

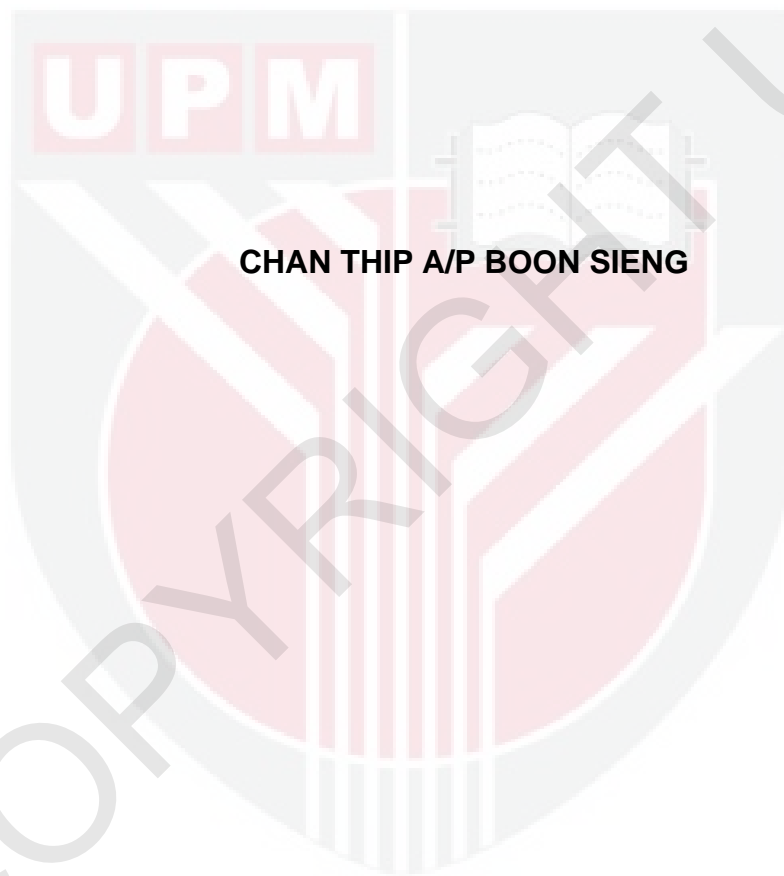


***ANTAGONISTIC ACTIVITY OF *Xylaria* sp. AND *Neopestalotiopsis*  
*egyptiaca* AGAINST THREE TREE PATHOGENS***

**CHAN THIP A/P BOON SIENG**

**FH 2019 3**

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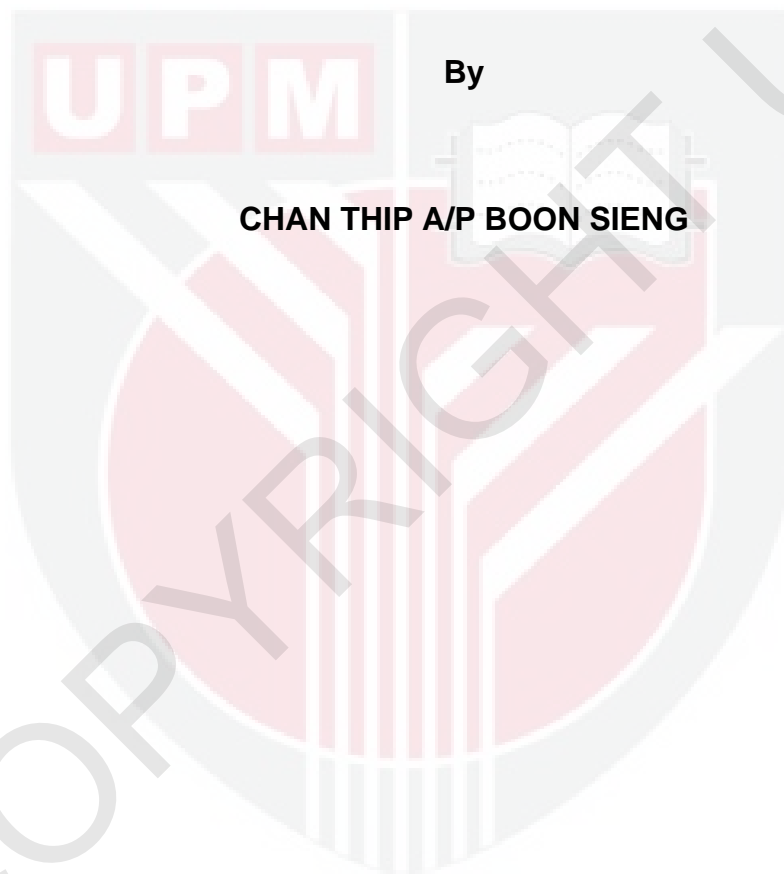


