STUDIES ON SOME SOURCES OF RESISTANCE FOR FUSARIUM WILT IN WATERMELON ECOTYPES

By

NOURA EBRAHIM SHAFIKE EBRAHIM

B.Sc. Agric. Sci. (Horticulture), Fac. Agric., Zagazig Univ., Egypt, 2003
M.Sc. Agric. Sci. (Vegetable Crops), Fac. Agric., Tanta Univ., Egypt, 2009

THESIS

Submitted in Partial Fulfillment of the Requirements for the Degree of

DOCTOR OF PHILOSOPHY

In

Agricultural Sciences
(Vegetable Crops)

Department of Vegetable Crops
Faculty of Agriculture
Cairo University
EGYPT

2017

SUPERVISION SHEET

STUDIES ON SOME SOURCES OF RESISTANCE FOR FUSARIUM WILT IN WATERMELON ECOTYPES

Ph.D. Thesis
In
Agric. Sci. (Vegetable Crops)

By

NOURA EBRAHIM SHAFIKE EBRAHIM

B.Sc. Agric. Sci. (Horticulture), Fac. Agric., Zagazig Univ., Egypt, 2003
M.Sc. Agric. Sci. (Vegetable Crops), Fac. Agric., Tanta Univ., Egypt, 2009

SUPERVISION COMMITTEE

Dr. MERGHANY MOHAMED MERGHANY
Professor of Vegetable Crops, Fac. Agric., Cairo University

Dr. AHMAD HASSAN KHEREBA (LATE)
Professor of Vegetable Crops, Fac. Agric., Cairo University

Dr. MARWA ABD-ELATEFF ZYTON
Lecturer of Plant pathology, Fac. Agric., Cairo University

Dr. YOUSSOF TALAT EMAM EL-LITHY
Head Research of Vegetable Crops, Hort. Res. Inst., A.R.C.

ACKNOWLEDGEMENT

The author wishes to express his appreciations to ***Dr. Merghany Mohamed Merghany****, Professor of Vegetable Crops, Faculty of Agriculture, Cairo University for his supervision, continued assistance and guidance through the course of this study and revision the manuscript of this thesis.*

Acknowledgements to the spirit of ***Dr. Ahmed Hassan Khereba****, Professor of Vegetable Crops, Faculty of Agriculture, Cairo University and God's mercy be upon him for his assistance and very supportive to me throughout the full study period.*

I would like also to express my sincere thanks and appreciations to ***Dr. Marwa Abd-Elateff Zyton****, Lecturer of Plant Pathology, Faculty of Agriculture, Cairo University for her supervision, continued assistance and guidance through the course of this study and revision the manuscript of this thesis.*

The author also wishes to express his deepest gratitude to ***Dr. Yossef Talaat Emam,*** *Head Research of Vegetable Crops, Horticulture Research Institute, Agricultural Research Center for his supervision, continuous help and guidance throughout this investigation.*

Thanks are also extended to the staff members of the Vegetable Crops Department, Faculty of Agriculture, Cairo University and the research staff of Vegetable Research branch, Horticulture Research Institute, Agricultural Research Center.

Special deep appreciation is given to my family, and my friends for their help, encouragement, and the facilities provided during the work of this thesis.

CONTENTS

ABBREVIATIONS

C.V	**Coefficient of Variance**
TSS	**Total Soluble Solids**
MP	**Mid Parents**
GCA	**General Combining Ability**
SCA	**Specific Combining Ability**
KVRF	**Kaha Vegetable Research Farm**
EP	**Experimental Plot**
RCBD	**Randomized Complete Block Design**
ADH	**Average Degree of Heterosis**
BP	**Better Parent**
R	**Resistant**
S	**Susceptible**
PAL	**Phenylalanine Ammonia Lyase**
PPO	**PolyPhenol Oxidase**
PO	**PerOxidase**

Name of Candidate: Noura Ebrahim Shafike Ebrahim **Degree:** Ph. D.

