POLLUTION OF DATES BY POSTHARVEST PATHOGENS

By

AZZA MOHAMED ALI NAFEA'

B.Sc. Agric. Sci. (Pl. Path.), Ain Shams University, 1984

THESIS

Submitted in Partial Fulfilment of The Requirements for The Degree of Master of Science

In

ENVIRONMENTAL SCIENCES

Department of Agriculture Sciences

Institute of Environmental Studies *and* Researches

Ain Shams University

1995

APPRPVAL SHEET

NAME : AZZA MOHAMED ALI NAFEA'
TITLE : POLLUTION OF DATES BY POSTHARVEST PATHOGENS .

THIS THESIS FOR M. Sc. DEGREE
IN ENVIRONMENTAL SCIENCES
(AGRICULTURAL SCIENCES)

HAS BEEN APPROVED BY :

PROF . DR . H . M . MAZYAD H. Mazyad
PROF . DR . A . M . EL HAMMADY A. M. El-Hammady
PROF . DR . KH . A . OKASHA Kh. Okasha

Date : / / 1995

(Committee in charge)

الله

بسم الله الرحمن الرحيم

ACKNOWLEDGMENT

The author whishes to express her sincere appreciation and deepest gratitude to Prof Dr. KH. A. Okasha,Director of Horticultural Institute Agric. Res. Center, Giza and Director of Strawberry development Center, Fac. of Agric., Ain Shams University , for his continuous supervision, helpful advice throughout the course of this work.

Many thanks are also extended to Prof. Dr. Mohamed M. El-Zayat, Plant Pathology Dept., Fac. of Agric., Ain Shams Univ., and Prof. Dr. Zeinab M. El-Tobshy, Head of Postharvest Pathology Res. Dept., Agric. Res. Center, Giza, for their continuous kind help.

Deep thanks are also due to Dr. S. M. Hanafy, Researcher, Postharvest Pathology Res. Dept., Agric. Res. Center, Giza, for supervision, useful suggestions and valuable advices throughout this investigation.

Deep thanks are also due to Prof. Dr. Salwa, M. A. Dogheim, Cheif and Head of Pesticide Residues and Pollution Dept., Center, Agriculture Pesticide Laboratory and Mr. Ashraf El-Marsefy for their help in setting the residual effect.

Sincere thanks and appreciation are due to Dr. Saniya, M.A. El-Neshawy Senior Researcher and also Dr. M. M. El-Sheikh Senior Researcher, Postharvest Pathology Res. Dept., Agric., Res. Center, Giza, for their generous helpful advice.

Thanks are also due to the Mycological Research Department, Plant Pathology Research Institute, Agriculture Research Center, Giza and Microbiology Department, Faculty of Agriculture, Ain Shams University, for the assistance in microbial identification.

Thanks are also due to all staff members of Postharvest Pathology Res. Dept., Agric. Res. Center for their encouragement and supplying facilities.

CONTENTS

INTRODUCTION

Date palm has been known 4 thousand years B.C., cultivated area exists in most continents of the world. The date is one of the most important fruit crops in Egypt as well as in many other countries of the world specially in the Arab countries. According to Ministry of Agriculture Statistics, (Anonymous, 1992) there are about seven million trees of different varieties; which produce about 603652 tons whereas these varieties are Zaghlool, Samani, Bent Eisha, Abriemi, Agalani, Amhat, Amry, Haiany, Siewi, Bertamoda and Gargora.

Several pathogenic fungi attack date fruits during storage and marketing causing serious losses, such as *Alternaria alternata, Cladosporium herbarum, Thielaviopsis paradoxa, Penicillium spp, Rhizopus nigricans, Aspergillus niger, Aspergillus flavus and Candida sp* (Klotz, 1930; Fawcett, 1931; Gafar *et al.*, 1979; Baraka *et al.*, 1985 and Omamor, 1988).