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**FACULTY OF FORESTRY  
UNIVERSITI PUTRA MALAYSIA**

**2018**

**ANTAGONISTIC ACTIVITY OF *Xylaria* sp. AND  
*Neopestalotiopsis egyptiaca* AGAINST THREE TREE PATHOGENS**



**A Project Report Submitted in Partial Fulfilment of the Requirements  
for the Degree of Bachelor of Forestry Science in the  
Faculty of Forestry  
Universiti Putra Malaysia**

**2018**

## **DEDICATION**

**Specially dedicated to my:**

**Parent**

**Siblings**

**Prof. Dr. Rozi Mohamed**

**Faculty of Forestry**

Thank you for your encouragement and support

And all the sacrifices that you have given

Thank you for everything. May god bless all of us.

## ABSTRACT

*Fusarium oxysporum*, *Ceratocystis fimbriata* and *Phellinus noxius* are pathogenic fungi and causal agent of disease to plantation and forest tree. Chemical fungicides are commonly used to control these pathogen, but they are not environmental friendly. As alternative, biological control agents are being sought to replace chemicals. In this study, the growth performance and morphological characteristics of two endophytic fungal (*Xylaria* sp. and *Neopestalotiopsis egyptiaca*) and three fungal pathogens (*C. fimbriata*, *P. noxius* and *F. oxysporum*) were examined. They were inoculated on Potato Dextrose Agar (PDA) : 1) normal PDA (aPDA). and 2) PDA with adjusted pH values between 7.2-7.4 (nPDA). The growth of *N. egyptiaca* was faster than *Xylaria* sp. growth, while the growth of *F. oxysporum* was three times and two times faster than *C. fimbriata* and of *P. noxius* respectively. The antagonistic activity was determined through dual culture assay and non-volatile compound assay. *Xylaria* sp. was a better pathogen inhibitor compared to *N. egyptiaca*. Based on percentage inhibition of radial growth (PIRG) value *Xylaria* sp. could inhibit three tree pathogens while *N. egyptiaca* only could inhibit *P. noxius* and less effective to control the growth *C. fimbriata* and *F. oxysporum*. This shows that between these two endophytic fungi isolates, *Xylaria* sp. has potential as biological control agents against tested fungal pathogens.

## ABSTRAK

*Fusarium oxysporum*, *Ceratocystis fimbriata* dan *Phellinus noxius* adalah kulat patogen dan agen penyebab penyakit kepada pokok ladang dan hutan. Racun kulat kimia biasanya digunakan untuk mengawal patogen ini, tetapi ia tidak mesra alam. Sebagai alternatif, agen kawalan biologi sedang dicari bagi menggantikan bahan kimia. Dalam kajian ini, prestasi pertumbuhan dan ciri-ciri morfologi dari dua kulat endophitik (*Xylaria* sp. dan *Neopestalotiopsis egyptiaca*) dan tiga patogen kulat (*Ceratocystis* sp., *Phellinus noxius* dan *Fusarium oxysporum*) telah dikaji. Mereka telah diinokulasikan pada Potato Dextrose Agar (PDA): 1) PDA biasa (aPDA). dan 2) PDA dengan nilai pH diselaraskan antara 7.2-7.4 (nPDA). Pertumbuhan *N. egyptiaca* lebih cepat daripada pertumbuhan *Xylaria* sp. sementara pertumbuhan *F. oxysporum* adalah tiga kali dan dua kali lebih cepat daripada *C. fimbriata* dan *P. noxius* masing-masing. Aktiviti antagonistik ditentukan melalui pengujian kultur dwi dan non-volatile compound. *Xylaria* sp. adalah perencat patogen yang lebih baik berbanding dengan *N. egyptiaca*. Berdasarkan perencatan nilai radial (PIRG) nilai *Xylaria* sp. boleh menghalang tiga patogen pokok manakala *N. egyptiaca* hanya boleh menghalang *P. noxius* dan kurang berkesan untuk mengawal pertumbuhan *C. fimbriata* dan *F. oxysporum*. Ini menunjukkan bahawa di antara dua kulat endophytic ini, *Xylaria* sp. mempunyai potensi yang lebih baik sebagai agen kawalan biologi terhadap patogen kulat yang diuji.

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## APPROVAL SHEET

I certify that this research project report entitled “Antagonistic activity of *Xylaria* sp. and *Neopestalotiopsis egyptiaca* against three tree pathogen” by Chan Thip a/p Boon Sieng has been examined and approved as a partial fulfillment of the requirements for the Degree of Bachelor of Forestry Science in the Faculty of Forestry, Universiti Putra Malaysia.

