STUDIES ON MANGO ROT IN EGYPT

By
Soheir Sayed Hussein Goneim
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Name : Soheir Sayed Hussein Goneim

Approved By :

Prof. Dr. - - - - - - - - - - - - - - - - - -

Prof. Dr. - - - - - - - - - - - - - - - - - -

Prof. Dr. - - - - - - - - - - - - - - - - - -

(Committe in Charge)

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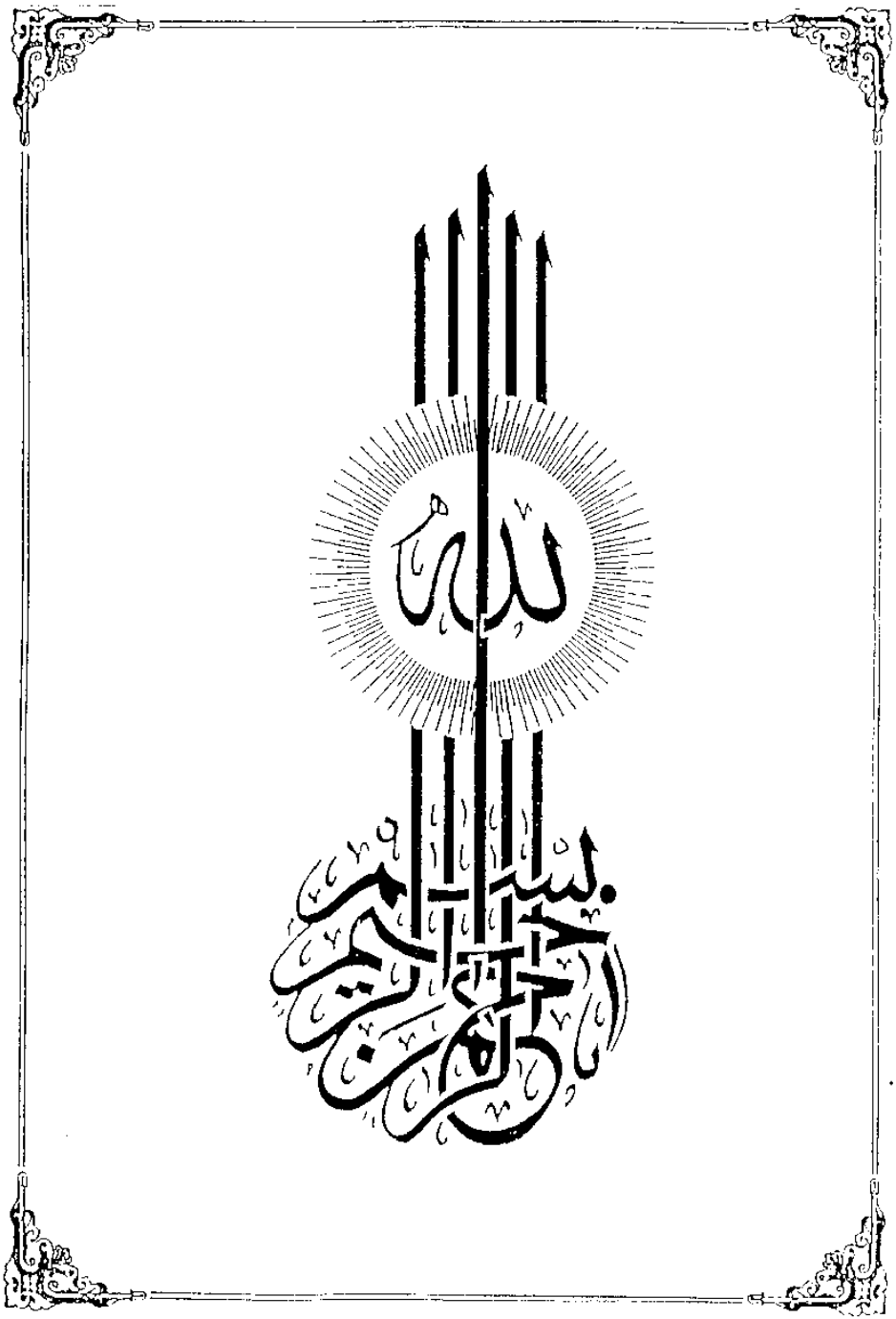

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TO MY FAMILY

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INTRODUCTION

Mango (*Mangifera indica* L.) is one of the most important fruit crops in Egypt. Mango trees cover 32, 272 feddans distributed in different locations mainly in Giza, El- Sharkia, El- Ismailia, El- Beheira and Assuit Governorates, according to Ministry of Agriculture Statistics Anonymous (1983). The total crop produced from the cultivated area is about 122,917 tons annually, which representing the third position among the Egyptian fruit crops after citrus and grape.

