



ANTAGONISTIC REACTION OF *Leptosphaeria* sp. AND *Neocardana musae* AGAINST SEVERAL TREE PATHOGENS

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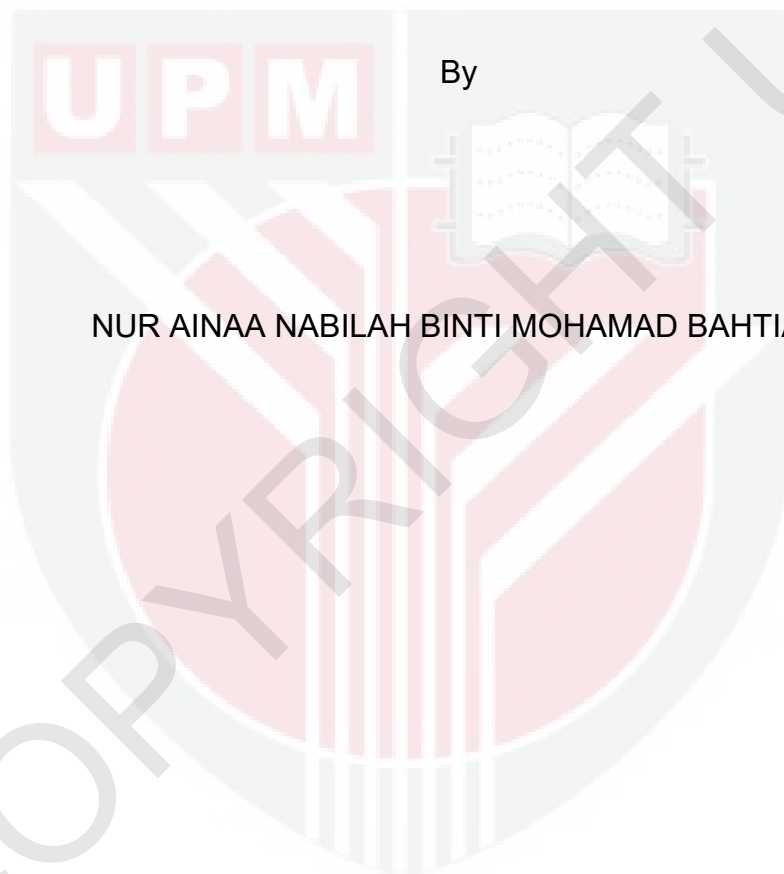


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DEDICATION

For my beloved family,

Mohamad Bahtiar bin Ali

Saberiah binti Ismail

Also my siblings.

To all my friends,

My lab partners, Chan Thip and Adeline Augustine.

Thank you for your encouragements supports

And the sacrifices that you given.

Last but not least,

I dedicated this dissertation to Mrs. Raida Hamzah

Who has encouraged me, helped and give so much support during
conducting this research and in my study.

Thank you for everything. May Allah Bless All of us.

ABSTRACT

The use of endophytic fungi that are able to inhibit growth of tree pathogens is an alternative to fungicide utilization. In this study, the growth performance of fungal endophytes (*Leptosphaeria* sp. and *Neocardana musae*) and fungal pathogens (*Ceratocystis fimbriata*, *Phellinus noxius* and *Fusarium oxysporum*) on Potato Dextrose Agar (PDA) were examined. The antagonistic activities of the two selected endophytes were evaluated using dual culture and non-volatile compound assays. The growth of *Fusarium oxysporum* was 3-fold faster compared to *Ceratocystis fimbriata* when grown in medias without endophytes. However, the radial growth of *Fusarium oxysporum* was two times slower than *Leptosphaeria* sp. in non-volatile compound assay. In dual culture assay, *Leptosphaeria* sp. had the highest potential of antagonistic inhibition against *Fusarium oxysporum* while in non-volatile compound assay *Neocardana musae* had the highest potential of antagonistic inhibition against *Phellinus noxius*. Positive percentage of inhibition of both endophytes in dual culture assay against *Fusarium oxysporum* was between 30-48% while *Phellinus noxius* was between 11-22% on day seven. Meanwhile, the positive percentage of inhibition in non-volatile compound assay after seven days for the three tree pathogens against two endophytes were between 4-32%. Both selected endophytes had potential antagonism effect against the three tree pathogens. This study was limited to artificial surrounding. Further study needs to be carried out to confirm endophytic fungi as natural biocontrol agents against tree diseases.

