

# UNIVERSITI PUTRA MALAYSIA

# FUNGAL PATHOGENS ASSOCIATED WITH MIKANIA MICRANTHA AND THEIR POTENTIAL AS BIOLOGICAL CONTROL AGENT

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## FACULTY OF AGRICULTURE

## UNIVERSITI PUTRA MALAYSIA

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### FUNGAL PATHOGENS ASSOCIATED WITH MIKANIA MICRANTHA AND

### THEIR POTENTIAL AS BIOLOGICAL CONTROL AGENT

BY



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 Agricultural Science.

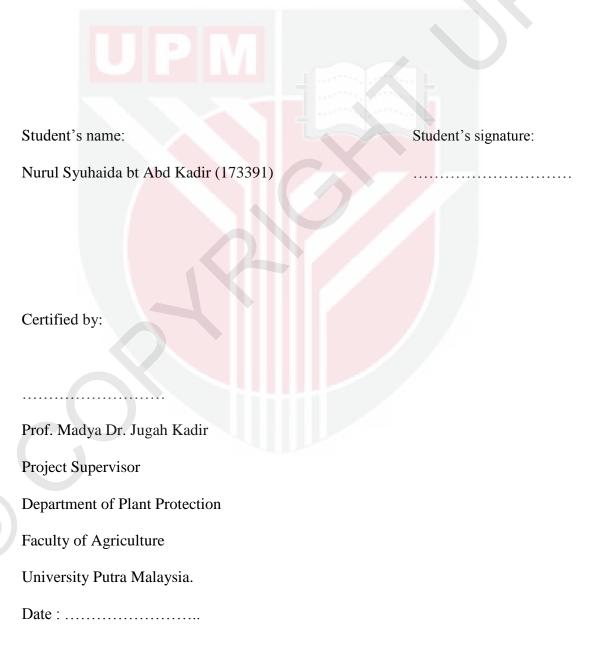
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### CERTIFICATION

This project report entitled Fungal Pathogens Associated With *Mikania Micrantha* And Their Potential As Biological Control Agent is prepared by Nurul Syuhaida Bt Abd Kadir 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 Agricultural Science.



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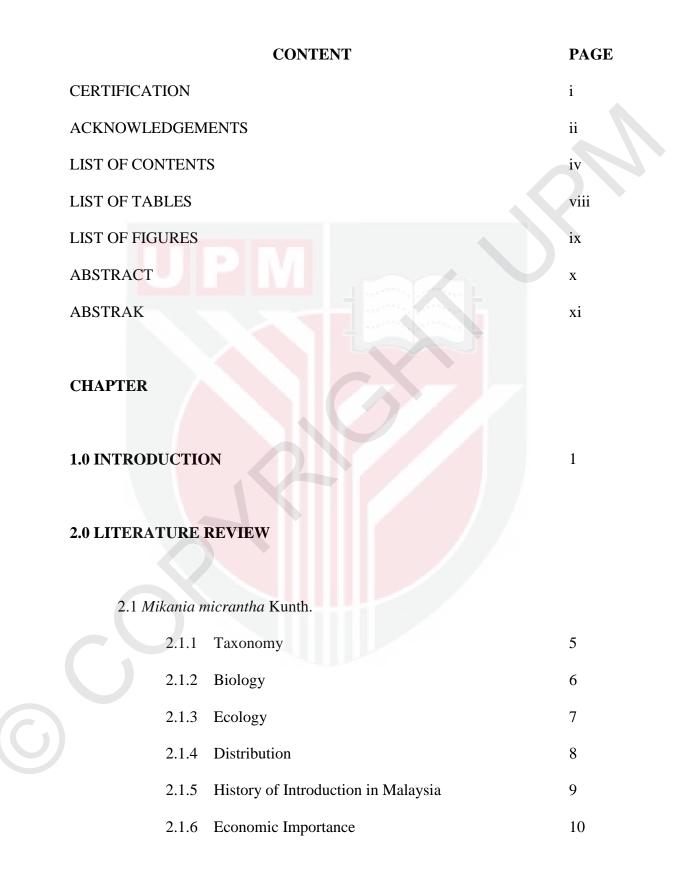
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### ABSTRACT

