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EVALUATION OF MAJOR FOLIAR DISEASES IN COMMERCIAL OIL PALM NURSERIES FOR IMPROVING DISEASE MANAGEMENT

AZLAN AZIZI MUHAMAD NOR

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By

AZLAN AZIZI BIN MUHAMAD NOR

Thesis Submitted to School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirement for the Degree of Master of Science

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Special dedication to:

My lovely mother …

Wan Zainab Bt Wan Harun,

My caring father…

Muhamad Nor Bin Said

My lovely wife…

Normahfuzah Husna Bt Samsuddin

And

My handsome and cute sons and daughter…
Saifullah al faruq Bin Azlan Azizi
Saifullah al Faris Bin Azlan Azizi
Wardatul Widad bin Azlan Azizi

'It is difficult to be patient but to waste the rewards for patience is worse'

-Abu Bakar (R.A)-

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

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Chairman : Zainal Abidin Mior Ahmad, PhD
Faculty : Agriculture

Field surveys were conducted in nine selected oil palm nurseries in Peninsular Malaysia including government and private nurseries which provided and supplied oil palm planting materials in Malaysia. Studies covered 4 nurseries in Johor (Kluang, Bkt Tongkat, Kahang and Ayer Hitam), 3 nurseries in Perak (Teluk Intan, Permatang Guntung and Kg Bakar Arang) and 2 nurseries in Selangor (Sepang and Kuala Langat). The disease evaluation revealed that leaf spot disease was a major problem with the highest mean incidence is 62.81% compared to anthracnose disease at 16.52%. For disease incidence of leaf spot disease, the highest incidences were recorded in Kuala Langat, Selangor (90.3%) and Kluang, Johor (87.7%). The least incidences of leaf spot were recorded in 3 nurseries in Perak occurring between 50 to 55%. For assessment of disease incidence of anthracnose, the highest incidence was recorded in Kuala Langat, Selangor (45.0%) and the least incidences were recorded in 6 nurseries which were located in Johor and Perak occurring between 8.0 to 14.0%. For assessment of disease severity, high severities for leaf spot disease were recorded in Kluang (64.7%) and Kahang, Johor (59.22%). Besides, the least severity was recorded in Permatang Guntung, Perak with 19.23%. For severity of anthracnose, high severities were recorded in Kuala Langat, Selangor (9.1%) and Teluk Intan, Perak (6.57%) and the least severities were recorded in 6 nurseries which were located in Johor and Perak occurring between 1.0 to 2.5%. The study also found disease incidence of leaf spot and anthracnose diseases were both highly significant with different age of seedling. As the seedling became older, incidence of leaf spot and anthracnose diseases were reduced. For leaf spot disease, seedling 0-4 month score the highest percentage at 77.47% followed by 4-12 month which was 72.89% and seedling with age 12 month and above were most resistance with lowest score 49.0%. This was similar with disease incidence of anthracnose for 0-4 months (21.56%), 4-12 months (16.86%) and with the least incidence was observed in seedlings aged 12 months and above at 14.89%. For interaction of seedling age with disease severity of leaf spot,

study revealed that there was highly significant relationship between disease severity and seedling ages. Seedling with age 0-4 month were most susceptible and severely affected (50.90%) followed by seedling age 4-12 month (39.84%) and the most resistance seedling age is comes to seedling with 12 month and above with only 18.4%. However, for disease severity of anthracnose, there was no significant relationship. Study found that, these three stages of ages which were 0-4 month (3.5%), 4-12 month (3.83%) and 12 month and above (3.31%) score the disease severity with mostly the same with each other. The symptoms of leaf spot and anthracnose diseases also were recorded and characterized based on field observation. For isolation of pathogen, study indicated that anthracnose was found to be associated mainly with *Colletotrichum* spp. Meanwhile, leaf spot was found mostly associated with *Curvularia* sp., and *Pestalotiopsis* sp. For interaction of agricultural practices with disease incidence and severity of leaf spot, study found that there was no significant correlation between disease incidence of leaf spot with irrigation system, frequency of watering, mulching and water sources for seedling 0-4 month and 12 month and above. However, for seedling 4-12 month, there was negative correlation between water sources with leaf spot incidence (-0.76*) and severity (-0.84**). For anthracnose disease, there was no significant correlation between disease incidence and severity with irrigation system, frequency watering, mulching and water sources for seedling 0-4 month, 4-12 month and 12 month and above.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

