STUDIES ON THE EFFECT OF SOIL BIOAGENT AND SOME NON TRADITIONAL SUBSTANCES ON INFECTING STRAWBERRY WITH ROOT, CROWN ROT AND WILT DISEASES IN EGYPT

By

OMNIA MOUSTAFA MOHAMED

B.Sc. Agric. Sci. (Biotechnology), Fac. Agric., Cairo Univ.,2003

THESIS

Submitted in Partial Fulfillment of the Requirements for the Degree of

MASTER OF SCIENCE

In

Agricultural Sciences (Agric. Microbiology)

Department of Microbiology
Faculty of Agriculture
Cairo University
EGYPT

2012

SUPERVISION SHEET

STUDIES ON THE EFFECT OF SOIL BIOAGENT AND SOME NON TRADITIONAL SUBSTANCES ON INFECTING STRAWBERRY WITH ROOT, CROWN ROT AND WILT DISEASES IN EGYPT

M.Sc. Thesis

In

Agric. Sci. (Agric. Microbiology)

By

OMNIA MOUSTAFA MOHAMED

B.Sc. Agric. Sci. (Biotechnology), Fac. Agric., Cairo Univ.,2003

SUPERVISION COMMITTEE

Dr. HUSSEIN EMAM HUSSEIN MAKBOUL
Emeritus Professor of Microbiology, Fac. Agric., Cairo University

Dr. REFAA IBRAHEM REFAA
Professor of Microbiology, Fac. Agric., Cairo University

Dr. HANAA ABD-EL-BAKII EID
Senior Researcher, CAPL, Agric. Res. Center

ACKNOWLEDGEMENT

First, I'm indebted to ALLAH forever

I wish to express my sincere thanks, deepest gratitude and appreciation to ***Dr. Hussein Emam Hussein Makboul*** *and* ***Dr. Refaee Ibrahim Refaee*** *Professors of Microbiology, Faculty of Agriculture, Cairo University for suggesting the problem, supervision, continued assistance and their guidance throughout the course of study and preparation of the manuscript. Sincere thanks to* ***Dr. Hanaa Abdel-Baky Eid*** *Senior Researcher, Fungicides, Bacterocides and Nematocides Research Department, Central Agriculture Pesticide Laboratory, ARC. For sharing in supervision.*

Deep thanks to ***Dr. Ashraf El-Kady*** *Researcher Professor, Pesticide Formulations Research Department, Central Agriculture Pesticide Laboratory, ARC. For his great help.*

Special deep appreciation is given to my family's. Also I feel deeply grateful to my collques in Fungicides, Bacterocides and Nematocides Research Department, Central Agriculture Pesticide Laboratory ARC.

Name of Candidate: Omnia Mostafa Mohamed El-Sayed **Degree:** M.Sc.

Title of Thesis: Studies on the effect of soil bioagent and some non traditional substances on infecting strawberry with root, crown rot and wilt diseases in Egypt.

Supervisors: Dr. Hussein Emam Makboul
Dr. Refae Ibrahim Refae
Dr. Hanaa Abd El-Baki Eid

Department: Microbiology **Branch:**

Approval: 24/ 1 /2012

ABSTRACT

Twenty two strains of pathogenic fungi were isolated from roots and crown of strawberry plants grown in two governorates namely, Ismaillia and Kalubia. Isolated fungi proved to be pathogenic against five varieties of strawberry plants. These fungal isolates were screened and the most pathogenic ones were identified as *F. solani, F. oxysporum, R. solani* and *P. cactorum*. They proved to be highly pathogenic for Berilbright and Sweet charli, while Shandler was less susceptible. For biological control 21 bacterial cultures were isolated from the rhizosphere of strawberry plants and used *in vitro* studies. Among them three isolates significantly inhibited the mycelium growth of the pathogenic fungi. Culture filtrates of these isolates were also examined, at different incubation periods, against the selected pathogenic fungi. The culture filtrates revealed that their highest antifungal activity were between 3 and 10 days. In addition, the effect of five essential oils were tested and showed that lemongrass oil and peppermint were very effective against fungal growth. The lowest inhibitory effect was obtained in the presence of rosemary oil. Essential oils were formulated as EC and tested in vitro and in vivo against the selected pathogenic fungi. Different fungicides were also tested *in vitro* and *in vivo* studies against the selected pathogenic fungi and showed an obvious decrease in their pathognicity. Premis and Maxim were very effective against *Fusarium* spp., while Moncut significantly affected *R. solani***.** The most effective treatments of bacteria, essential oils or fungicides were also examined under greenhouse conditions, and all of them decreased the infection of pathogenic fungi. As a result of using *in vivo* conditions the selected bioagents and the natural oils, fresh weight, dry weight as well as length of strawberry plant were significantly increased.