Mikania micrantha is an invasive weed that is spreading rapidly to many parts of the world including tropical countries. The abundance of M. micrantha in Malaysia is at present a severe problem for plantation area and idle land. This study were conducted to investigate and identify the fungal pathogens associated with *M. micrantha* and their potential as biological control agent. Cultural and chemical control are used extensively to control this invasive weed but it become less effective with buildup of weed resistance on herbicide and labor intensive. Introduction of biological agent will become an alternative method as well as reduce the environmental pollution. In this study, the sample materials were collected based upon disease symptoms shown on the plant parts around UPM Serdang. Isolation and purification of fungi were done in laboratory and followed by identification of fungi based on their morphological characteristics. Pathogenicity test on detached leaf done with focus on the effect of different fungal pathogen and different leaf stages of M. micrantha was done. Disease assessments were done to examine the pathogenic level of the isolated fungi based on disease incidence and disease severity. From disease severity data, *Curvularia* sp. is very pathogenic to *M*. micrantha as indicated by high AUDPC value (258.07 unit, P<0.05) and faster disease progress rate (0.26 unit/day, P<0.05). The time taken to reach 50% of disease severity is faster (8 days) compared to Colletotrichum sp. (>10 day). Pathogenicity of pathogen on different leaf stages showed older leaf stage is more susceptible to both fungal pathogens. From this study, spot, lesion and necrotic symptoms were exhibited and observed on the leaf parts as a result of pathogenic affect from the isolated fungi and their ability to inhibit the growth of *M. micrantha* by the development of disease.

### ABSTRAK

Mikania micrantha merupakan rumpai invasif yang merebak dengan cepat ke merata tempat di dunia termasuk negara-negara tropika.Kehadiran M. micrantha yang banyak di Malaysia pada masa ini menjadi masalah kritikal bagi kawasan ladang dan tanah terbiar.Kajian ini telah dijalankan untuk menyiasat dan mengenalpasti patogen kulat yang berkaitan dengan M. micrantha dan potensi mereka sebagai agen kawalan biologi. Kawalan kultur dan kimia digunakan untuk mengawal rumpai invasif ini tetapi ia menjadi kurang berkesan dengan pembentukan rintangan rumpai terhadap racun herba dan memerlukan tenaga kerja yang ramai. Pengenalan agen biologi akan menjadi satu kaedah alternatif serta mengurangkan pencemaran alam sekitar. Dalam kajian ini, bahanbahan sampel diambil berdasarkan tanda-tanda penyakit yang ditunjukkan pada bahagian tumbuhan M. micranta di sekitar UPM Serdang.Pengasingan dan penulenan kulat telah dilakukan di makmal dan diikuti dengan pengenalpastian kulat berdasarkan ciri morfologi mereka.Kemudian, ujian kepatogenan pada daun dilakukan dengan memberi tumpuan kepada kesan patogen kulat yang berbeza dan peringkat daun M. micrantha yang berbeza.Penilaian penyakit telah dilakukan untuk meneliti tahap patogenik berdasarkan kejadian penyakit dan keterukan penyakit. Daripada data keterukan penyakit, Curvularia sp. adalah sangat patogenik terhadap M. micrantha sepertimana nilai AUDPC tertinggi (258,07 unit, P <0.05) dan kadar perkembangan penyakit yang lebih cepat (0.26 unit/hari, P <0.05). Masa yang diambil untuk mencapai 50% daripada keterukan penyakit adalah lebih cepat (8 hari) berbanding Colletotrichum sp. (> 10 hari).Patogenik patogen pada peringkat daun yang berbeza menunjukkan peringkat daun yang lebih tua adalah lebih mudah terdedah kepada kedua-dua patogen kulat.Dari kajian ini, bintik daun, luka dan gejala nekrotik telah muncul dan diperhatikan pada bahagian

daun kesan akibat patogenik kulat dan menunjukkan keupayaan mereka untuk menghalang pertumbuhan *M. micrantha* melalui perkembangan penyakit.



### **CHAPTER 1**

#### INTRODUCTION

*Mikania micrantha* Kunth. (Family: Asteraceae) commonly known as mile-aminute because of its vigorous fast growth habit (Waterhouse, 1994) that colonizes agricultural land and badly damages tree crops and agroforestry in moist tropical forest in Asia, particularly South-east Asia (Choudhury, 1972; Holm *et al.*, 1977; Muniappan and Viraktamath, 1993; Parker, 1972; Waterhouse, 1994). This herbaceous vines is locally known as 'Selaput Tunggul' have ability to propagates through wind-dispersed achenes and by stem fragments which easily roots at the nodes (Barreto and Evans, 1994). Its native distribution are South to Central America where it is found in tropical and subtropical areas from sea level up to relatively high altitudes (Holm *et al.*, 1977).

This species has become a major weed throughout Asia and 17 countries in the South Pacific (Waterhouse and Norris, 1987) including Malaysia where it was classified as invasive through Global Invasive Species Database managed by the Invasive Species Specialist Group (ISSG) of the IUCN Species Survival Commission. Besides that, it also listed in Federal Noxious Weed USDA in 2010.

