J. Agric. Sci. Mansoura Univ., 30 (11): 6573 – 6583, 2005

OCCURRENCE OF ROOT-ROT DISEASE OF CHAMOMILE IN EGYPT

Farrag, Eman S. H.
Plant Pathology Dept., National Research Centre, Dokki, Giza, Egypt.

ABSTRACT

Recently chamomile (*Matricaria chamomilla* L.) root-rot disease are widely distributed causing serious losses on yield in many cultivated regions in Egypt. 45 isolates representing 10 fungal species were recovered from chamomile roots. Samples were collected from 13 localities at 2 different growth stages of the crop. The most dominant species were *Macrophomina phaseolina; Fusarium oxysporum; Aspergilius niger; Rhizopus stolonifer; Fasarium solani and Rhizoctonia solani.* Pathogenicity test proved the ability of *F.oxysporum, R.solani* and *M.phaseolina* to infect chamomile roots and produce the symptoms of root-rot disease. The efficacies of the antagonist *Trichoderma harzianum*, as well as, chitosan glutamate 0.5% were evaluated for the control of pathogenic fungi *in vivo*. Chitosan glutamate significantly suppressed the fungal diseases. Antagonistic *T.harzianum* showed lower reductive effect of disease in comparison with chitosan glutamate.
Keywords: Chamomile, *Fusarium, Rhizoctonia, Macrophomina* and Control.

INTRODUCTION

Medicinal plants present an important source in agriculture section of national economy in many countries. Medicinal and aromatic plants are still an essential oil source of the well known drugs and crude drugs, since there urgent demands in the foreign markets. A large scale production for export should be taken in consideration. There is one plant with special advantages in this regard, namely chamomile. The chamomile (*Matricaria chamomilla* L.) is found in its wild state in Egypt (Tachholm, 1974). The total areas cultivated with chamomile in Egypt according to 2003/2004 statistic were 9813 feddans produced 9359 tons (Anonymous, 2004). It is susceptible to 1' fungal diseases and 1 nematode in Europe, but none of these fungal have been reported elsewhere (Woo *et al.*, 1991). On the other hand, only nematode and phytoplasma infections were recorded in Egypt and Canada (Ismail *et al.*, 2004 and Khadhair *et al.*, 1999).

The objective of this investigation was to isolate and identify the causal agents of root-rot disease of chamomile in Egypt. Subsequently, the possibility of controlling or reducing this disease using chemical and biological control were investigated.

MATERIALS AND METHODS

Sampling:

Chamomile (*Matricaria chamomilla* L.) root samples were collected from infected plants, which showed wilting and yellows symptoms. The samples were collected from 13 different localities in 6 Governorates (EL-Sharkia, EL-Fayoum, EL-Giza, Beni-swef, EL-Minia and Assiut). From each area, samples were taken at two different plant stages (seedling 25-30 days and flowering stage 50-60 days after transplanting). Mean disease rating

(MDR) of the collected root samples was estimated with a disease index using the following formula.

MDR=Σ (ab)/n, where, Σ (ab) is the sum of plants

a = The degree of affected plants.

b = The number of plants which have the same degree.

n = The total number of diseased plants.

To detect the different degrees of infection (to which the plant is affected), plants were classified into 6 categories:-

0= healthy plants; 1= yellowish; 2= yellowish and 1/3 plant wilted; 3= 2/3 plant wilted; 4= whole plant wilted and 5= plant dead, according to Woltz and Arthur, 1973 for chrysanthemum plants (Figure 1).

Plant material:

Chamomile seeds were surface sterilized by immersion in 0.5% aqueous sodium hypochlorite for 5 min, followed by extensive rinsing in sterilized distilled water. Seeds were sown in sterilized pots containing sterilized clay soil for 5 weeks on a greenhouse condition at 24-26 °C. The transplants were used for pathogenicity test and control experiments by *T. harzianum* or chitosan glutamate.

