NON CHEMICAL CONTROL OF SOME SOIL BORNE DISEASES AND NEMATODES IN THE ECOSYSTEM OF THE DESERT RECLAIMED SOILS

BY

KHALED ISMAIL ZAKI
B. Sc. Plant Pathology (Cairo Univ.), 1984
M. Sc. Plant Pathology (Ain Shams Univ.), 1990

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Name of student : KHALED ISMAIL ZAKI MOHAMED

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This thesis for Ph.D. degree in Environmental Science has been approved by:

Prof. Dr. Mohammed Nagy Shatla
Prof of Plant Pathology
Fac. of Agric, Ain Shams University

Prof. Dr. Ibrahime Sadek Elewa
Prof of Plant Pathology
Fac. of Agric, Ain Shams University

Prof. Dr. El - Shawadfy Mansour Mousa
Prof of Plant Pathology (Nematode Diseases)
Fac. of Agric, El Menoufia University

Committee in charge

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ABSTRACT

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Non chemicals control of some soil borne pathogens has been investigated in two faces

Part I. Effect of soil solarization on the population level of root -knot nematodes, *Meliodogyne* spp and some soil borne fungi on fig trees.

This part of study has been done in the Field experiment at El Kassassin Research Station in El Salhya Zone, Agricultural Research Center in 1992 and 1993. Naturally infested soils, with root-knot nematodes (*Meliodogyne* spp.) on fig (*Ficus* sp.) trees; varieties (Aboudy&Sultany)- under drip irrigation system were used.

The efficacy of soil solarization, in reducing the population levels of soil borne pathogens, including root-knot nematodes (*Meliodogyne* spp) on young fig trees was evaluated. Total count of egg masses and galls per gram of root before and after mulching were determined. Soil microflora including total count of fungi and bacteria also were assessed. Soil temperatures were monitored through the experiments at depths 5, 10, 15, and 20 cm in all mulched plots and the control treatment. Also soil moisture were determined before and after solarization.

Results showed that the maximum soil temperature obtained were 37.9 and 40.7 in mulched plots at depth of 5 cm in 1992 and 1993 seasons respectively. There was some reduction obtained under mulched soil with the transparent polyethylene film comparing with unmulched treatment or with the values obtained before solarization. Althought, none of the treatments, of transparent polyethylene was significantly ($p \leq 0.05$) reduced the number of egg masses, and galls in fig varieties used in this study. Total fungi and bacteria on fig variety (Aboudy) were decreased after 8 weeks of solarization in film-mulched treatment with 1 or 2 layer as well the control, compared to the count before treatment. On the two varieties, (Aboudy&Sultany) the total count of bacteria in film-mulched treatment as well the control treatment were decreased after 8 weeks of solarization On the other hand, the total count of fungi and bacteria were

increased after 8 weeks of solarization in film-mulched treatment with 1 or 2 layer compared with the control treatment.

Part II.. Biocontrol of *Rhizoctonia solani*-induced damping off and root-knot nematodes caused by *Meliodogyne incognita* on cotton plants.

This part of study has done in the department of plant pathology, Univ. of Arizona during 1994 and 1996.

Screening of 22 bacterial strains from roots of cotton resulted in the recovery of two strains (D1, K1) which were capable of reducing the incidence of *Rhizoctonia solani*-induced damping off cotton. On the basis of the results of GC-FAME and Biolog tests, both strains were identified as *Burkholderia (Pseudomonas) cepacia.* Of the two bacterial application methods tested (soil drenching and seed coating), only soil drenching was effective.