Introductory of this invasive weed in Asia has probably started during the early part of the 20<sup>th</sup> century (Choudhury, 1972; Holmes, 1982; Waterhouse, 1994). Ismail (2001) stated that *M. micrantha* was introduced in Malaysia in the early 1950's as non-

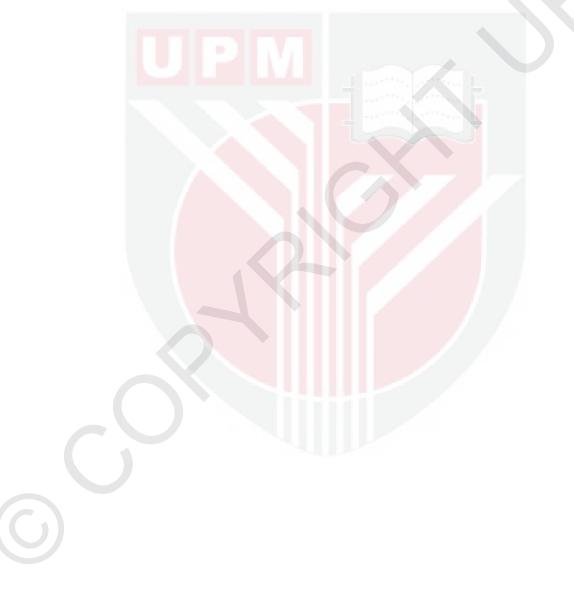
legume cover crop for rubber plantation due to scarcity of legume seeds. While in Indonesia, it's has been introduced as a ground cover in 1940's and quickly spread to the Pacific Islands, south-east Asia and Papua New Guinea and give problems to plantation and idle land (Waterhouse, 1994). Recently, the weed has spread more to southwestern India where it is invading both natural and planted forests, as well as subsistence and cash crops at the forest interface (Sankaran and Sreenivasan, 2001) and also to China (Zhang *et al.*, 2004).

*M. micrantha* became a problematic weed when it start to cut the light interception of the main crop by smothering on it (Huang *et al.*, 2000). *M. micrantha* successfully outcompeting many plant species by forming a thick ground cover, including food and industrial crops and can be concluded as a major weed of subsistence farms and plantation in many countries. In addition, *M. micrantha* causing a loss of production and localized death of plants which can lead to serious implication for income and food security by chokes and smother other crops. Besides lowering the crop yield, it's also give difficulty in harvesting because of its creeping and twinning habit (Holm *et al.*, 1991; Waterhouse and Norris, 1987). By 1960's, *M. micrantha* became problematic weed in plantation crops, particularly of tea in northeastern India and rubber and oil palm in southeastern Asia (Holm *et al.*, 1977; Parker, 1972; Waterhouse 1994). Teoh *et al.* (1985) reported that yield loss in oil palm up to 20% in the first 5 years was attributed to *M. micrantha* and about 5% of total weed control costs in rubber and oil palm plantation was used to controlled this invasive weed.

Sahid (1995) stated that weed can be host vector for pest and disease that causes reduction in crop yield for about 42% than other pest like insects (28%), pathogen (27%) and nematodes (3%). He added, *M. micrantha* released allelopathy biochemical during decaying and inhibit the vegetative growth of any nearby plants. While most of the seeds were viable up to 80% and can be found for about 3 262/ m<sup>2</sup> for oil palm plantation and 3 292/ m<sup>2</sup> for rubber plantation (Sahid, 1995).

In purpose to curb with these problems, all the mechanical, cultural, chemical and biological controls have been applied (Cock *et al.*, 2000; Ellison and Murphy, 2001; Ellison *et al.*, 2004; Parker, 1972; Zhang *et al.*, 2004). The current management methods are focused on cultural and chemical controls instead of biological controls due to lack of awareness and enforcement in plantation management. In spite of that, cultural and chemical controls are expensive and often ineffective where the weed can be recolonized within two weeks when control by slashing method (Choudhury, 1972) and chemical application were unsustainable as well as environmentally damaging (Sankaran and Sreenivasan, 2001).

According to biological control studies, biological agents has host specificity where it will not affect the non-target species as do as chemical herbicides (CAB International Institute of Biological Control, 1987). Through studies and researches, the natural enemies can be introduced and manipulated to inhibit the growth of uncontrolled invasive weed and reduced the application of herbicides. Hence, this study will help in controlling the overpopulation of *Mikania micrantha* by using biological control agent as well as reducing the environmental pollution. The objective of this study is to investigate and identify the fungal pathogen associated with *M. micrantha* and their potential as biological control agent while the hypothesis of this study is at least there is a significant different among different fungal used to inhibit *M. micrantha* growth. The higher pathogenicity level exhibit severe damaged on the detached leaf as their ability to inhibit the growth of *M. micrantha*.



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