ABSTRAK

Penggunaan kulat endophitik yang mampu menghalang pertumbuhan patogen pokok adalah sebagai alternatif daripada penggunaan racun kulat. Dalam kajian ini, prestasi pertumbuhan kulat endophitik (*Leptosphaeria* sp. dan *Neocardana musae*) dan kulat pathogen (*Ceratocystis fimbriata*, *Phellinus noxius* dan *Fusarium oxysporum*) pada Potato Dextrose Agar (PDA) telah diperiksa. Aktiviti antagonistik dari dua kulat endophitik yang dipilih telah dinilai dengan menggunakan kultur dua dan ujian kompaun yang tidak berubah-ubah. Pertumbuhan *Fusarium oxysporum* adalah tiga kali lebih cepat berkembang berbanding dengan *Ceratocystis fimbriata* apabila ditumbuhkan dalam kedua-dua media tanpa endophitik. Walau bagaimanapun, pertumbuhan akar *Fusarium oxysporum* dua kali lebih perlahan daripada *Leptosphaeria* sp. dalam ujian kompaun yang tidak menentu. Dalam ujian kultur dua, *Leptosphaeria* sp. mempunyai potensi tertinggi perencatan antagonistik terhadap *Fusarium oxysporum* sementara dalam ujian kompaun yang tidak menentu *Neocardana musae* mempunyai potensi tertinggi perencatan antagonistik terhadap *Phellinus noxius*. Peratusan positif perencatan antagonistik kedua-dua endophytes dalam pengujian kultur dua terhadap *Fusarium oxysporum* adalah antara 30-48% manakala *Phellinus noxius* adalah antara 11-22% pada hari ketujuh. Sementara itu, peratusan positif perencatan antagonistik dalam ujian kompaun tidak menentu selepas tujuh hari untuk tiga patogen pokok terhadap dua endophytes adalah antara 4-32%. Kedua-dua endophitik yang dipilih mempunyai kesan potensi antagonistik terhadap tiga patogen pokok. Kajian ini terbatas kepada persekitaran yang direka. Kajian lanjut perlu dilakukan untuk mengesahkan kulat endophitik sebagai agen kawalan bio semula jadi terhadap penyakit pokok.

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APPROVAL SHEET

I certify that this research project report entitled “Antagonistic Reaction of *Leptosphaeria* sp. and *Neocardana musae* against Several Tree Pathogens” by Nur Ainaa Nabilah Binti Mohamad Bahtiar has been examined and approved as a partial fulfillment of the requirement for the Degree of Bachelor of Forestry Science in the Faculty of Forestry, Universiti Putra Malaysia.

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LIST OF ABBREVIATIONS

PDA	Potato Dextrose Agar
aPDA	Media of Potato Dextrose Agar with adjusted pH values
nPDA	Media of Potato Dextrose Agar with normal pH values
pH	Power of Hydrogen
L	Litre
ml	Millilitre
g	Gram
mm	Millimeter
cm	Centimetre
°C	Degree Celsius
%	Percent

CHAPTER ONE

INTRODUCTION

1.1 General Background

Forest plantation industry contributes as a major way to generate income in Malaysia. The initiative of timber product from forest plantation could indirectly save natural forest from exploitation (Lee, 1999). Forest plantations not only provide raw materials for the industry but also jobs to the local people and pressure to actual forest (Gales, 2002). However, the plantation industry is facing problem of tree diseases cause by pathogens. Tree pathogens can decreases tree growth and cause death in a large or small scale and in early or mature trees (Castello et al., 2014).

Many countries are facing huge economic losses in plantation industry for crop and forest products because of fungal attack. For an instance, Solpot et al. (2016) reported that Fusarium Wilt cause by *Fusarium oxysporum* has negatively impacted banana industry around the world. Fungus called *Puccinia psidii* infects *Eucalyptus* in Central and South America with *Eucalyptus* rust has lead to economic crisis (Coutinho et al., 1998). Moreover, fast growing species of *Acacia mangium* has been attack by pathogen called *Phellinus noxius* in Peninsular Malaysia.

Several alternatives have been done to solve the problem including the introduction of natural biocontrol agent. Various pathogens, pests, weeds and plant parasitic nematodes undermine the crop, horticulture and other plants production can be resisted by microbial control agents like bacteria, actomycete, virus and fungi that work in different ways with more economic and secure way (Kalia & Mudhar, 2011).

1.2 Problem Statement

In most cases, the plantation manager will use pesticide, fungicide or chemical to control pathogen. The application of fungicide sprays and sulphur dusting can successfully regulate the pathogen (Lee, 1993). Nevertheless, the utilization of chemical substance to control pathogen is hazardous and not environmentally friendly. Fungicide causes a long term trouble to the environment and complication to the human health (Ghisalberti, 2000). There are better ways to solve plant disease cause by fungi. Surely, the alternative for chemical control is the use of endophytic microorganisms as good biocontrol agent (Nair & Padmavathy, 2014). The application of endophytic fungi as the natural biocontrol agent can be used to combat tree diseases cause by pathogens. The use of endophytic fungi that is able to inhibit tree pathogen growth is more effective and desirable than the fungicide utilization. Previous study has shown that endophytes *Penicillium simplicissimum* and *Leptospheria* sp. are able to inhibit *Verticillium dahlia* in the early stage of the study (Yuan et al., 2017). In addition, the capability of the selected endophytic fungi in being biocontrol agent is yet to be known.

1.3 Objectives

The present study was designed to meet the following objectives;

- I. To study the growth performance of fungal endophytes (*Leptosphaeria* sp. and *Neocardana musae*) and pathogens (*Ceratocystis fimbriata*, *Phellinus noxius* and *Fusarium oxysporum*) on Potato Dextrose Agar (PDA)
- II. To evaluate the antagonistic effect of two endophytes on three tree pathogens using dual culture and non-volatile compound assay

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