Isolation of fungi:

Chamomile roots were washed in running tap water and were cut into 1-cm segments. The segments were divided into two groups. The first was washed with sterilized water 3 times, dried and inserted onto the surface of potato dextrose agar (PDA) medium amended with streptomycin sulfate. The second group was surface sterilized by soaking in 2% solution of sodium hypochlorite for 3 min, then washed 3 times with sterilized distilled water and transferred to another group of plates containing the same medium. In each Petri-dish five segments were placed and incubated at 28 ±2 °C for 4-6 days, then examined for fungal identification. Three replicate Petri-dishes were used for each sample. The emerged fungi were identified using relevant reference (Raper and Thom, 1949; Rifai, 1969; Booth, 1977; Domsch *et al.*, 1980 and Moubasher, 1993) in Botany Dept., Fac. Sci., Assiut Univ.

Pathogenicity test:

Pathogenicity of *Fusarium* spp.; *R. solani* and *M. phaseolina*, which were isolated from sterilized chamomile roots, was determined on chamomile plants under greenhouse conditions. Inocula of each isolate were prepared by growing in 500 ml glass bottles containing sterilized barley grain medium at 28 ±2 °C for 15 days. Clay soil and pots (20 cm in diameter) were sterilized with 5% formalin and left in the open air for 3 weeks to remove any toxic remains. About 4 Kg of soil were placed in each pot. Soil infestation was performed by mixing it with about 60 g of inoculum with the soil in each pot (rate of 1.5%) and pots were then watered daily for one week. Sterilized uninoculated, 60 g barley grains were used as control. Nine fungal isolates representing the three tested fungi were used in this investigation *.i,e Fusarium oxpsporum* (isolates 1,2 and 3 from Assiut Governoate; *F. solani* (solate 4 from El-Giza Governorate); *F. moniliforme* (isolate 5 from EL-Fayoum Governorate); *R. solani* (isolates 6 and 7 from El-Fayoum and El-Sharkia Governorates, respectively) and *M. phaseolina* (isolates 8 and 9 from

El-Fayoum Governorate). Three replicated pots were used for each treatment and this experiment was repeated twice. Five transplants from chamomile were transplanted in each pot one week after soil infestation and pots were watered directly. Three months later, the percentage of root-rot disease incidence was recorded using the following formula:

Disease incidence % = (A-B)/A x 100

Where,

A= Number of healthy plants produced from transplants planted in soil free of pathogen.

B= Number of healthy plants produced from transplants planted in soil infested with the pathogen.

Re-isolation from artificially infected plants was performed to meet Koch,'s postulate. Surviving plants percentage was also recorded at the end of the experiment.

Preliminary antagonism test:

The antagonistic fungus, *i.e. T. harizianum* was isolated from rhizoplane of infected chamomile plants. The inhibitory effect of this isolate on the growth of *F. oxysporum*, *R. solani* and *M. phasiolina* was studied according to the method described by Hazarika and Das, 1998. Also, the inhibition zone was noticed and mycoparasitism detected visually and by light microscope.

Pot experiment:

1- Using of *T. harzianum* as a biocontrol agent:

An isolate of *T. harzianum* exhibited antagonistic effect against the three pathogenic fungi was isolated from the naturally infected chamomile plants. The inocula of *T. harzianum* and pathogen were mixed with soil (2% w/w of each) as mentioned under pathogenicity test. The control treatment was mixed with 4% (w/w) of sterilized barely grains then watered for 7 days. Chamomile plants were transplanted one week after soil infestation.

2- Chitosan glutamate treatment:

This experiment was designed to determine the effect of chitosan glutamate on chamomile plants in the presence or absence of fungal pathogens. The effect of chitosan was determined by applying 100 ml of the chitosan gultamate solution at concentration 0.5% into each pot at one-week intervals. Chitosan glutamate was kindly provided from Dr.: Aly S. Aly, Textile Research Division, National Research Centre, Egypt.

Five replicate pots containing three transplants of chamomile were used for each treatment and this experiment was replicated twice. Percent inhibition was calculated according to the following formula (1-*T/C*) 100, where *C* is the number of plant mortality on the control plants, *T* is the number of plant mortality on the control plants. The replicated pots were arranged in complete randomized design and the data was analyzed using LSD at 5% according to Snedecor and Cochran, 1980. The plants were viewed daily for symptoms and mortality. At the end of the experiment (15 weeks), root symptoms were observed by splinting the crown and main root in each replicate.

