



UNIVERSITI PUTRA MALAYSIA

**ETIOLOGY OF POST-HARVEST DISEASES CAUSED
BY FUSARIUM SPECIES IN TOMATO**

ABUBAKAR ABUBAKAR ISMAILA

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By

ABUBAKAR ABUBAKR ISMAILA

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

February 2013

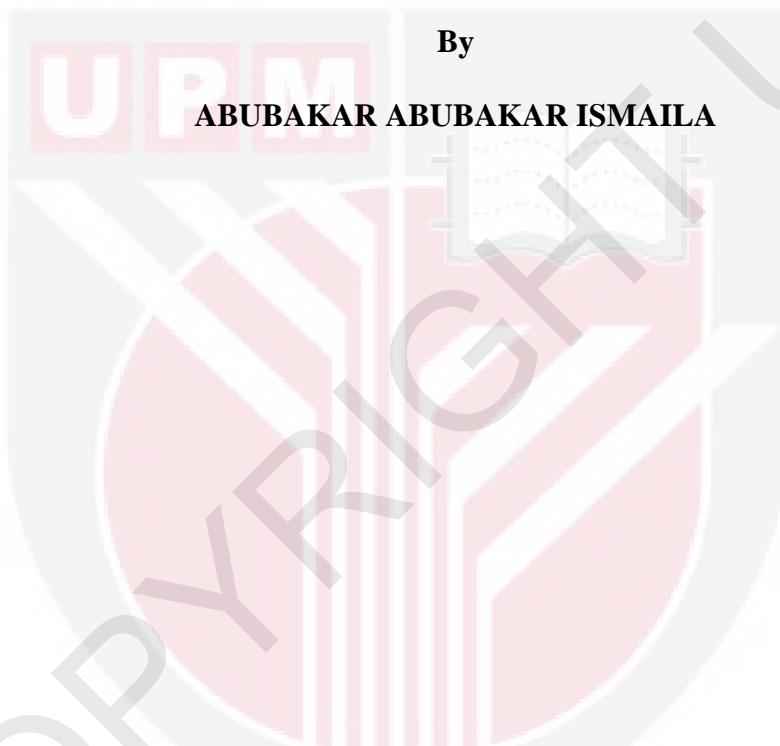
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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment
of the requirement for the degree of Master Science

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February 2013

Chairman: Nur Ain Izzati Mohd Zainudin, PhD

Faculty: Science

Fusarium species is one of the common pathogens of post-harvest spoilage to cause fruit rots on tomato and other perishable vegetable fruits. The objectives of this study were to determine the diversity of *Fusarium* species isolated from post-harvest fruit rots of tomato, to identify the causal organism based on their phenotypic characteristics, to verify the pathogen of *Fusarium* fruit rot of tomato based on pathogenicity test and to classify the *Fusarium* isolates into vegetative compatibility groups (VCGs). Carnation leaf-piece agar (CLA) and potato dextrose agar (PDA) media were used for phenotype-based identification of the *Fusarium* isolates with emphasis for characterizations of the shapes and sizes of the macroconidia and microconidia, colony features, growth rates and chlamydospores. A total of 180 *Fusarium* isolates were obtained from 13 locations throughout Selangor. *F. solani* was most abundantly isolated (34%) followed by *F. semitectum* (31%), *F. oxysporum* (31%), *F. subglutinans* (3%) while the least was *F. equiseti* (1%). Twenty seven isolates were tested for pathogenicity test by injecting 1 ml of the conidial suspension

onto healthy tomatoes. All the tested *Fusarium* isolates were pathogenic on tomato with different severity levels. The non-inoculated control fruits were injected with the sterile water showed no any symptoms of fruit rot. The most virulent was *F. oxysporum* (isolate B711T) with disease severity index (DSI) 93.75%, while the least were *F. solani* (isolate B647T) and *F. oxysporum* (isolate B727T) with DSI of 37.50%. All *Fusarium* isolates were then classified into VCGs which were *F. oxysporum* (10 VCGs), *F. semitectum* (3 VCGs) and *F. subglutinans* (2 VCGs). The isolates of *F. oxysporum* were genetically diverse as depicted by the index and distribution of the VCGs. However, there was no strong correlation observed between VCGs of all three species and locations.

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

**ETIOLOGI PENYAKIT POST TUAI DISEBABKAN OLEH *FUSARIUM*
SPESIS DI TOMATO**

Oleh

ABUBAKAR ABUBAKAR ISMAILA

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Spesies *Fusarium* adalah salah satu patogen biasa kerosakan lepas tuai yang menyebabkan reput pada buah tomato dan sayur-sayuran lain. Objektif kajian ini adalah untuk mengenalpasti kepelbagaiannya *Fusarium* species yang dipencarkan dari penyakit lepas tuai reput buat tomato, untuk mengidentifikasi organisma penyebab berdasarkan ciri fenotipnya, untuk mengesahkan patogen penyakit reput buah *Fusarium* berdasarkan ujian kepatogenan dan mengkelaskan isolat *Fusarium* ke dalam kumpulan keserasian vegetatif (VCGs).

Media agar keratan daun *carnation* (CLA) and agar kentang dektrosa (PDA) telah digunakan untuk pengenalpastian pencilan *Fusarium* berdasarkan ciri fenotip yang menumpukan kepada bentuk, saiz makrokonidia dan mikrokonidia, ciri koloni, kadar pertumbuhan dan klamidospora. Sejumlah 180 pencilan *Fusarium* diperolehi daripada 13 lokasi di sekitar Selangor. *F. solani* adalah yang terbanyak dipencarkan (34%) diikuti oleh *F. semitectum* (31%), *F. oxysporum* (31%), *F. subglutinans* (3%) dan yang terendah adalah *F. equiseti*

(1%). Dua puluh tujuh pencilan diuji kepatogenannya dengan menyuntik 1 ml ampaian konidia ke atas tomato yang sihat. Kesemua pencilan *Fusarium* yang diuji adalah patogenik dengan tahap keseriusan yang berbeza. Tomato yang tidak diinokulasi dan disuntik dengan air steril tidak menunjukkan sebarang simptom. Pencilan yang paling virulen adalah pencilan B711T *F. oxysporum* dengan darjah keseriusan penyakit (DSI) 93.75%, manakala yang terendah adalah pencilan *F. solani* (B647T) dan *F. oxysporum* (B727T) dengan DSI 37.5%. Kesemua pencilan *Fusarium* kemudiannya dikelaskan ke dalam kumpulan keserasian vegetatif iaitu *F. oxysporum* (10 VCGs), *F. semitectum* (3 VCGs) dan *F. subglutinans* (2 VCGs). Pencilan *F. oxysporum* adalah pelbagai dari segi genetik seperti yang dapat dilihat pada indeks dan taburan VCGs. Walaubagaimanapun, tiada korelasi yang kukuh dapat diperhatikan di antara VCGs dengan spesies dan lokasi.

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APPROVAL

I certify that a Thesis Examination Committee has met on 13th February, 2013, of viva voice to conduct the final examination of Abubakar Abuabakar Ismaila on his thesis entitled "Etiology of Post-harvest Diseases Caused by *Fusarium* Species in Tomato" in accordance with the Universities and University Colleges Act 1976 and the Constitution of the University Putra Malaysia [P.U.(A) 106] 15 March, 1998. The Committee recommends that the student be awarded the Master Science Degree in Mycology and Plant Pathology.

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DECLARATION

I declare that the thesis is my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently, submitted for any other degree at Universiti Putra Malaysia or at any other institution.



ABUBAKAR A. ISMAILA

Date: 13th February, 2013

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