

UNIVERSITI TEKNOLOGI MARA

**ALLELOPATHIC
POTENTIAL OF CASSAVA
(*Manihot esculenta* var. Kuning)
AGAINST
SELECTED
WEEDS IN
AEROBIC
RICE
(*Oryza sativa* L.)**

**SITI AISYAH BT MOHAMMAD
TAUPIK**

MSc


July 2021

AUTHOR'S DECLARATION

I declare that the work in this thesis 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 Student : Siti Aisyah Bt Mohammad Taupik
Student I.D. No. : 2019904363
Programme : Master of Science – AT750
Faculty : Plantation and Agrotechnology
Thesis Title : Allelopathic Potential of Cassava (*Manihot esculenta* var. Kuning) against Selected Weeds in Aerobic Rice (*Oryza sativa* L.)

Signature of Student : 

Date : July 2021

ABSTRACT

Aerobic rice production systems require less water than conventional systems. However, rapid growth of weeds is the major constraint in aerobic rice due to the lack of standing water that could prevent the growth of weeds. As the result, weed control in aerobic rice is highly dependent upon synthetic herbicide. Nevertheless, excessive use of herbicide could lead to herbicide resistance in weed, human health and environmental concern. Hence, this study aimed to evaluate the allelopathic potential of cassava plant on the germination and seedling growth of selected weeds in aerobic rice and to identify allelochemical compounds which were responsible for the inhibitory effects. Laboratory bioassay revealed the degree of phytotoxicity of different vegetative parts of cassava aqueous extracts can be classified in the order of decreasing inhibition as follows: leaf > stem > tuber > tuber peel. The leaf aqueous extract at 0.5% (w/v) concentration completely inhibited the germination and seedling growth of the *Ageratum conyzoides* L. (broadleaf), *Eleusine indica* L. (grass), and *Cyperus distans* L. (sedge) without affecting aerobic rice. In greenhouse experiment, the degree of inhibitory effect of cassava residues followed the order of decreasing inhibition: tuber peel > tuber > leaf > stem. Although the tuber peel was the most phytotoxic part, the leaf residue was the only vegetative part that gave no inhibitory effect on aerobic rice. The leaf residues at 8 t ha⁻¹ reduced the seedling emergence and shoot growth of *A. conyzoides* and *C. distans* by 85-100% whereas stimulation was evident on *E. indica*. Fractionation of the aqueous leaf extract was subsequently carried out and the degree of phytotoxic activity of different solvents of fractions can be classified in the following order of decreasing inhibition: ethyl acetate > methanolic > hexane > aqueous. Seven potential allelochemicals with herbicidal activity including coniferol, transferuldehyde, luteolin, gigantol, anemonin, β -carboline, and procyanidin A2 were identified from the ethyl acetate and methanolic extracts of cassava leaf. These findings suggest that the cassava leaf has potential use for weed control in aerobic rice and might be developed as the source of natural herbicide.

ACKNOWLEDGEMENT

First and foremost, I am thankful to my Almighty God who gives me strength and determination to complete this research study. I would also like to extend my utmost gratitude to my deepest appreciation my supervisors Associate Professor Dr. Chuah Tse Seng (Faculty of Plantation and Agrotechnology, UiTM Arau, Perlis) and my co supervisors Associate Professor Dr. Chia Poh Wai (Faculty of Science and Marine Environment, UMT) and Dr. Siti Nur Anisah Aani (Faculty of Plantation and Agrotechnology, UiTM Merlimau, Melaka) for their kind supervision, constructive comments, inspiring guidance and invaluable advice throughout the research. Nothing can express how thankful I am to them. Without precious support and comment from them, this thesis would not have been the same as present here.

I'm glad for Secretariat of the Registrar of Study Leave Section and Management of the Faculty of Fisheries and Food Sciences, UMT for gave full support for me as a staff to further studies. This opportunity is one in million for me as a staff.

I would like to extend my sincere gratitude to all technical staff of Faculty of Fisheries and Food Science, UMT (En Mohd Shahrul Zanudin dan Puan Noor Shuhana Mohd Izhar), Centre of Research and Field Service, technical staff (En. Muhammad Zulhilmi Ramlee, En. Nik Mohd Hafiz Abdullah, Puan Nor Atiyyah Mohamed, En Azlien A. Jalil), for their valuable assistance and cooperation during the completion of this project.

Besides, I would like to express my thanks to colleagues and friends for their help and motivation throughout this project. It's impossible to list all of their names here but few of them who deserved special mentioned are Hannan Safiyyah Tan Sian Hui Binti Abdullah, Fatin Nur Asyikin Ahmad Nazri, Norliyana Fatin Omar, and Naimah binti Abdul Halim who is willing to share their experiences.

Finally, I would like to thank my beloved family for their constant support, understanding, encouragement and prayer along my journey to successfully finish my studies at UiTM and completing this project. Without helps of the particular that mentioned above, this dissertation would be has been merely a dream. I hope this research and thesis can be worthy and useful to everyone from now and future.

Thank you.

TABLE OF CONTENTS

	Page
CONFIRMATION BY PANEL OF EXAMINERS	ii
AUTHOR'S DECLARATION	iii
ABSTRACT	iv
ACKNOWLEDGEMENT	v
TABLE OF CONTENTS	vi
LIST OF TABLES	ix
LIST OF FIGURES	xi
LIST OF SYMBOLS	xiv
CHAPTER ONE: INTRODUCTION	1
1.1 Background	1
1.2 Problem Statements	2
1.3 Significance of Study	3
1.4 Objectives	4
CHAPTER TWO: LITERATURE REVIEW	5
2.1 Problematic Weeds in Aerobic Rice	5
2.2 Crop Allelopathy	7
2.2.1 Crop Extracts	8
2.2.2 Crop Residues	11
2.3 Allelochemical	14
2.3.1 Factors Affecting Allelochemical Release	16
2.4 Allelochemical for Weed Control	18
2.5 Cassava	22
2.5.1 Vegetative Parts of Cassava Plant	24
2.5.1.1 <i>Stem</i>	25
2.5.1.2 <i>Leaf</i>	26