---

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Date: January 2019



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## LIST OF ABBREVIATIONS

aPDA	Potato Dextrose Agar with adjusted pH value 7.2pH - 7.4pH PDA
nPDA	Potato Dextrose Agar with normal pH value
PIRG	Percentage of inhibition



## CHAPTER ONE

### INTRODUCTION

#### 1.1 Background

In Malaysia there are existence of Forest Plantation and Industrial crops plantation. Based on Malaysian Timber Industry Board (MTIB) there are nine tree species recommended by the Ministry to be planted in the forest plantation include Rubber (*Hevea brasiliensis*), *Acacia* spp. (*Acacia mangium* or hybrid), Teak (*Tectona grandis*), Sentang (*Azadirachta excelsa*), Khaya spp. (*Khaya ivorensis*/*Khaya senegalensis*), Kelempayan or Laran (*Neolamarckia cadamba*), Batai (*Paraserianthes falcataria*), Binuang (*Octomeles sumatrana*) and five selected species of bamboo. Other than forest plantation, industrial crop plantation also important which is planted food crop such as coconut (*Cocos nucifera*), coffea, tea and etc. There are total 390,000 ha of forest plantation in Peninsular Malaysia, 271,110 ha in 2013 in Sabah and 471,892 ha in 2013 in Sarawak. The total is about 1,133,092 ha and only 133,951.8 ha is industrial crop plantation for the whole Malaysia in 2016. These two kinds of plantation could get infected by diseases that lead to loses of money.

Forest plantations and crop plantation are very important to the country since they provide food and generate income to our country. The forest plantation is an important alternative for the production of wood other than direct felling from natural forest. But in the plantation area the environment is modified environment for the plant compare to the natural forest environment and this

will give the impact to the plant in term of their immunity towards disease. The present of human in an area will introducing more disease and pest because of human will bring pathogen from outside.

In Malaysia the pest and disease control is done to avoid the more lost on the yield and income to the plantation. For agriculture sector the pest and disease control is done through their feeding and burrowing activities and the disease that involving microorganism such as fungi, bacteria and virus. The famous disease that affected our crops and forest plantation is *Ganoderma* basal stem rot and *Maramius* bunch rot. The most important thing is uses of environmental friendly control method for pathogenic fungi, but in Malaysia the main weapon to control the disease is chemical fungicides. The used of the fungicides for long period may lead to the fungicide-resistant strains, and the fungicides also able became harmful to the consumer of the crop (Hewajulige and Wijesundera, 2014).

In cocoa plantation there are practices to avoid the pest such as cocoa pod borer that first reported to be used in Sabah in late 1980. There is combination of the control method to increase the degree of success to control the disease. The common methods that been applied is clean and more frequent harvesting, selecting spraying of moth resting and sleeving the young pods to prevent the laying egg of pest. The Vascular Streak Dieback (VSD) is one of the example that occur in the plantation and it been estimated to cause the loss about 25%-30%. The method used to control this

disease is by using chemical control, Isolation or barrier, disease avoidance, pruning, disease resistance, rehabilitation and culture or nutrient practices. In oil palm plantation area, a basidiomycete's fungus, *Ganoderma* sp. which is the causal agent for the basal stem rots disease. This disease ruined thousand hectare of oil palm plantation in Southeast Asia especially Indonesia and Malaysia (Azahar et al., 2014).





## 1.2 Problem Statement

Pathogen can cause many diseases to plant especially crop and this is causing loses in term of the productivity of the crops. Many people solve this problem by using chemical fungicides. The chemical fungicides give effect to the environment such as the soil pollution as well as water pollution. The chemical fungicides also can cause effect to the plant as well. In long time period pathogen can produce the resistance against the fungicides. Chemical fungicides can cause proliferation of resistance in the pathogen populations. (Chet & Indar, 1994).

The biological control is different for different species because every species has different natural enemies. The study about the biological control of each disease that occurred is needed, because the previous finding from study may be not suitable for the disease currently this is because the development of new resistance. Furthermore, the study that has been done in the laboratory may be not suitable to be applied in the real situation, thus further study is needed because we need to apply the result of the research in the field. In order to control the disease there are lack of information about the species that cause the diseases.

### 1.3 Objectives

- To examine the growth performance of *Xylaria* sp., *Neopestalotiopsis egyptiaca*, *Ceratocystis fimbriata*, *Fusarium oxysporum* and *Phellinus noxius* on normal Potato Dextrose Agar (PDA) and PDA with adjusted pH value (7.2 - 7.4).
- To evaluate the antagonistic effect of two endophytes (*Xylaria* sp. and *N. egyptiaca*) on three tree pathogen (*C. fimbriata*, *F. oxysporum* and *P. noxius*) using dual culture and non-volatile compound assay.

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