Title of Thesis: Studies on Some Sources of Resistance for Fusarium Wilt in Watermelon Ecotypes

Supervisors: Dr. Merghany Mohamed Merghany
Dr. Ahmed Hassan Khereba (Late)
Dr. Youssof Talat Emam El-Lithy
Dr. Marwa Abd-ElAteef Zyton

Department: Vegetable Crops **Approval:** 3 / 7 /2017

ABSTRACT

This study was conducted during the period from 2011 to 2016 at Kaha Vegetable Research Farm (KVRF), Qalubia Governorate to evaluate some watermelon landraces collected from ten different local geographic regions of Egypt to increasing their homogeneity through inbreeding and selecting the best individual genotypes during four successive generations to produce 15 inbred lines. Seedling inoculation procedures were used to screen 15 lines of watermelon ecotypes for resistance to fusarium wilt. Of these ecotypes, 5 lines significantly showed resistance to *fusarium oxysporum*. And used four lines as female parent Suhag 1(P1) - Suhag 2(P2)-Sinaa (P3)-Bir El-Abd 2(P4); and the cultivars Giza1 (P5), Crimson Sweet (P6) and the line (Beni Swif) (P7) were used as male parents in a line X tester mating design to produce twelve hybrids. Parents and hybrids were evaluated to horticultural characters and resistance to fusarium wilt. Biochemical parameter such as phenolic content and some enzymes in three watermelon hybrids shown susceptible, moderately resistance and resistant to fungus *fusarium oxysporum* f.sp. *niveum*.

Estimates of coefficient of variance (C.V %) values showed that, most of the breeding lines were highly homogeneous and could be considered pure lines. All parents and crosses were significant with positive value for all traits studied. With respect to heterosis effects, cross P2 XP6 gave highest values with significant effect for plant fresh weight, total yield /plant and fruit weight for mid-parent and better parent. Crosses P2X P7, P3X P5 and P4 X P6 gave earliest female flower over mid-parent and better parent, cross P4XP6 gave highest values with significant effect for rind thickness for mid-parent and better parent. Cross P1XP7 gave highest values with significant effect for TSS for mid-parent. Results showed that the lowest mean performance of seven parents and their twelve crosses of watermelon for disease severity on the foliage growth were 24.8% and on the xylem vesicles were 19 % for parents line (Beni Swif) (P7) and the lowest disease severity on the foliage were 24.30 % for crosses (P4XP5) and on the xylem vesicles were 28 % for crosses (P4XP7). Data reveal that, in general, the three enzymes, i.e. PAL, PPO and PO and free, conjugate and total phenols were greatly increased in the shoot base of the hybrids by increasing the resistance of these hybrids.

Key words: landraces, Evaluation, *Fusarium* resistant, KVRF.

INTRODUCTION

Watermelon, (*Citrullus lanatus, Thunp.*) is an important horticultural crop across wide areas of the world. Having 2n=22 chromosomes. Genetic information on watermelon could be obtained from inter-varital crosses which need to increase production, improved quality and resistance to diseases. Watermelon fruits mostly eaten fresh, but in Africa they are also cooked. The rind may be pickled or candied. (Robinson and Decker- Walters 1997).

Giza1 watermelon cultivated area reached 81485 fed, which yielded about 13.73 tons/fed, with a total production of 1118771 tons [(1)], while Balady watermelon cultivated area reached 30341 fed, which yielded about 12.89 tons/fed, with a total production of 391261 tons [(1)].

All over the world, many investigators are interested in collecting their landraces or accession lines and estimate their agronomic traits or pathogenicity test in order to raise a new genotype for breeding programs.

Fusarium wilt of watermelon is a soilborne disease caused by the fungus *Fusarium oxysporum* f. sp. *niveum*. The disease is a major problem in watermelon production in susceptible varieties. Presently, within the formae specialis *F. oxysporum* f. sp. *niveum* occurs in three races: races 0, 1 and 2 on the basis of their degree of aggressiveness on watermelon differential genotypes (Crall, 1963; Martyn, 1987, Martyn and Bruton, 1989; Netzer, 1976; Zhou and Everts, 2004).

1. Department of Agriculture and Economics and Statistics, Ministry of Agriculture A.R.E. 2016.