RESULTS

Incidence of root-rot disease:

The mean disease rating (MDR) of root-rot collected samples from different localities was estimated (Table, 1). It is clear that root discoloration was accompanied with yellowing and wilting symptoms of shoot system; also, it was increased with the plant age (Figure, 1). Generally, disease symptoms commonly observed on the aerial plant parts were yellowing, stunting, wilting and death of shoots. The MDR fluctuated between 0.6 and 4.2. EL-Khadadeh village exhibited the highest rate (4.2) and the disease was epidemic in this region, while EL-Katepa village gained the lowest rate at crop maturity stage (1.1).

Table (1): Mean disease rating (MDR) of collected chamomile plants from different localities.

Locality			Plant growth stage	
Goverorate	District	Village	Seedling	Flowering
EL-Fayoum	EL-Fayoum	El-Khateep	2.4	2.7
		EL-Osheary	1.4	1.9
		Decia	2.3	3.1
		Sakran	2.2	3.0
	Sannouris	Dakam	2.6	3.4
EL-Sharkia	Belbais	EL-Katepa	0.6	1.1
Assiut	Abnoub	EL-Khadadeh	2.2	4.2
EL-Giza	EL-saff	Dema	1.4	2.2
Bani Swif	EL-fashn	EL-Sadat	1.1	1.8
		EL-Karsa	1.8	2.3
		Telet	1.5	2.8
	Ehnasia	Abd El-Samad	0.8	1.2
EL-Minia	EL-Edua	Sednawi	1.4	2.9

Fungi associated with chamomile root-rot:

Ten fungal species belonging to 9 genera were isolated from unsterilized chamomile root surfaces (Table, 2). The most dominant fungi that occurred in high frequencies throughout the two different plant stage were *M. phaseolina* (24.5%), *F. oxysporum* (12.5%); *A. niger* (7.4%); *Rhizopus stolonifer* (6.8%) ; *F. solani* (5.3%); *T. harzianum* (5.1%) and *R. solani* (4.6%). In seedling stage the most dominant species were *M.phaseolina* (6.2%) and *F. oxysporum* (3.3%). During the flowering stage the order of dominant species was changed and the most frequent species were *M.phaseolina* (18.3%) *F. oxysporum* (9.2%); *A. alternata* (4.2%), *R. solani* (3.9%) and *F. solani* (3.8%). Other fungal species were observed in low percentage during the two periods of isolation (Table2).

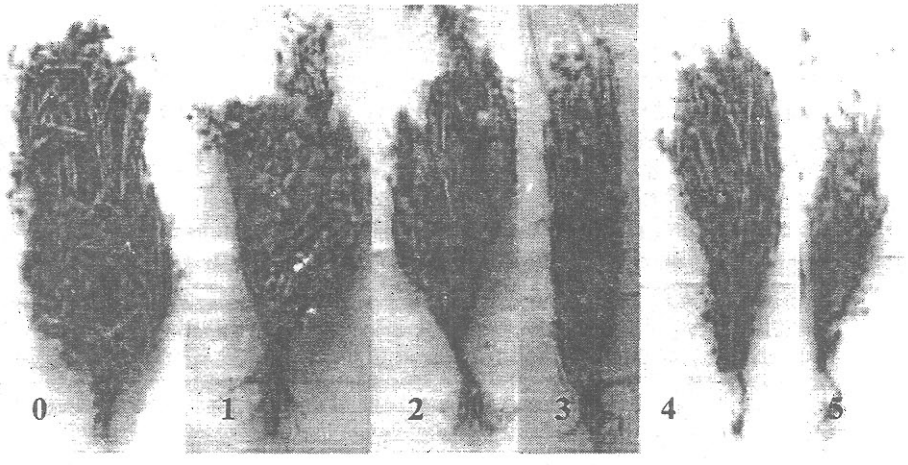

Figure (1): Different degrees of root-rot disease severity in chamomile shoot system O= Healthy plant; 1=Yellowish; 2= yellowish and 1/3 plant wilted; 3= 2/3 plant wilted; 4 = whole plant wilted and 5 = dead plant.

