دراسات فسيولوجية مرضيه علي تكتلات (تشوهات) المانجو

مقدمة من

عبير أبوزيد محمد السعيد عبدربه

رسالة علمية مقدمة استيفاءً لمتطلبات منح درجة

ماجستير في العلوم الزراعية

قسم النبات الزراعي

(تخصص امراض النبات)

من

جامعة الإسكندرية

٢٠٠٩

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Alexandria University
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PHYSIOPATHOLOGICAL STUDIES ON MANGO MALFORMATION

BY

ABEER ABO-ZEED MOHAMMED El SAID

A thesis submitted in partial fulfillment of the requirements governing the award of the degree of

MASTER IN AGRICULTURAL SCIENCES

Department of Agriculture Botany

(PLANT PATHOLOGY)

From

Alexandria University

2009

Alexandria University
Faculty of Agriculture
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ACKNOWLEDGMENT

All thanks to Allah, most beneficent and merciful

I would like to express my gratitude and my deepest appreciation to Prof. Dr. Sayed. A. El-Kazzaz Professor of Plant Pathology ,Faculty of Agriculture, Alexandria University, for his encouragement, valuable suggestions, and revising the manuscript. His limitless help support me in the difficult times.

My thanks and gratitude is extended to Prof. Dr. Saad M. Shama Professor of Plant Pathology, Faculty of Agriculture, (Saba-Basha), Alexandria University, for his help and guidance throughout the course of this study, in reviewing this manuscript and supervision.

I honestly lack words to express my deepest appreciation to Dr. Mostafa Abd-El-Azeem A. Amer Ass. Prof. of Plant Pathology, Faculty of Agriculture, (Saba-Basha), Alexandria University, for his limitless help and for the time he dedicated to put things in order, his great effort in reviewing the manuscript and his kind help.

Special thanks to my husband Mr. Nader Abd El-Wahab Ass. Lecturer, of Plant Pathology, Faculty of Agriculture, Alexandria University, for his kind help, encouragement and providing useful materials.

Lastly, I would like to express my special and genuine gratitude to my father, my mother, my brothers, and my sisters for their kinds, generous efforts, great help and spiritual supports to finish this work. Also, great thankfulness to all my friends especially Hoda, Layla, Amany, Islam and Rasha for giving me their wholehearted support, and showing great patience during this work.

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CHAPTER 1

INTRODUCTION

The mango (*Mangifera indica*), was introduced in Egypt since 1883, mango is currently grown throughout the Nile Valley, in the Nile Delta and in areas around El Fayoum governorate. It is one of the country's most economic fruit crops (El Khoreiby, 1997). In 1996, an estimated 215 657 tons of fruit worth £E 431 million were harvested in Egypt (Anon, 1996). The most producing centers are in Sharkia, Ismailia, Giza, Fayoum, Qena governorates and Nobaria. The most important varieties are Hindy, Pairi, Tymour, Ewas, Zebda and Langara (Anon, 1996).

A significant impediment to increase mango production in Egypt is malformation disease (Ploetz *et al.,* 1999). Malformation was first reported in India in 1891 (Watt, 1891). Since then, it has also been described in other areas in Asia (Israel, Malaysia, Pakistan), Africa (South Africa, Sudan, Swaziland, Uganda) and the Americas (Brazil, Central America, Mexico, USA) (Ploetz, 2001). Malformation was first recognized in Egypt in 1934 and by 1958 had become a major problem (Ibrahim *et al.,* 1975).

Mango malformation (MM) disease is the most limiting factor to mango production in Egypt, that malformation causes losses of at least £E 35 million/year (Ploetz *et al.,* 2002). The disease affects vegetative and floral panicles resulting in phyllody and hypertrophy (Ploetz, 1994). The disease has been attributed to various causes including viral (Das *et al.,* 1989), nutritional (Prasad *et al.,* 1965) and hormonal (Dang and Daulta, 1982) and *Fusarium mangiferae* was first isolated from malformed tissue, (Summanwar *et al.,* 1966) and recognized as *F. moniliforme*. Later, (Varma *et al.,* 1974) used the name *F. moniliforme* var. *subglutinans* and demonstrated its involvement in both the vegetative and floral forms of the disease. (Nelson *et al.,* 1983) recognized the fungus as *F. subglutinans* in the section Liseola, which broadly corresponds with the so-called *Gibberella fujikuroi* complex (O'Donnell *et al.,* 1998a). To accommodate morphologically and phylogenetically-related isolates of *F. subglutinans* (Steenkamp *et al.,* 2000) that had been shown previously to cause mango malformation (Freeman *et al.,* 1999), (Britz *et al.,* 2002) established the taxon, *F. mangiferae*.

