



UNIVERSITI PUTRA MALAYSIA

**ANTIMICROBIAL EXTRACT OF *FICUS DELTOIDEA* TO CONTROL
PLANT FUNGAL PATHOGENS**

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FP 2016 59

ANTIMICROBIAL EXTRACT OF *FICUS DELTOIDEA* TO CONTROL PLANT
FUNGAL PATHOGENS

BY

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A project report submitted to Faculty of Agriculture, Universiti Putra Malaysia, in fulfillment of the requirement of PRT 4999 (Final Year Project) for the award of the degree of Bachelor of Horticultural Science

Faculty of Agriculture

Universiti Putra Malaysia

2015 / 2016

This project report entitled “Antimicrobial extract of *Ficus deltoidea* to control plant fungal pathogens” is prepared by Zainina binti Zainal Kasim and submitted to the Faculty of Agriculture in fulfillment of the requirement of PRT 4999 (Final Year Project) for the award of the degree of Bachelor of Horticultural Science.

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ACKNOWLEDGEMENT

First of all, I am very grateful to the Almighty Allah SWT for the blessing, strength and health in order for me to complete this final year project.

Then, my deepest appreciation to Associate Professor Dr. Wong Mui Yun, my final year project supervisor, for her guidance, advice, dedicated efforts, supports and encouragement for me to conduct my final year project and to complete this thesis. My sincere thank you to the staff in the Mycology Laboratory, Mrs. Asmalina, Mr Shamsudin and Mr. Johari for their advice and guidance. I also want to take this opportunity to record my sincere thank you to the staff at Taman Herba, Unit Taman Pertanian Universiti, Universiti Putra Malaysia for providing me the source of plant material, *Ficus deltoidea*, to complete this experiment. My sincere gratitude to both of my parents Mr. Zainal Kasim bin Hassan and Mrs. Rosemany binti Abdul Majid and my fellow friends Nornita, Nur Asifa, Nor Intan Syazwani and Nurlisa for their help, moral support and understanding throughout my study in Universiti Putra Malaysia.

Last but not least, my sincere thank you to anyone directly or indirectly have helped me to accomplish this final year project and completing my study in Universiti Putra Malaysia.

CONTENTS

	Page
TITLE PAGE	i
ENDORSEMENT/CERTIFICATION	ii
ACKNOWLEDGEMENT	iii
CONTENTS	iv
LIST OF TABLES	vii
LIST OF FIGURES	viii
LIST OF ABBREVIATIONS	ix
LIST OF APPENDICES	x
ABSTRACT	xi
ABSTRAK	xii
CHAPTER	
1 INTRODUCTION	1
1.1 Background	1
1.2 The objectives of the study	2
1.3 The hypothesis of the study	3

2	LITERATURE REVIEW	4
2.1	Control methods of plant disease	4
2.1.1	Chemical control	4
2.1.2	Biological control	5
2.1.3	Cultural control	5
2.1.4	Genetic resistance	6
2.1.5	Physical control	6
2.1.6	Regulatory control	7
2.2	<i>Ficus deltoidea</i>	8
2.2.1	Taxonomic classification	8
2.2.2	Description	8
2.3	Anti-fungal and antibacterial activity of <i>Ficus deltoidea</i>	9
2.3.1	Qualitative phytochemical studies of <i>Ficus deltoidea</i>	9
2.4	Plant pathogenic Fungi	
2.4.1	<i>Ganoderma boninense</i>	10
2.4.2	<i>Rhizoctonia solani</i>	11

3	MATERIALS AND METHODS	
	3.1 Plant material	13
	3.2 Microorganisms	13
	3.3 Preparation of plant extract	13
	3.4 Screening of antifungal activity	14
	3.5 Experimental design and statistical analysis	15
4	RESULTS AND DISCUSSION	
	4.1 Leaf extraction from <i>Ficus deltoidea</i>	16
	4.2 The effects of <i>Ficus deltoidea</i> extract on <i>Ganoderma</i> <i>Boninense</i>	16
	4.3 The effect of <i>Ficus deltoidea</i> extract on <i>Rhizoctonia solani</i>	17
	4.4 The effect of <i>Ficus deltoidea</i> extract based on concentration	18
	DISCUSSION	20
5	CONCLUSION	22
	REFERENCES	23
	APPENDICES	26