PENILAIAN PENYAKIT DAUN UTAMA DI TAPAK SEMAIAN KELAPA SAWIT KOMERSIAL BAGI PENGURUSAN YANG LEBIH BAIK

Oleh

AZLAN AZIZI BIN MUHAMAD NOR

Disember 2014

Pengerusi : Zainal Abidin Mior Ahmad, PhD
Fakulti : Pertanian

Kajian di lapangan telah dijalankan di sembilan tapak semaian sawit terpilih di Semenanjung Malaysia termasuk hak milik kerajaan serta persendirian yang menyedia dan membekalkan anak benih sawit ke seluruh Malaysia. Kajian merangkumi 4 tapak semaian di Negeri Johor (Kluang, Bkt Tongkat, Kahang dan Ayer hitam), 3 tapak semaian di Perak (Teluk Intan, Permatang Guntung dan Kg Bakar Arang) dan 2 tapak semaian di Selangor (Sepang dan Kuala Langat). Penilaian penyakit mendapati penyakit 'leaf spot' atau bintik daun adalah penyakit utama dengan purata insiden sebanyak 62.81% berbanding penyakit 'anthracnose' yang hanya 16.52%. Untuk insiden penyakit bagi 'leaf spot', peratusan insiden tertinggi direkodkan di Kuala Langat, Selangor (90.3%) dan Kluang, Johor (87.7%). Peratusan insiden terendah pula direkodkan di 3 tapak semaian di Negeri Perak dengan peratusan insiden antara 50.0 ke 55.0%. Untuk penilaian peratusan insiden 'anthracnose' pula, peratusan tertinggi direkodkan di Kuala Langat, Selangor (45.0%) manakala terendah pula direkodkan di 6 tapak semaian yang terletak di Negeri Johor dan Perak dengan peratusan antara 8.0 ke 14.0%. Untuk penilaian 'disease severity' atau keterukan penyakit, peratusan tertinggi bagi 'leaf spot' direkodkan di Kluang (64.7%) dan Kahang, Johor (59.22%). Selain itu, peratusan terendah pula direkodkan di Permatang Guntung, Perak dengan 19.23%. Untuk keterukan penyakit bagi 'anthracnose' pula, peratusan keterukan tertinggi direkodkan di Kuala Langat, Selangor (9.1%) dan Teluk Intan, Perak (6.57%). Peratusan terendah pula direkodkan di 6 tapak semaian yang terletak di Negeri Johor dan Perak dengan 1.0 ke 2.5%. Kajian juga mendapati insiden penyakit 'leaf spot' dan 'anthracnose' mempunyai perhubungan yang tinggi dengan umur anak benih yang berbeza. Semakin matang umur anak benih, insiden penyakit 'leaf spot' dan 'anthracnose' juga semakin berkurangan. Untuk penyakit 'leaf spot', anak benih 0-4 bulan mencatatkan peratusan insiden paling tinggi iaitu 77.47% diikuti oleh 4-12 bulan dengan 72.89% dan anak benih berusia 12 bulan keatas mempunyai ketahanan penyakit paling tinggi dengan peratusan insiden paling rendah iaitu 49.0%. Begitu

juga dengan insiden bagi ‘anthracnose’ yang mana anak benih berusia 0-4 bulan (21.56%), 4-12 bulan (16.86%) dan insiden terendah diperhatikan pada anak benih berumur 12 bulan ke atas dengan 14.89%. Untuk perkaitan antara umur anak benih dengan ‘disease severity’ atau keterukan penyakit bagi ‘leaf spot’, kajian mendapati ada perhubungan yang rapat antara keterukan penyakit ‘leaf spot’ dan umur anak benih. Anak benih dengan umur 0-4 bulan adalah lebih teruk dijangkiti dengan peratusan 50.90% diikuti 4-12 bulan (39.84%) dan anak benih berumur 12 bulan keatas adalah paling kurang teruk dijangkiti dengan hanya 18.4%. Walaubagaimanapun, bagi keterukan penyakit ‘anthracnose’, tiada sebarang perkaitan diperhatikan. Kajian mendapati bahawa ketiga-tiga peringkat umur iaitu 0-4 bulan (3.50%), 4-12 bulan (3.83%) dan 12 bulan ke atas (3.31%) menunjukkan peratusan keterukan jangkitan yang hampir sama. Simptom bagi penyakit ‘leaf spot’ dan ‘anthracnose’ juga telah direkod dan dikelaskan berdasarkan pemerhatian di ladang. Untuk pengasingan patogen, kajian mendapati penyakit ‘anthracnose’ adalah berkait rapat dengan *Colletotrichum sp.* sementara ‘leaf spot’ pula adalah berkait rapat dengan *Curvularia sp*. dan *Pestalotiopsis sp.*. Bagi perkaitan antara pengurusan ladang dengan insiden dan keterukan penyakit bagi ‘leaf spot’, kajian mendapati tiada perhubungan antara insiden dan keterukan penyakit dengan kaedah pengairan, kekerapan siraman, pengunaan sungkupan serta sumber air bagi anak benih 0-4 bulan dan 12 bulan keatas. Walaubagaimanapun, untuk anak benih berumur 4-12 bulan, terdapat perhubungan antara sumber air dengan insiden (-0.76*) dan ‘severity’ atau keterukan penyakit (-0.84**). Bagi penyakit ‘anthracnose’, tiada perhubungan diperhatikan antara insiden dan keterukan penyakit dengan kaedah pengairan, kekerapan penyiraman, pengunaan sungkupan serta sumber air bagi anak benih 0-4 bulan, 4-12 bulan serta 12 bulan keatas.