Mango fruits in Egypt are subject to the attack by few rots such as those incited by the fungi *Botryodiploida theobromae* and *Alternaria* sp. However, recently, mango flowers and young fruits are severely attacked in the field by a disease causing mango fruit dropping due to the inner rot of embryo after fruit dropping. This disease was noticed in Egypt for the first time in 1971, causing great losses in the Southern region of Tahrir province especially on the Taimour cultivar (Cafar *et al.* 1979).

Hence, the aim of this work was to later concentrated on the study of the causal pathogen of inner fruit rotting disease of mango fruits, testing its virulence on some mango cultivars as well as studying the biochemical changes associated with the disease in affected fruits.

This work also covered some histological studies concerned with the mode of fungus penetration in mango fruits. Furthermore, the efficiency of some fungicides to control this disease was investigated in the laboratory as well as in the field.

REVIEW OF LITERATURE

Recently, fruit drop or embryo rot of mango fruit became an important disease which attacks mango trees in Egypt causing considerable losses in orchards.
The present literature will be reviewed concerning this disease as following :

Mango Fruit Rots :

Ragab (1961) and Ragab *et al.* (1971 a & b) described a soft rot of mango fruits in Egypt caused by the fungus *Bolryodiplodia theobromae* Pat. They studied its pathogenicity, host range and its physiological characteristics. On the other hand Abdel Megid *et al.*, (1968) described a new rot disease of mango fruits caused by *Alternaria tenuissima*. This was early described in India in 1965 by Mukherji.

The Causal Organism and Symptoms :

Das Gupta and Zachariah (1945), found that *Fusarium* sp. was the main organism which caused the die back disease of mango. The general characteristics of symptoms were wilting of branches and twigs, particulary on adult trees, followed by a complete defoliation resulting in a scorch appearance.

Singh (1963), stated that drop of affected fruits, in some mango varieties, due to disease or insect attack, was about 15.42 to 2.61 % or 0.35 to 1.18 %.

Lingeral (1969), found that the damage caused by Oidium mangifera was serious, but the die back (Fusarium sp.) was less important.

Gafar et al. (1979),stated that fruits affected with the dropping phenomenon possessed abnormal growth and shape compared with the normal ones. F. oxysporum was found to be the most frequent fungus associated with the internal tissues of malformed fruits. However, inoculation of fruits with this fungus failed to develop such symptoms.

Baraka (1983), reported that pathogenicity tests revealed that F. oxysporum was more virulent on mango inflorescences causing blossom blight.

Physiological Studies :

Porter (1928), stated that Fusarium oxysporum, F. niverum grew most rapidly on PDA medium between 24°C and 32°C, minimum temperature being below 8°C, and its maximum temperature being above 35°C. The fungus grew rapidly on a wide range of acid and alkaline media (pH 3 to 8.3). The viability of this fungus was maintained for 20 days in an oxygen-free chamber.

Sleeth (1934) mentioned that the optimum temperature for the growth of F. oxysporum F. niveum in cultures was found to be between 24°C and 28°C. The minimum being about

5°C and the maximum just being above 35°C.

Hu et al., (1964), concluded that eight out of nine isolates of F. oxysporum F. niveum grew normally at 25°C, and the other one at 30°C.

Youssef (1968), reported that F. oxysporum made a good growth on a variety of laboratory media and was best on Richard's, Czapeck Dox, and Waksman's agar media. On the other hand, nutrient agar medium was the least favourable for fungal growth.

Saurikar and Mehta (1973), mentioned that isolates of F. moniliforme grow at pH 2 to 8 with an optimum at pH 4 for mycelial growth and sporulation. There was a slight mycelial growth but no sporulation at 5°C and 45°C, where both were best at 25°C.

