

UNIVERSITI TEKNOLOGI MARA

**POTENTIAL OF *Curcuma longa* AND
Cymbopogon citratus EXTRACT AS
BOTANICAL PESTICIDES FOR
CONTROLLING APPLE SNAILS,
*Pomacea canaliculata***

SITI HAWA PUTEH BINTI MANSUR

Msc

November 2020

AUTHOR'S DECLARATION

I declare that the work in this dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

Name of Students : Siti Hawa Puteh Binti Mansur

Student I.D. No : 2014142787

Programme : Master of Science (Crop Protection)- AT780

Dissertation Title : Potential of *Curcuma longa* and *Cymbopogon citratus* as botanical pesticides for controlling Apple Snails, *Pomacea Canaliculata*

Signature of Student :

Date : November 2020

ABSTRACT

Apple snail, *Pomacea canaliculata* is an invasive species that seriously affects rice cultivation in many Asian countries and a major pest that leads to the declining of rice productivity in Malaysia. The application of synthetic molluscicides on apple snails in paddy fields resulted in negative impacts on the environment and human health. Botanical pesticide is a potential alternative way to combat apple snails. Their biodegradable, specific target and safe characteristic have prompted many researchers based on botanical pesticides. The objectives of this research are to quantify terpenes content from *Curcuma longa* and *Cymbopogon citratus* plants extracts using Gas Chromatography Mass Spectrometry (GCMS) and to compare the most effective *Curcuma longa* and *Cymbopogon citratus* plants extract in controlling apple snails. The leaves and rhizomes of *Curcuma longa* and *Cymbopogon citratus* were extracted using methanol and ethanol solvents respectively. The extracts were tested on apple snails for five concentrations ranging from 10,000 ppm until 50,000 ppm. The time recorded for mortality and antifeedant test of apple snail from 24, 48, 72, and 96 hours. The phytochemical screening and active compound in leaves and rhizomes *Curcuma longa* and *Cymbopogon citratus* was tested by using Salkowski test to show terpenes compound and Gas Chromatography Mass Spectrometry (GCMS) respectively. GCMS results showed that the main chemical compounds in the leaves and rhizome of *Curcuma longa* was α -phellandrene and turmerone respectively while for leaves and rhizomes of *Cymbopogon citratus* was α -citral and Selin-6-en-4 α -ol respectively. The results from the mortality test conducted showed that the methanol extraction for rhizomes of *Curcuma longa* was effective in controlling apple snails, resulted in the highest mean percentage (84%) of apple snail's mortality during the toxicity test. The methanol solvent is the best solvents compared to ethanol solvent proven by low LC₅₀ value against apple snail. The LC₅₀ values (20,960 ppm) of methanol solvents for rhizomes of *Curcuma longa* were suggested to be applied for apple snails' control. The correlation coefficient between mortality of apple snails, antifeedant index and feeding deterrent for all treatments was due to the significant increase of time exposure. Based on the findings of this study, methanol extractions for rhizome of *Curcuma longa* was recommended for apple snails' control and is potential to be formulated as botanical pesticides. Therefore, further analysis should be carried out to formulate the botanical pesticides based on rhizomes of *Curcuma longa* and be tested for field testing.

ACKNOWLEDGEMENT

I would first like to thank my supervisor Dr. Siti Noor Hajjar Md Latip because the door to Dr. Siti's office was always open whenever I ran into a trouble spot or had a question about my research or writing. Her guidance helped me in all the time of research and writing of this thesis. I would also like to express my gratitude to the staff of University Teknologi MARA and Jengka for providing the knowledge and assistance during the research process. Special thanks go to my numerous friends for helping me with this research project.

Finally, I must express my very profound gratitude to my parents and my siblings for providing me with unfailing support and continuous encouragement throughout my years of study and through the process of researching and writing this thesis. This accomplishment would not have been possible without them. Thank you.

TABLE OF CONTENTS

	Page
CONFIRMATION BY PANEL OF EXAMINERS	ii
AUTHOR'S DECLARATION	iii
ABSTRACT	iv
ACKNOWLEDGEMENT	v
TABLE OF CONTENT	vi
LIST OF TABLES	ix
LIST OF SYMBOLS	x
LIST OF ABBREVIATIONS	xi
CHAPTER ONE INTRODUCTION	
1.1 Background of Study	1
1.2 Problem Statement	4
1.3 Significant Study	5
1.4 Scope of Study	6
1.5 Objectives of Study	7
CHAPTER TWO: LITERATURE REVIEW	
2.1 The Apple Snail <i>Pomacea canaliculata</i>	8
2.1.1 Taxonomy and Morphology	8
2.1.2 History and Distribution	12
2.1.3 Habitat	14
2.1.4 Life cycle	15
2.1.4.1 Eggs	15
2.1.4.2 Hatchlings	17
2.1.5 Host Plants	18
2.1.6 Damage	20
2.1.7 Economic Importance	22
2.1.8 Control Measurement	23
2.1.8.1 Biological control	23
2.1.8.2 Cultural control	25
2.1.8.3 Chemical control	26