Key words: Strawberry, root rot, wilt disease, biological control, essential oils, fungicides

CONTENTS

INTRODUCTION

Strawberry (*Fragaria* spp.) is a herbaceous perennial member of the rose family (*Rosaceae*). Recently, great efforts have been made to improve strawberry production and fruit quality under Egyptian conditions for local consumption as well as exportation. Most of strawberry plantations are localized in Kalubeia and Ismailia governorates. Strawberry plantations in Egypt are progressing at a relatively fast rate, especially in new reclaimed desert lands (El-Sharkawy, 2006).

Strawberry could be cultivated with fresh and/or frozen (frigo) transplants, where fresh plantations are the main source for exportations. The cultivated area during 2009/2010 growing season reached ca 12725 Fadden, the average fruit yield per Fadden reached ca 18399 ton. (Higher committee of strawberry, Ministry of Agriculture, 2011).

Strawberry plants are subjected to the attack by several diseases, which are responsible for considerable crop losses. Among those, are the casual of root, crown rot and wilt diseases which cause harmful effect to the roots of the plant. Many efforts have been carried out to overcome the hazard effects of these diseases apart from chemical control.

It is well known that people all over the world suffer from pollution of agricultural chemicals which make great disturbance to the human health and development of resistance (Al-tawagry, 2008). In order to reduce such harmful effect of pesticide application, different trails were used. For this reason, resistant cultivars in addition to biological control were applied. The use of antagonistic microorganisms or their products, some plant extracts as well as essential oils were very safe to limit the damage caused by phytophathogens. Many of these biological control agents and essential oils, are still being tested and not and not commercially available. Nevertheless, biological control agents and essential oils are preferred over pesticides because they do not leave any residue or toxic substances ; they are environmental friendly and may be cheaper (Campbell, 1989).

This work was conducted to isolate and to identify the phyto-pathogens implicated in root, crown rot and wilt diseases of strawberry, and to evaluate the anti microbial potential of certain isolated rhizospheric bacteria against the causal pathogens, and the possibility of controlling these diseases by some essential oils, aiming to develop reliable management strategies for root, crown rot and wilt diseases of strawberry.

REVIEW OF LITERATURE

1. Root, crown rot and wilt diseases of strawberry plants and other crops.

Strawberry plants are subjected to the attack by several diseases which are responsible for considerable crop losses, among of these diseases are the fungal diseases which considered to be the most important diseases and occur in all parts of the plant, including flowers, fruits, leaves, crowns and roots. Yields and quality of fruits are usually reduced when strawberry plants are infected by fungi.

Fungi isolated from mycoflora of strawberry roots grown after legume or cereal crops were studied in Poland during 1980-82 (Stompor-chrzan, 1991). A relationship was found between fungal species composition and the preceding crops. *Fusarium, Penicillium, Trichoderma, Gilocladium* and *Mucor* were the most frequent and consistent species in strawberry roots. *Alternaria* and *Rhizoctonia* were less frequent but occurred in all plots. *Phoma* spp. were more frequent after legume cultivation, *Phythium ultimum* and *Fusarium* spp. after cereals.

Isolation trials from rotted sugar-beet roots collected in Egypt (Kafr El-Shikh governorate) yielded: *Alternaria* spp.; *Mucor* spp.; *Fusarium* spp., *F. conglutinans*, *F. solani*; *Phoma* (Pleospora) *betae*; *Pythium debaryanum*; *Rhizoctonia solani*; *Scleorotium bataticola*; *Sclerotium rolfsii* (the sclerotial state of *Athelia rolfsii*) and