Shukla and Bhargava (1977), indicated that growth and sporulation of F. solani were best at pH 5.5- 6.5 and 22°C- 28°C.

Olutiola (1978), found that F. oxysporum grew and sporulated best at 30°C and pH 7.5. Light stimulated sporulation but inhibited growth. The best N source of growth and sporulation was L- asparagine. Sucrose supported maximum growth while sporulation was best on mannitol.

Kim et al. (1982), mentioned that abundant micro- and macrocondidia were produced in culture on SA and the optimum temperature for mycelial growth was 25°C-30°C.

Effect of Mango Shoot Extract on Fungal Growth :

El- Ghandour et al., (1979), reported that extracts of healthy tissues of shoots and/ or inflorescences of 3 mango CVS., significantly retarded the in vitro growth of F. moniliforme. Those from the resistant Zebda were more effective than those from the susceptible Taimour and Hindy.

Kumar et al., (1979), tested in vitro the antifungal properties of plant extracts F. oxysporum. Spore germination was completely inhibited by onion, cotton and bean extracts while the others either stimulated or partially inhibited spores germination.

Abdel- Hafize (1982), found that healthy Zebda mango shoot extracts agar medium reduced the rate of growth of F. moniliforme var. subglutinans than those of Hindy , Balady and Pyri. Taimour extract did not significantly stimulate the fungal growth although it is a highly susceptible cultivar.

Varietal Reaction :

Abdel- Megid et al. (1971), reported that mango varieties varied in their natural susceptibility to fruit

dropping from 5.6 % to 63 %. Some varieties were highly affected, e.g. Kalb- El- Tour, Ormance and Taimour. Other varieties were moderately affected, e.g. Mabroka, Misk and Pyri. Hindy Bezra and Nesr were slightly susceptible.

Baraka (1983), mentioned that six mango varieties namely Taimour, Sinnara, Hindy, Sokkari, Zebda, Balady and Kobbania, differed in their reaction to blossom blight incited by F. oxysporum. Taimour, Sinnara, Hindy and Sokkari were highly susceptible. On the other hand, Kobbania variety was moderately susceptible.

Chemical Components in Relation to Disease Severity :

A- Total, reducing and non reducing sugars :

Youssef and Youssef (1971), reported that in general carbohydrates increased in all cultivars in response to infection with F.oxysporum, however this increase was noticeable in the susceptible cultivars.

Abdel- Sattar (1978), mentioned that reducing sugars were higher in peels of susceptible banana variety as compared with least susceptible one. On the other hand, the amount of non-reducing sugars was higher in the least susceptible variety. The most susceptible varieties, showed lower amounts of the same sugars.

Chattopadhyaya et al. (1978), mentioned that after fruit set, reducing and total sugar contents of the peel and flesh of mango CVS Himsagar and Bombai, rose markedly at maturity, accompanied by a sharp decline in polysaccharide content. Sugar contents were higher in the flesh and peel.

Abdel- Hafize (1982), showed that total sugar content of susceptible variety Hindy was higher than resistant variety Zebda in both panicles and shoots. After infection malformed shoots and panicles showed accumulation of total sugar.

new malformed shoots, contained a higher concentration of phenols than those of the old ones, and than the phenolic contents of both Juvenile and old shoots of the resistant Zebda variety. Inoculation of Juvenile and old shoot of susceptible Taimour and resistant Zebda varieties with F. moniliforme and F. oxysporum, isolated from malformed mango tissues, resulted in an increase in their phenolic content. These results show that the fungus resulted in an accumulation of more phenolic compounds in the shoots of susceptible Taimour variety than in those of resistant Zebda variety.

Abdel- Sattar (1978) found that lower amounts of total and free phenols were observed in banana fruits of susceptible varieties. While resistant variety showed intermediate amounts of total free phenols.

Mohammed et al., (1981) attributed the resistance to F. oxysporum f. sp. niveum to a high level of preformed phenols which hinder infection, and to a phytoalexin which prevented establishment of the pathogen within the host tissue.

Abdel-Hafize (1982) reported that results obtained on the relation of phenolic contents to malformation of shoots and panicles of Hindy cv. showed that there was no correlation between phenolic content and resistance. Healthy Hindy shoots and panicles contained higher amounts of total, free