Table (2): Fungi isolated from non-sterilized diseased chamomile roots and their frequencies.

Species	% Frequency through		Total
	Seedling	Flowering	
Pencillium expansum	0.9	1.4	2.3
Aspergillus niger Ttiegh.	1.8	5.6	7.4
Fusarium oxysporum Schttdl	3.3	9.2	12.5
F.solani (Mart.) Sacc	1.5	3.8	5.3
Rhizopus stolonifer (Ehrenb lind)	2.5	4.3	6.8
Alternaria altrenata (Fr.) keissl	0.4	4.2	4.6
Macrophomina phaseolina (Tassi)Goid	6.2	18.3	24.5
Trichoderma harzianum Rifai	1.7	3.4	5.1
Rhizoctonia solani J.kuhn	0.7	3.9	4.6
Derchslera spicifera (Bainier) Arx	0.2	1.5	1.7

On the other hand, surface sterilized chamomile roots in seedling stage yielded fungi identified as *F. oxysporum*, *R. solani*, *M. phaseolina*, *F. moniliforme* and *F. solani* (19.0, 19.9, 12.1, 3.1 and 10.5%, respectively). At flowering stage, *F. oxysporum*, *R. solani* and *M. phaseolina* were detected in 55.9%, 49.8% and 39.7% of the total examined root segments, respectively (Table, 3). Data indicated that, *F. moniliforme* was only isolated from samples collected from El-Fayoum Governorate. Meanwhile, *M. phaseolina*, *R. solani* and *F. solani* were isolated from El-Sharkia, El-Giza and El-Minia. But only two isolates were found in two Governorates, *F. oxysporum* and *F. solani* in Assiut, while *R. solani* and *F. solani* in Bani-Sweif

Pathogenicity test of isolated fungi:

Pathogenicity test of *Fusarium* spp., *R. solani* and *M. phaseolina* on chamomile plants revealed that, *F. oxysporum* produced wilting symptoms characterized by yellowing of the leaves of infected plants that spread from the lower leaves to the upper ones. Leaves wilted, dried and then whole plants wilted and died. *M. phasealina* produced root-rot symptoms also characterized first by yellowing of the leaves then appearance of brown necrotic spots on shoots. Lower leaves dried before the upper ones. This was followed by wilting, drying and death of the whole plant. This was always associated with rotting of the roots of the infected plants. *R. solani* produced symptoms characterized by yellowing of the leaves associated with the appearance of dark brown colour in shoots. These symptoms were followed by drying, death of whole plants and rotting of the roots.

Table (3): Percentage of fungi isolated from surface sterilized chamomile roots.

Fungal isolate	Governorate												Total	
	El-Fayoum		El-Sharkia		Assiut		El-Giza		Beni-Swei		El-Minia			
	S*	F	S	F	S	F	S	F	S	F	S	F	S	F
M. phaseolina	2.6	13.4	7.3	19.2	0.0	0.0	0.0	2.4	0.0	0.0	2.2	4.7	12.1	39.7
F. oxysporum	4.4	8.3	0.0	0.0	14.6	47.6	0.0	0.0	0.0	0.0	0.0	0.0	19.0	55.9
R. solani	5.3	13.4	2.6	7.3	0.0	0.0	2.8	8.3	6.2	11.5	3.0	9.3	19.9	49.8
F. solani	1.2	3.5	1.2	3.1	3.1	8.2	2.2	4.4	1.7	4.5	1.1	3.5	10.5	27.2
F. moniliforme	3.1	9.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1	9.2

*** S= seedling stage, F= flowering stage**

Data presented in Table (4) clearly indicate that *F. oxysporum* isolate No 3 was highly pathogenic in chamomile (66.1% disease incidence and 13.3% in surviving plants). On the other hand, *F. solani* isolate 4 and *F. moniliforme* isolate 5 were considered weekly pathogenic. The corresponding means of disease incidence were 20 and 26.6%, but the surviving plants were 66.6 and 60.0%. *R. solani* isolates 6 and 7, also *M. phaseolina* isolates 8 and 9 were considered only moderately pathogenic, they produce disease incidence around 33.3, but surviving plants were between 40.0 and 53.3%.