The goal of this study was to investigate the etiology of date fruit rots during storage and marketing; as well as physiological and chemical studies. Also, disease management including, different type of containers, biological control, Postharvest fungicides, as well as effect of sulphur dioxide (SO_2), Sodium bisulfite, Sodium Carbonate and Borax. Also, Using hot water treatments before cold storage. At the same time, the residues of fungicidal pollution on treated date fruits were analyzed. Bioassay detection for the most prevalent mycotoxins that are potentially carcinogenic to human which contaminate fruits during storage were investigated. (Epply, 1974).

This study will help in extending the shelf life of date fruits for longer periods so to prolong the marketing duration for local consumption, as well as for exportation of Egyptian date fruits.

REVIEW OF LITERATURE

1. *Causal Organism and Disease Syndrome :*

A number of postharvest diseases of date fruits are characteristically initiated by the invasion of pathogenic fungi directly or through wounds created in during harvesting and crop handling causes serious damages.

Klotz, (1930), concluded that cracking of distal end of the date fruits resulting from the physiological disorder known as "black nose" which offers a good harbor for air borne fungi such as *Alternaria spp. Phomopsis sp. Rhizopus spp.* and *Hormodendron sp.*

Fawcett, (1931), found that *Thielaviopsis paradoxa* was first reported in Egypt. Samples collected from Fayoum and Alexandria were usually prevalent near the Mediterranean coast and among neglected palms.

Turrell *et al.*, (1940), found that the two most important fungi causes spoilage were *Aspergillus niger* and *Alternaria spp.*, which incitant of calyx-end rot, causing spot decay of date fruits. Almost 50% of the loss was due to fungal decay.

Bliss, (1944), found that *Alternaria stemphylicides*, associated with spoilage of date fruits in California which grown on Czapek's agar medium and it forms effused, dark olive to black colonies. The hyaline, septate, branched hyphae are 3-6 μ in diameter. The aerrgenous, solitary, or 2-3-catenulate conidia are brownish-olive, darkening with age, opaque, oval, ovate, rotund, subangular, or obolavate, slightly constricted at the septa, muriform, with 0 to 9 (mostly 1 to 4) transverse and 0 to 3 longitudinal septa.

Minz, (1958), isoalted *Diplodia phornicum and D. natalensis* from diseased leaf stalks of date palms.

Almandil, (1961), stated that *Penicillium spp., Rhizopus spp., Rhizoctonia spp.* and yeasts were active in bringing severe molds for date fruits. Side spot decay, caused by *Alternaria, Fusarium and Helminthosporium spp.* was mostly confined to the late entire Rutab stage.

Carpenter and Klotz (1966), reported that species of *Alternaria, Helminthosporium and Macrosporium* may infect date fruits directly, at the beginning of Khalal stage. While *Aspergillus niger and Citromyces ramosus* may cause a calyx end rot at the late of Khalal or early Rutab stage.

Chohan, (1972), isolated *Alternaria citri. A. stemphylicides, Aspergillus niger. A. phoenicis. Catenularia fuligines. Fusarium moniliforme. F. semitectum. F. lateritium, Heliminthosporium molle,* *Penicillium roseum, Diplodia phoenicum, Phomopsis phoenicola and Pleospora herbarum* from preharvest and dropped date fruits. All obtained isolates exhibited pathogenic capabilities, when tested on date fruits under laboratory conditions.

Gafar *et al.*, (1979), isolated *Thielaviopsis paradoxa, Diplodia phoenicum and Fusarium sp.* from diseased spathes of palms, grown at different localities, the affected tissues were dry, firm and carried the black powdery spores. Two types of *T. paradoxa* spores were observed, hyaline cylindrical microconidia, measuring (10-15 μm x 3.5-5 μm) and macroconidia measuring (16-19 x 10-12 μm) extruding in chains from the tips of lateral hyphae, and were brown, thick walled and ovate.