The present work was designed to investigate: -

1- Isolation of the pathogen from mango malformed tissues.
2- Identification of the pathogen using morphological and cultural characteristics.
3- Pathogenicity tests to healthy seedlings of Keet cultivar.
4- PCR amplification using analysis for verification of *Fusarium mangiferae* from infected tissues.
5- Determination of macronutrients status N, P and K (%) in panicles and leaves from healthy and malformed tissues of six cultivars of mango trees.
6- Determination of plant Hormones content Indole-3-Acetic Acid (IAA) and Gibberellic Acid (GA) in healthy and infected flowers and spurs of Sokary cultivar.
7- Determination of total and reducing sugars in panicles and leaves collected form healthy and malformed tissues of six cultivars of mango trees.
8- Determination of total Phenolic contents in healthy and malformed panicles obtained

from different five cultivars of mango trees.

9- Biocontrol of *Fusarium mangiferae* using tow isolates of *Bacillus subtilis*, one isolate of *Pseudomonas fluorescens* and *Trichoderma harzianum*.

10- Study the effect of some fungicides on the linear growth of *Fusarium mangiferae in vitro*.

CHAPTER 2

REVIEW OF LITERATURE

2.1. Distribution and economic importance of mango malformation

Malformation is well known in India and has also been confirmed in most mango-growing countries: Sudan (Minessy *et al.,* 1971), Cuba (Soroa, 1983), Australia (Peterson, 1986), the United Arab Emirates (Burhan, 1991), Pakistan, Egypt, South Africa, Brazil, Israel, Central America, Mexico and USA (Kumar and Beniwal, 1992) and Bangladesh (Meah and Khan, 1992).

The disease is endemic as a tree once infected never recovers (Mallik, 1963). Losses due to malformation have not been accurately assessed because yield loss is not a linear function of disease severity (Kumar *et al*., 1987). Nevertheless, malformed inflorescences in a tree do not bear fruit, thus causing losses in yield. Tree losses up to 86% in one grove have been recorded over a three-year period (Kumar, 1983). In northern India particular, over 50% of the trees are affected; with consequent heavy losses in yield (Mango Cultivation, 1983). The disease also threatens the mango industry in Egypt (Hifny *et al*., 1978). In South Africa, the disease is present on 73% of mango farms, with severity ranging from 1 to 70% of the trees affected (Rijkenberg and Crooks, 1984).

2.2. Symptoms of mango malformation

Tow distinct stages of malformation, vegetative and floral (Kumar *et al.,* 1987), characterize the disease. Vegetative malformation (VM), first described in 1953 (Nirvan, 1953), is more pronounced on young seedlings, but also appears on mature trees. Typical symptoms in seedling are loss of apical dominance and swelling of vegetative buds in the leaf axial or at the tip. The seedling then produce small shoot lets bearing small, scaly leaves (Nirvan, 1953) with a bunch-like appearance, the so-called bunchy-top (BT) stage (Kumar and Beniwal, 1992).

Symptoms of floral or blossom malformation (FM) appear with the emergence of inflorescences. Flowers in a malformed inflorescence (MI/MIS) are much enlarged and crowded the generally hypertrophy axes of the panicle, thus producing no fruit or aborting early (Kumar and Beniwal, 1992). Such panicles appear greener, increased and crowded branching (Hifny *et al.,* 1978) generally causes them to be heavier. Severely malformed inflorescence produces far more flowers (Hifny *et al.,* 1978), though most remain unopened (Kumar and Beniwal, 1992).

The vegetative malformed panicles of the disease is observed more frequently on young seedlings, where axillary or apical buds produce misshapen shoots, which have shortened internodes and brittle leaves that are significantly smaller than those of healthy plants (Kumar *et al.,* 1993). Malformed shoots tend to remain compact thus giving rise to a bunchy-top appearance (Kumar *et al.,* 1993, Ploetz, 1994 and Marasas *et al.,* 2006).