LIST OF TABLES

Table		Page
1(a)	Diameter, Average Diameter and Standard Deviation of mycelial growth of <i>Ganoderma boninense</i>	26
1(b)	Diameter, Average Diameter and Standard Deviation of mycelial growth of <i>Rhizoctonia solani</i>	28
2	Tables of mixture of Potato Dextrose Agar (PDA) and Malt Extract Agar (MEA) with leaf extract of <i>Ficus deltoidea</i> based on concentration.	30

LIST OF FIGURES

Figure		Page
2.2.2	Picture of leaf and figs of <i>Ficus deltoidea</i>	8
2.3	(a) Vitexin and (b) isovitexin chemical structure	9
2.4.1	Pale and necrotic leaf canopy of oil palms attacked by <i>G. boninense</i> ; spear leaves remain unopened.	11
2.4.2	Symptoms showed by paddy leaves. Grey spots are formed, As the spot enlarge the center become grayish white. Lesions on the upper parts of plants extend rapidly coalescing With each other to cover entire tillers from the water line to the flag leaf	12

LIST OF ABBREVIATIONS

ANOVA	Analysis of variance
°C	Degree Celsius
cm	Centimeter
ml	Milliliter
mg	Milligram
PDA	Potato Dextrose Agar
MEA	Malt Extract Agar
%	Percent

LIST OF APPENDICES

Appendix	Page
1 Tables of Diameter, Average diameter and Standard deviation of Mycelial growth of Plants Pathogenic Fungi By Day.	26
2 Tables of mixture of Potato Dextrose Agar (PDA) and Malt Extract Agar (MEA) with leaf extract of <i>Ficus deltoidea</i> based on concentration.	30
3 Print out of the <i>Ficus deltoidea</i> extract against <i>Ganoderma boninense</i> and <i>Rhizoctonia solani</i> Analysis of Variance Procedure, the SAS system.	31

ABSTRACT

Around 85 percent of plant diseases are caused by fungal pathogens. Long term use of synthetic fungicides will lead to too much carcinogenic residue in soil and eventually will cause harm in terrestrial and aquatic biotic lives. It is beneficial to find alternative ways to control the widespread of fungal diseases using environmental-friendly approaches. The objectives of this study are to 1) extract antimicrobial compounds from the leaves of *Ficus deltoidea* and 2) determine the effect of the extracted antimicrobial compounds on the mycelial growth and spore germination of selected fungal pathogens *in vitro*. Two types of fungi were used, *Rhizoctonia solani*, and *Ganoderma boninense*. Leaves were washed and then ground. Five gram of leaf powder was diluted in distilled water and filtered using filter paper. The filtrate was used to test the inhibitory effect on mycelial growth of the selected fungal pathogens using poison agar technique in three replicates for each fungal pathogen at four different concentrations (5, 10, 15 and 20%) of leaf extracts and compared with control (0%). Poisoned agar plates containing *F. deltoidea* extract showed inhibition of mycelial growth, where percent inhibition of diameter growth (PIDG) of *G. boninense* was 55.9% at 7th day and *R. solani* 53.67% at 5th day. Meanwhile, there was 100% inhibition occurred for both *G. boninense* and *R. solani* at the concentrations of 10%, 15% and 20%. Thus, this showed that extracts of *Ficus deltoidea* has the potential to be used as a bio fungicide, a safe substitute to chemical fungicides.