Table (4): Pathogencity test of *M. phaseolina, F. oxysporum, R. solani* and *F. solani* isolates on chamomile plants.

Tested fungi	Isolate No.	Disease incidence %	Surviving plants%
F. oxysporum	1	53.3	26.6
	2	46.6	40.0
	3	66.1	13.3
F. solani	4	20.0	66.6
F. moniliforme	5	26.6	60.0
R. solani	6	33.3	46.6
	7	33.3	53.3
M. phaseolina	8	26.6	46.6
	9	33.3	40.0
Control	-	0	100.0
LSD 5%		3.98	7.53

Antagonistic effect of *T. harzianum* against causal of root-rot disease:

The antagonistic effect of *T. harzianum* against *F. oxysporium*, *R. solani* and *M. phasiolina* was studied *in vitro*. Table (5), shows that *T. harzianum* had an inhibitory effect on the mycelial growth of the pathogens. It reduced the growth of *F. oxysporum, R. solani* and *M. phaseolina* with 29.71, 38.62 and 47.00% of the control, respectively. The inhibition was related to its ability to overgrowth them (mycoparasitism).

Table (5): *in vitro* inhibitory effect of *T. harzianum* against root-rot pathogens.

Fungi tested	Linear growth			Mode of action	
	Control	Treated	Reduction %	Inhibition zone	Mycoparasitism (Overgrowth)
F. oxysporum (3)*	90	63	29.71	0.0	+
R. solani (6)	90	55	38.62	0.0	+
M. phaseolina (9)	90	47	47.06	0.0	+

* Isolate number

Pot experiment:

The effect of *T. harzianum* and chitosan glutamate in potted soil artificially infested by each pathogenic fungus *i.e. F. oxysporum, R. solani* and *M. phaseolina* were studied under greenhouse condition (Table, 6). Applications of *T. harzianum* and chitosan glutamate as soil treatment significantly reduced the root-rot disease incidence. The best result was achieved by chistosan glutamate when added to soil (Figure, 2). It was involved the reduction of plant mortality by 100 % (Table, 6).

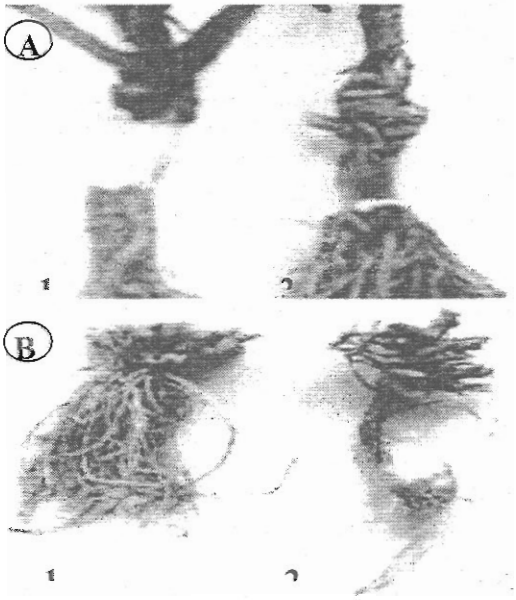

Figure (2): Effect of chitosan glutamate 0.5% on the root system of chamomile plants inoculated with *F. oxysporum* (A) or *R. solani* (B). Notice the differences between chitosan glutamate treated roots (healthy appearance), 1; compared with untreated ones (Purple-brown discoloration and signs of root-rot), 2.

Table (6): Effect of *T.harzianum* and chitosan glutamate (0.5%) on percentage of root-rot diseases of chamomile.

