

UNIVERSITI TEKNOLOGI MARA

**THE EFFECTS OF ORGANIC MATERIALS
ON GROWTH AND PRODUCTION OF
SELECTED SECONDARY METABOLITES
OF *BOESENBERGIA ROTUNDA* (L.) Mansf.**

AZREEN SUHANA BINTI ZELNOR

Dissertation submitted in partial fulfillment
of the requirement for the degree of
Master of Science
(Plant Biotechnology)

Faculty of Plantation and Agrotechnology

February 2022

ABSTRACT

Boesenbergia rotunda (L.) Mansf. is a highly important medicinal plant under Zingerberaceae family commonly known as temu kunci and widely found in Asian countries where it is commonly used as food ingredient and ethnomedicine. The rhizome and fingerroot of this species contain several bioactive compounds with pharmaceutical properties. This plant requires optimum environment especially nutrient to increase the production and improve the quality of this plant. Intensive use of chemical fertilizer in agriculture affected people health and environment. Organic material has been widely used in agriculture development to improve the soil quality, crop yield, plant growth performance, and to reduce the dependencies on chemical fertilizer. This study was conducted to identify the effects of organic materials on plant growth and production of selected secondary metabolites of this species. This study conducted at glass house Rimba Ilmu, Universiti Malaya using completely randomized design (CRD) which involve seven treatment and four replications include control, chemical fertilizer, biochar, vermicompost, food waste compost, empty fruit bunch compost and lignohumate in 5 kg of soil. The effects of this treatments based on the plant growth, number leaves, fresh and dry weight of rhizome and fingerroots, also production of alpenetin, pinocembrin, cardamonin, pinostrobin and panduratin A in rhizome. In this study, vermicompost gave the significant increases and highest reading of plant height (52.71 cm), number of leaves (8), rhizome and fingerroots fresh weight (210.00 g), dry weight of rhizome and fingerroot (16.53 g) and pinostrobin production (949.9725 mg/g) compared to others treatments. Biochar shows significant highest of cardamonin (195.5725 mg/g) and pinocembrin (615.6225 mg/g) accumulation. Lignohumate shows significant highest of panduratin A (222.6900 mg/g) and alpenetin production (452.6475 mg/g). The treatment used organic materials shows the best effects in all parameter measured. In conclusion, organic materials can give the positive effects on growth and selected secondary metabolites of *B.rotunda* and at the same time can reduce the dependencies on chemical fertilizer.

Keywords: organic material, fertilizer, growth performance, vermicompost, food waste compost, biochar, and lignohumate.

ACKNOWLEDGEMENT

Praise to Allah S.W.T because of the blessing and grace that have been given to me to accomplish this thesis. This thesis couldn't have been accomplished without the splendid support and cooperation from all of peoples who always encourage me to settle this thesis. I wish to express my sincere gratitude to Assoc. Prof. Ts. Dr. Nor Azma binti Yusuf, from Faculty of Plantation and Agrotechnology because her support and guidance I have been able to complete my research. I respect her because understand every problem that faced by students throughout this study. I also want to express my appreciation to Dr. Rosazlin binti Abdullah and staff at Universiti Malaya for their advice and support until I completing this thesis.

Besides that I also want to deliver appreciation to all staff at Faculty of Plantation and Agrotechnology, Universiti Teknologi MARA (UiTM) campus Sham Alam, Puncak Alam dan Jasin because of their guidance along this journey. Lastly, I want to deliver my special thanks to my family who always give support spiritually and financially throughout this study. Special thanks also go to all my friend who helped me directly and indirectly to complete this research.

Thank you very much.

TABLE OF CONTENTS

	Page
CONFIRMATION BY PANEL OF EXAMINERS	ii
AUTHOR'S DECLARATION	iii
ABSTRACT	iv
ACKNOWLEDGEMENT	v
TABLE OF CONTENTS	vi
LIST OF FIGURES	vii
LIST OF TABLES	viii
LIST OF ABBREVIATIONS	x
CHAPTER ONE: INTRODUCTION	1
1.1 General Introduction	1
1.2 Scope of Research	3
1.3 Research Objectives	4
CHAPTER TWO: LITERATURE REVIEW	5
2.1 Medical Plant Industry in Malaysia	5
2.1.1 Medical Plant in Peninsular Malaysia	5
2.1.2 Medical Plant Research in Malaysia	6
2.2 Species Studied	6
2.2.1 Common Uses	8
2.2.2 Bioactive Compounds in <i>Boesenbergia rotunda</i>	9

2.2.3 Pharmacological Properties	16
2.3 Fertilizer	18
2.3.1 Chemical Fertilizer	19
2.3.1.1 Effects of Chemical Fertilizer Applications	19
2.3.2 Organic Materials	20
2.3.2.1 Types of Organic Materials	22
2.3.2.1.1 Biochar	22
2.3.2.1.2 Vermicompost	24
2.3.2.1.3 Compost	26
2.3.2.1.4 Lignohumate	28
2.4 Plant Secondary Metabolites	29
2.4.1 Introduction to Plant Secondary Metabolites	29
2.4.2 The Importance of Plant Secondary Metabolites	30
2.4.3 Factor of Plant Secondary Metabolites Accumulation	31
2.4.4 Flavonoids	31
CHAPTER THREE: RESEARCH METHODOLOGY	33
3.1 Materials and Methods	33
3.1.1 Plant Materials	33
3.1.2 Study Area and Experimental Design	33
3.1.3 Growth Performance of <i>Boesenbergia rotunda</i>	36
3.1.4 Plant Materials for HPLC Analysis	36
3.1.5 Preparation of Extract for Analysis of Flavonoid Content	37