Field trials were conducted in Safford and Marana, Arizona in April 1995 to compare the effectiveness of D1 and K1 with that of commercially available bio-fungicides (sold under the trade mark of Deny and Kodiak for control of *R. solani*) and of chemical fungicides, Baytan-Apron. Stains D1 and K1 were applied to the soil as liquid spray and as a barley meal-based formulation; Deny was applied to the seeds as peat moss-based formulation (according to the manufacturer's specifications); Kodiak and Baytan-Apron were placed on seeds (seed coated) by the supplier of these products. The tests were conducted in plots with and without added *R. solani* inoculum. In Safford, D1 and K1 performed much better than Deny, Kodiak, and Baytan-Apron. In plots without the added *R. solani* inoculum, (natural infection) both D1 and K1, applied as aqueous spray, caused 86 and 73 % increase in stand count, compared to the control (no treatment), respectively. The respective increase or decrease percentages for Deny , Kodiak, and Baytan- Apron were +44.5, -3.85, and -15.2, respectively.In plots with added fungal inoculum, Kodiak and Baytan-Apron treatments caused slight decreases in stand count, compared to the control In Marana trial, none of the treatments in plots without the added fungal inoculum, including Baytan-Apron, was effective against the disease. In Marana plots with added fungal inoculum, only Baytan-Apron caused a significant ($p \leq 0.05$) increase in stand count, compared to the control (no treatment).

Post-emergence damping off incidence, caused by *R. solani*, isolates R5 and R8, was reduced with increases in CO_2 concentrations and decreases in O_2 concentrations in soil atmosphere. In plants inoculated with *R. solani* (R5 or R8) and D1, biocontrol performance significantly decreased when O_2-to-CO_2 concentrations were modified from the ambient levels of 210-to-0.3 ml/l to 150-to-60 and 120-to-90 ml/l. *Rhizoctonia solani* was sensitive to antibiotics produced by D1, particularly, tri-chloropyrrolnitrin .

Exposure of second-stage larvae or eggs of *M. incognita* to D1 (an antagonist of *R. solani*) and to strain M16 (*Pseudomonas* sp., capable of colonizing roots of cotton) carrying a chitinase gene for 24 hours resulted in significant ($p \leq 0.05$) decreases in the number of nematodes. However exposure of the nematode larvae or eggs to stains M8 (*Pseudomonas* sp., capable of colonizing cotton roots)resulted in significant ($p \leq 0.05$) increases in the number of nematodes which could migrate through a sand layer. In greenhouse test, plants inoculated with second-stage *M. incognita* larvae and with strain D1, strain M16-chitinase, resulted in decreases in the number of eggs per gram root by 46.4 and 60 % respectivily than those inoculated with nematode alone (control). All test antibiotics (tri-chloropyrrolnitrin, pyrrolnitrin, amino pyrrolnitrin and quinolinol), produced by D1, caused a significant reduction in the number of second-stage nematode larvae within 24 h of exposure to the antibiotics.

Key words: soil borne diseases-damping off-soil solarization--fig *(Ficus* sp.) -cotton-biocontrol-*R.solani*- *Pseudomonas* sp.-*M.incognita*-root knot nematodes - soil composition -CO_2.

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particularly those grown in areas with sandy soil were found to be very susceptible to the root knot nematode attack. High infestation may result in root killing, but the fig trees easily produce new roots (Matz , 1918).

In the western Mediterranean costal plain of Egypt, root knot nematode (*Meliodogyne* spp.) had proven to play an important role in the deterioration of fig trees , the most dominant in this area. It was observed that large farms were highly infected with root 90 % infection (Hendy 1994).

Since the control of soil borne pathogens, and plant parasitic nematodes is mostly performed by chemical treatments which affect greatly soil microflora, pathogens, and pests,. Moreover, its high costs , phytotoxicity , disturbance of microbial balance and health hazard, make its use should be on the basis of risk-benefit analysis (El-Zayat, 1990). Control by crop rotations is instead possible only for a few nematode species having a narrow host ranges. Moreover resistant cultivars are available only for a few crops and may select promise in controlling nematodes in warm areas .(Lammberti and Greco. 1990).

Traditional control of nematodes includes resistant cultivars , soil fumigation and biological control . To date no research has been done on the exploration of *Ficus* spp. resistant to nematodes. Fumigation of soil before the establishment of a fig nursery is a mean to limit the dissemination of parasitic nematodes . Orchard fumigation is expensive and may need to be limited to the planting rows (Insera and O' Bannon, 1974). Moreover, control of soil borne diseases in established orchard constitutes a major problem for tree pathology, (Tjamos,1990). On the other hand, successes in reducing disease incidence in trees by solarization will be

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