Treatments	Plant mortality		Reduction %
	Plant No.	%	
T. harzianum	2	13.3	-
T. harzianum+F. oxysporum (3)*	4	26.6	63.6
T. harzianum+R. solani (6)	3	20.0	50.0
T. harzianum+M. phaseolina (9)	5	33.3	28.5
Chitosan glutamate 0.5%	0	0.0	-
Chitosan glutamate+ *F. oxysporum* (3)	0	0.0	100.0
Chitosan glutamate+ *R. solani* (6)	0	0.0	100.0
Chitosan glutamate+ *M. phaseolina* (9)	0	0.0	100.0
F. oxysporum (3)	11	73.3	-
R. solani (6)	6	40.0	-
M. phaseolina (9)	7	46.6	-
Control	1	6.6	-
$LSD_{0.05}$	0.12	6.93	

* Isolate number

DISCUSSION

Eleven fungal species were recovered from the rhizoplane of chamomile (*Matricaria chamomilla* L.). The most dominant fungi which were isolated with high frequencies during the two periods of plant growth (seedling and flowering stage) were *M. phaseolina; F. oxysporum; A. niger; Rhizopus stolonifer; F. solani; T. harzianum* and *R. solani*. Most of these species specially *M. phaseolina; F. oxysporum; F. solani* and *R. solani* were reported as root pathogen to many plants such as soybean (Aziz *et al.*, 1997); Bean (Ziedan and Mahmoud, 2002); Tomato (Lafontaine and Benhamou, 1996); Groundnut (Saleh, 1997) and Grapevine (Ziedan, 2003). From the surface sterilized roots, 5 fungal species were isolated; (*F. oxysporum*; *R. solani* and *M. Phaseolina)* were considered the main dominant species. The all five fungal pathogen isolates were isolated only from El-Fayoum Governorate and it combined with wide-spread of root-rot symptoms. This might be attributed to the past history of chamomile cultivation in this region or perhaps to relationships between saprophytic ability of the fungus, the host and the environmental condition under natural field conditions. The observed root-rot symptoms of chamomile were found similar of other plants *i.e.* discoloration of roots accompanied with yellow and wilting symptoms. These observations were similar to obtained by Woltz and Arthur (1973) in chrysanthemum, Ziedan (1993) in sesame, Carver, *et al.*, 1996 and Ziedan (2000) in peanut. In pathogenicity tests, the isolated fungi caused root-rot in chamomile similar to that obtained under natural conditions. This results agree with Mullen *et al.*, 1995; Nalim *et al.*, 1995; Vallone, 1998 and Datta *et al.*, 2000). Ehteshamul-Haque *et al.*, (1992) observed more than 50% reduction in infection by *Macrophomina phaseolina* and *Rhizoctonia solani* of 30 days old lentil seedling as a result of applcation of *T. harzianum; T. viride; T. hamatum* and *Bacillus japonicum* as seed treatments. On the other hand, chitosan glutamate 0.5% application increased resistance to infection. These

data are in harmony with those obtained by Benhamou and theriault, (1992); Benhamou *et al.*, (1994); lafontaine and Benhamou, (1996) and Nawar (Lubna), (2005). Application of chitosan glutamate may reduce pathogen colonization or stopped pathogen invasion in the tissues. This is the first time for studying the soil borne fungal diseases affecting chamomile in Egypt. Chitosan glutamate application seemed to be a promising method to control chamomile wilt and root-rot diseases, for reducing environmental pollution and toxicity in medical products.

REFERENCES

Anonymous (2004). Report of central department of agricultural economics division and statistics, Agriculture Ministry, Egypt.

Aziz, N. H; M. Z. EL-Fouly; A. A. El-Essawy and M. A. Khalaf (1997). Influence of bean seedling root exudates on rhizosphere colonization by *Trichoderma lignorum* for the control of *Rhizoctonia solani. Botany Bulletin Academy Sinica, 38: 33-39.*

Benhamou, N.; P. J. Lafontaine and M. Nicole (1994). Induction of systemic resistance of Fusarium crown and root-rot in tomato plants by seed treatment with chitosan. *Phytopathology, 84:1423-1444.*

Benhamou, N. and G. Therianlt (1992). Treatment with chitosan enhances resistance of tomato plants to the crown and root-rot pathogen, *Fusarium oxysporium* f. sp. *radicis-lycopersici. Physiol. Mol. Plant Pathol., 41: 1423-1444.*

Booth, C. (1977). *Fusarium, laboratory guide to identification of the major species.* 237 p.

