculty of UiTM. Furthermore, I would like to take this opportunity to express my gratitude to Dr. Wan Iryani research group for the support, valuable information and guidance which helped me in completing this task through various stages.

Lastly, I thank to Allah s.w.t, my parents and friends for their constant encouragement and without them this assignment would not be possible.

## TABLE OF CONTENTS

CHAPTER ONE .....	9
INTRODUCTION .....	14
1.1 Background Information .....	14
1.2 Problem Statement.....	16
1.3 Study Justification .....	18
1.4 Study Objectives .....	19
1.5 Study Hypothesis .....	19
1.6 Conceptual Framework .....	20
1.7 Conceptual and Operational Definitions .....	21
CHAPTER TWO .....	22
LITERATURE REVIEW.....	22
2.1 Terminology.....	22
2.2 Patulin.....	23
2.3 Toxicity of patulin.....	26
2.4 Patulin exposure .....	27
2.5 Effect of Patulin .....	27
2.6 Legal Provisions.....	28
CHAPTER THREE .....	31
METHODOLOGY .....	31
3.1 Study Location .....	31
3.2 Study Design.....	32
3.3 Study Variables .....	32
3.4 Sampling Data Collection .....	32
3.6 Instrumentation .....	35
3.7 Study Limitation.....	37

## Abstract

### Determination of Patulin Residues in Apple by Liquid Chromatography-Electrospray Ionization-Mass Spectrometry /Mass Spectrometry (LC-ESI-MS/MS) For Consumer Risk Assessment

Nur Aliya Binti Hamdi

Patulin (PAT) is a mycotoxin produced by certain fungal species of *Penicillium* growing on fruit, including apples with brown rot. The aim of this study was to investigate the presence of PAT in the apple imported in Malaysia and to determine the daily intake of this toxicant from apple consumption. This research describes a simple and rapid method for determination of PAT based on a single extraction step followed LC-ESI-MS/MS. This method is an improvement over existing methods that require additional purification steps. The method was applied to 100 apple samples and demonstrated high levels of contamination in about one in five samples. The incidence of PAT contamination was 53% positive out of 100 samples with the mean value of 11.35ng/g. The levels of contamination determined in the total samples ranged from 3.57 to 34.69ng/g. PAT were detected in apple samples imported to Malaysia, however, further monitoring for PAT level in apple juice concentrates is necessary to control and protect the health risk from this mycotoxin.

**Keywords:** *Patulin, Mycotoxin, Apple, LCMS-ESI-MS/MS*