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This thesis was submitted to the senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Science. The members of the Supervisory Committee were as follows:

Zainal Abidin Mior Ahmad, PhD
Associate Professor
Faculty of Agriculture
Universiti Putra Malaysia
(Chairman)

Ganesan Vadamalai, PhD
Associate Professor
Faculty of Agriculture
Universiti Putra Malaysia
(Member)

Idris Abu Seman, PhD
Head of Ganoderma and Diseases Research
Malaysian Palm Oil Board (MPOB)
Malaysia
(Member)

BUJANG KIM HUAT, PhD
Professor and Dean
School of Graduate Studies
Universiti Putra Malaysia

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Signature: _____
Name of Member of Supervisory Committee: Associate Professor Dr. Ganesan Vadamalai

Signature: _____
Name of Member of Supervisory Committee: Dr. Idris Abu Seman

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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
BSR	Basal Stem Rot
Bkt	Bukit
DMRT	Duncan Multiple Range Test
DI	Disease Incidence
DS	Disease Severity
Kg	Kampung
MPOB	Malaysian Palm Oil Berhad
PDA	Potato Dextrose Agar
SAS	Statistical Analysis System
%	Percentage

CHAPTER 1

INTRODUCTION

1.1 General

The palm oil industry has been identified to be a major contributor to the economic well being of the countries involved. Anyawu *et al*. (1982) reported the oil palm (*Elaies guineensis Jacq.*) as one of the most important economic crops in the tropics and also a very important source of vegetable oil because of its capability as the highest production of oil compared to the other oil bearing plants (Soyebo *et al*., 2005).

Over the past 30 years, the worldwide area planted for oil palm has increased more than 150 percent (Fairhurst and Mutert, 1999). Between 1997 and 2001, global palm oil production increased by 31 percent, 34 percent for consumption, and 43 percent for global exports which is from 26.6 billion to 38.7 billion pounds of palm oil production and 89 percent of world export (Brown and Jacobson, 2005). It was stated that palm oil and palm kernel oil contributed for almost 50 percent of total global exports of oils and fats in 2002. This was supported by the statement from USDA (2005) that 83% of palm oil was used for edible purposes between 2000 and 2001 (Corley, 2009).

Most of this increase was recorded in Southeast Asia, with extremely impressive production increases in Malaysia and Indonesia (Fairhurst and Mutert, 1999). In 2005, Malaysia and Indonesia produced nearly 80% of 35 million tones of the total world production of palm oil (Tan *et al*., 2009).

Several reasons contributed to spectacular expansion of oil palm industries in the world. Fairhurst and Mutert (1999) stated the main reason for the great expansion of the oil palm industries as attributed to the strong and stable prices of crude palm oil and kernel oil following the increase inconsumption of dietary oils and fats in the developing economies such as China and India.This has indirectly encouraged investors to develop plantations on a large scale, suitable and fertile lands found in Malaysia and Indonesia.

1.2 Problem Statement

Like any other crop, the oil palm is being threatened by various pest and disease problems. From seed germination until fruit harvesting, the crop is exposed to several pests and diseases including those caused by fungal infections.

Due to the advantages and contributions of the oil palm industries as mentioned previously, the sustainability of oil palm cultivation especially in the aspect of effective pests and diseases management to increase productivity is particularly important. To achieve this, research and development of the major pests and diseases of oil palm must be undertaken.

In this connection, the identification of major pests and diseases of oil palm in Malaysia is very crucial for diagnosis and effective control of these problems in the oil palm plantations.

Although there have been studies on foliar diseases of oil palm conducted by previous researchers, information on diseases and their causal pathogens in oil palm especially in the nurseries are seriously lacking. As a result, managers of oil palm estates often face difficulties and confusion in identifying the symptoms of these diseases.

There is a need for surveys and observations on good agricultural practice in oil palm plantations. Poor agricultural practices would lead to increase incidence of diseases in oil palm nurseries.

From such studies, the relationship between agricultural practices and their influence on disease development can be observed and evaluated to improve disease management and reduce losses in oil palm plantations.

1.3 Objectives of study

In view of the problems stated, this study was undertaken with the following objectives:

(i) To conduct surveys of oil palm foliar diseases and identify the major disease problems based on assessment of disease incidence and severity in commercial oil palm nurseries.

(ii) To study the relationships between oil palm nursery agriculture practices and their influence on foliar disease development.

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Azizi Muhamad Nor Azlan, Zainal Abidin Mior Ahmad, Abu Seman Idris and Ganesan Vadamalai. 2018. Assesment of Leaf Spot and Anthracnose Diseases in Nurseries and It Relationship with Oil Palm Seedling Ages. Int. J. Adv. Multidiscip. Res. 5(1):19-26.

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