Carver, C. E.; D. Pitt and D. J. Rhodes (1996). A etiology and biological control of Fusarium wilt of pinks (*Dianthus caryophyllus*) using *Trichoderma aureoviride. Plant Pathology, 45: 618-630.*

Datta, P.; B. C. Das and D. K. Hazarika (2000). Integrated management of soybean stems rot. *Journal of biological control, 14(1): 67-69.*

Domsch, K. H.; W. Gams and T. H. Anderson (1980). *Compendium of soil fungi*, Vol. 1. 859 p. London

Ehteshamul-Haque S.; R. Y. Hashmi and A. ghaffar (1992). Biological control of root-rot disease of lentil. *LENS Newsletter, 19(2):43-45.*

Hazarika, D. K. and K. K. Das (1998). Biological management of root-rot of French bean (*Phaseolus vulgaris* L.) caused by *Rhizoctonia solani.* Plant Disease Research, 13(2): 101-105.

Ismail, A. E.; W. M. A. El-Nagdi and M. Y. Yassin (2004). Histopathology of chamomile infected with root-knot nematode, *Meloidogyne incognita* and reniform nematode, *Rotylenchulus reniformis. Pakistan J. Nematol., 22(2):143-194.*

Khadhair A. H.; A. McClay; S. F. Hwang and S. Shah (1999). Aster yellows phytoplasma identified in scentless chamomile by microscopical examinations and molecular characterization. *J. Phytopathology, 147:149-154.*

Lafontaine, P. J. and N. Benhamou (1996). Chitosan treatment: an emerging strategy for enhancing resistance of green house tomato plants to infection by *Fusarium oxysporum f.sp.radicis-lycopersici. Biocontrol Science and technology, 6: 111-124.*

Moubasher, A. A. (1993). *Soil fungi in Qatar and other Arab countries.* 566 p. Qatar.

Muilen, J. M; A. K. Haganj and P.E. Nelson (1995). A new stem canker disease of groundnut caused by *Fusarium oxysporum. Phytopathology, 85: 1193 (abstr.).*

Nalim, Ameena, F.; J. L. Starr; R. E. woodard; S. Suzanne and P. keller, Nancy (1995). Mycelial compatibility groups in Texas groundnut field populations of *Sclerotium rolfsii. Phytopathology, 85: 1507-1517.*

Nawar (Lubna). S. (2005). Chitosan and three *Trichoderma* spp. to control Fusarum crown and root-rot tomato in Jaddah, Kingdom Saudi Arabia. Egypt. J. Phytopathol., 33(1): 45-58.

Raper, K. B. and C. Thom (1949). *A manual of Penicillium.* 875p. Baltimore.

Rifai, E. (1969). A revision of the genus Trichoderma. *Mycologia, 116: 1-56.*

Saleh, O. I. (1997). Wilt, root-rot and seed diseases of groundnut in EL-Minia governorate, Egypt. *Egypt. J. Phytopathol., 25(1-2):1-18.*

Snedecor. G. W. and W. G. Cocharn (1980). *Statistical Methods.* 6th ed. Iowa State Univ. Press Ames.

Tackholm, V. (1974). Students flora of Egypt. 2nd Ed., Published by Cairo Univ., Cairo, Egypt.

Vallone, S. (1998). Disease management in no-tillage soybean system. *JIRCAS working report, 13:35-45.*

Woltz, S. S. and W. E. Arthur (1973). Fusarium wilt of chrysanthemum: effect of nitrogen source and time on disease development. *Phytopathology, 63(1): 155-157.*

Woo S. L.; A. G. Thomas; D. P. Peschken; G. G. Bowes; D. W. Douglas; V. L. Harms and A. S. McClay (1991). The biology of Canadian weeds. 99 Matricaria perforate Merat (Asteraceae). *Can. J. Plant Sci., 61:1101-1119.*

Ziedan, E. H. E. (1993). *Studies on Fusarium wilt disease of sesame (Sesamum indicum L.) In A.R.E.* M. Sc. Thesis, Fac. Agric., Ain Shams Univ., Cairo, Egypt. 176 pp.