Djerbi, (1981), stated that pre-harvest date fruit rots were the major problem. Twenty five percent of losses had occurred sporedically in some plantation in USA and Algeria.

El-Arosi *et al.*, (1982), stated that *A. alternata, Aspergillus fumigatus, Aspergillus japonicus, Aureotesidium, Botryodiplodia sp., Cladosporium tenuissimum, Fusarium moniliforme, F. lateritium, Nigrospora sp., Paecilomyces sp. and Penicillium sp.* were isolated from calyxes of infected date fruits.

Al-Hassan and Abbas (1983), isolated *Thielvaiopsis paradoxa.* from infected terminal bud rot of date palm.

Baraka *et al.*, (1985), isolated *Alternaria sp. Cladosporium sp., Thielaviopsis paradoxa, Aspergillus niger, Penicillium spp. and Rhizopus nigricans* from naturally infected Samany and Zaghlool dates. The fruits of the two varieties were more susceptible in the Rutab stage than in the Khalal stage. Also, they found that *T. paradoxa* infected wounded dates more than unwounded ones. They observed that infection usually starts as brown coloured watery lesion followed by a rot which spread to include the whole fruit.

Omamor, (1988), isolated *Botryodiplodia theobromae* from decayed dates in Nigeria, the fruit was covered by a gray mycelium and sporulation occurred three days later.

2. *Physiological Studies :*

2.1. Effect of Different Culture Media on Mycelial Growth:

Michael and Kamal (1970), stated that the medium with a nearly neutral reaction is the most favorable one for mycelial growth of *T. paradoxa*.

Lannaidis and Main. (1973), reported that spores of *A. alternata* were produced with a higher levels on potato dextrose agar (PDA).

Cheema *et al.*, (1976), studied the differences in the rate and amount of growth for six isolates of *Alternaria citri*. They were found a significant differences among these isolates some isolates grew most rapidly on PDA medium, while other isolates grew better on yeast extract agar (YEA).

Wadnwani, (1978), found that different carbon and nitrogen sources were supplied, separately, to *Alternaria alternata* in the basal medium prior to inoculation or at the site of infection, which was more severe in the least case.

Gafar *et al.*, (1979), found that *T. paradoxa* grows well on potato dextrose agar (PDA). Also, they found that the fungus produce two types of spores, hyalin cylindrical microconidia and macroconidia.

Al-Hassan and Abbas (1983), found that the ideal medium for mycelial growth of *T. paradoxa* was potato dextrose agar. In addition, medium containing date palm leaves or fruits extract supported good growth.

Mazen *et al*,. (1984), reported that *A. alternata, C. herbarum, Aspergillus niger* and *A. flavus*, were grew well on glucose-Czapek's agar, followed by cellulose-sucrose-Czapek's agar medium.

Wei *et al.*, (1985), found that the best culture medium for *A. alternata* was potato dextrose agar (PDA) followed by V 8 juice agar (V 8 Agar) and mycological agar (MA).

Susuri and Hagedorn (1986), studied the growth and nutrition of *A. alternata*, the causal organism of pea rots, grew well on PDA medium at 20-32°C with an optimum 28°C and on 6.6 pH. Also, they were found that mannos, dextrin, cellobiose and fructose were the best carbon sources, while nitrogen sources, peptone, calcium nitrate and urea supported maximum mycelial growth.

Jordan *et al.*, (1990) found that isolates of *Cladosporium allii-ceape* grew well at 15 and 20°C respectively on 2.5% malt extract agar.

2.2 Effect of Temperature, Relative Humidity (RH) and Vapour Pressure Deficit (VPD) on Mycelial Growth of *T. paradoxa, C. herbarum and A. alternata:*

Many investigators had studied the effect of temperature and relative humidity on the development of postharvest pathogens of date fruits.

Delp *et al.*, (1951), determined the optimum temperature for the development of *Cladosporium herbarum* on PDA as about 24°C. The growth was declined, rapidly and ceased at 32°C. Infection with *C.*