ABSTRAK

Kira-kira 85 peratus daripada penyakit berlaku pada tanaman adalah disebabkan oleh kulat-patogen. Penggunaan jangka panjang racun kulat sintetik akan membawa kepada terlalu banyak sisa karsinogenik di dalam tanah dan akhirnya akan menyebabkan kemudaratan dalam kehidupan biotik daratan dan akuatik. Adalah satu manfaat sekiranya mencari jalan alternatif untuk mengawal penyebaran penyakit kulat menggunakan pendekatan mesra alam. Objektif kajian ini adalah untuk 1) mengekstrak sebatian antimikrob dari daun *Ficus deltoidea* dan 2) menentukan kesan sebatian antimikrob yang diekstrak ke atas pertumbuhan kulat-patogen terpilih. Dua jenis kulat telah digunakan iaitu *Rhizoctonia solani*, dan *Ganoderma boninense*. Daun telah dibasuh dan kemudian dihancurkan. Lima gram serbuk daun dicampurkan dengan air suling dan ditapis menggunakan penapis kertas. Tapisan ini digunakan untuk menguji kesan pada pertumbuhan kulat patogen yang terpilih dengan menggunakan teknik agar beracun dalam tiga ulangan bagi setiap kulat patogen dalam empat kepekatan yang berbeza (5, 10, 15 dan 20%) daripada ekstrak daun dan dibandingkan dengan kepekatan kawalan (0%). Agar beracun yang mengandungi ekstrak *F. deltoidea* menunjukkan tanda-tanda perencatan kepada pertumbuhan kulat patogen, di mana pertumbuhan *G. boninense* direncat sebanyak 55.9% pada hari ke-7 dan *R.solani* telah direncat sebanyak 53.67% pada hari ke-5. Sementara itu, 100% perencatan telah berlaku pada pertumbuhan *G.boninense* dan *R.solani* pada kepekatan 10, 15 dan 20%. Ini menunjukkan bahawa ekstrak *F.deltoidea* berpotensi digunakan sebagai kawalan biologi kulat patogen tumbuhan yang lebih selamat daripada menggunakan racun kimia.

CHAPTER 1

INTRODUCTION

1.1.1 Background

Most of disease of agriculture crops is caused by plant pathogenic fungi. Some of these fungal disease cause total losses to farmer such as potato late blight disease that occurred in Ireland in 1845 which was caused by oomycete *Phytophthora infestans* (Schumann,2000). Other common fungi that always cause diseases in plants are *Ganoderma boninense*, *Pyricularia oryzae*, *Fusarium sp*, *Exserohilum rostratum*, and *Rhizoctonia solani* which cause basal stem rot of oil palm, rice blast, root and stem rot, leaf spot and sheath blight of rice.

The most effective and common way used to inhibit fungi or a fungal spore is using chemical fungicides. Farmers are likely to choose chemical fungicides to protect their crops from fungal diseases because of faster effect, easy to get and cheaper compare to other method of crop protection. Synthetic fungicides were shown to have undesirable attributes such as high and acute toxicity, long degradation period, accumulation in food chain and an extension of their power to destroy both useful organisms and harmful pests. (Jaysinghe *et.al*, 2013). This shows that the use of chemical fungicides is not good and can cause long term effects. Moreover, using chemical fungicides towards plant in long time can cause plant pathogens to develop resistance and it will be more difficult to fight the diseases. Even though, using chemical fungicides can give faster result but it is not encouraged as it will bring more negative effects in the future.

Antimicrobial compounds that are found in plant extracts are known to have the abilities to inhibit fungal growth. Extracts of plants have potential use to treat diseases caused by plant pathogenic fungi because of their antimicrobial properties. (Jaysinghe *et. al*, 2013). Secondary metabolites such as phenols, flavonoids and phenolic glycosides are produced abundantly in plants and many of them contain antifungal activities.

Ficus deltoidea, commonly known as Mas cotek is an herbal plant that is native in Southeast Asia (Shafaei *et. al*, 2015) .It is known that leaf extracts of *F. Deltoidea* have the presence of primary and secondary metabolites such as polyphenols, amino acids and flavonoids. (Shafaei *et. al*, 2015).

1.1.2 **The objective of the study**

The general objective of the study was to determine the potential of *Ficus Deltoidea* leaf extract as an alternative to chemical fungicide for the control of plant pathogenic fungi. The specific objectives of the study were:

1. To extract antimicrobial compounds from the leaves of *Ficus deltoidea*
2. To determine the effect of the extracted antimicrobial compounds on the mycelial growth and spore germination of selected fungal pathogens *in vitro*.

1.3 The hypothesis in the study

The hypotheses of this research were:

Ho: The leaf extract will not give effects on the mycelial growth and spore germination of selected plant fungal pathogens.

Ha: The leaf extract will give effects on the mycelial growth and spore germination of selected plant fungal pathogens.

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