Ziedan, E. H. E. (2000). Soil treatment with biofertilizers for controlling peanut root and pod-rot diseases in Nobria province. *Egypt. J. Phytopathol., 28(1-2): 17-26.*

Ziedan, E.H. (2003). Root-rot disease of grapevine in Egypt. *J. Agric. Sci. Mansoura Univ., 28(2):1473-1481.*

Ziedan, E. H. and S. Y. M. Mahmoud (2002). Calcium and sulphur soil treatment for improve biological control with *Trichoderma harzianum* for root-rot disease control of bean. *Assuit j. Agric. Sci., 33(3):149-160.*

تواجد مرض عفن الجذور على نبات البابونج فى مصر

ايمان صالح حسن فراج
قسم امراض النبات – المركز القومى للبحوث – الدقى -جيزه-مصر

خلال الاعوام القليلة الماضية انتشرت أمرض الذبول واعفان الجذور على نباتات البابونج فى بعض محافظات مصر مما تسبب فى خسائر بالمحصول و من هنا قد اجريت الدراسة بغرض عمل حصر لأكثر المسببات المرضية أنتشارا، وأكثر المحافظات اصابة، عزل المسببات المرضية وتعريفها، وكذلك دراسة امكانية تقليل هذه الخسائر عن طريق اتباع بعض الطرق الامنة للمقاومة بدون استخدام المبيدات الكيماوية.

وقد وجد من الدراسة الاتى:

١- تبين العينات المصابة التى تم جمعها من ١٣ منطقة فى ٦ محافظات وذلك خلال ميعادين من موسم النمو (مرحلة البادره، ومرحلة التزهير) ان منطقة القناديح بمحافظة اسيوط هى اكثر المناطق اصابة تليها مناطق دكم وديسيا والخطيب بمحافظة الفيوم ثم منطقة صيدناوى بمحافظة المنيا بينما كانت منطقة الكتيبة بمحافظة الشرقية هى اقل المناطق اصابة.

٢- عند عمل حصر للفطريات المصاحبة لجذور الكاموميل المصابة وذلك بالعزل منها بدون تعقيمها سطحيا تم الحصول على عزلات فطرية كانت تنتمى الى ١١ نوع فطرى و كان اكثر هذه الفطريات انتشارا

Macrophomina phaseoline , Fusarum oxysporum, Aspergillus niger, Rhizopus stolonifer, F. solani , Rhizoctonia solani

٣- عند العزل من الجذور المصابة بعد تعقيمها سطحيا فقد نتج عنة الحصول على ٥ انواع فطرية فقط وموزعة على المناطق المختلفة المعزول منها وهى

F.oxysporum, F.solani, F. moniliforme ,R. solani, M. phaseolina

٤- تم اختيار تسع عزلات من هذه الفطريات بحيث تمثل الانواع المعزولة وكذلك المناطق المختلفة المعزول منها وذلك لدراسة قدرتها المرضية. اظهر اختبار القدرة المرضية ان هذه الفطريات قادرة على احداث أعراض عفن الجذور والمشابه للاعراض الطبيعية الموجودة بالحقول وكانت عزلات الفطر *F.oxysporum* ارقام ٣،٢،١ يليها عزلات الفطر *R. solani* ارقام٧،٦ ثم عزلات الفطر *M. phaseolina* ارقام ٩،٨ هى اكثر العزلات قدرة على احداث المرض.

تم استخدام عزلة فطر *T. harzianum* المعزولة من حول جذور نباتات الكاموميل المصابة وكذلك مادة chitosan glutamate 0.5% فى معاملة التربة فى محاولة للتأثير على احداث المرض وذلك تحت ظروف الصوبة وأظهرت النتائج أن المعاملة بالكيتوزان كانت أفضل حيث انخفضت نسبة الأصابة بنسبة ٨٥،٧% مقابل ٦٠% بعد استخدام فطر الترايكوديرما.