Minufiya J. Agric. Res. Vol. 28 No. 6 : 1793 - 1806 (2003)

CONTROL METHODS OF OKRA ROOT ROT AND WILT DISEASES IN EGYPT

A. Seif El-Eslam; M.N. Khalil; Fatma S. Ahmed; Nour Jehan M. Eisa and Y.S. Khafagi

Plant Pathology Research Institute, ARC, Giza, Egypt

(Received: Aug, 17 , 2003)

ABSTRACT: *Root rot and wilt diseases Incited by Rhizoctonia solani, Pythium spp. Fusarium solani and F. oxysporum respectively cause more destructive effect on okra plants in Egypt and resulted yield reduction. Different methods were used to control these diseases during two successive summer seasons of 2001 and 2002.*

As for varietal reaction to both diseases, Doki1 hybrid, Doki2 hybrid and Golden Cost were the most resistant cultivars. While, Artest and White Filfate cultivars were moderately resistant. Esmaeli, Long Balady and Short Balady were the most susceptible ones. The most appropriate sowing date for reducing infection and increasing green pod yield was recorded in March and April during the two years of investigation.

Ammonium sulphate, at the rate of 200kg/ feddan was the best nitrogenous fertilizer applied for decreasing both diseases and increasing green pod yield. Higher levels, however, resulted in more infection and increasing disease severity with decreased in green pod yield. In contrast, increasing supplies of phosphorus and potassium up to 255kg/fed reduced infection. Therefore, combined application of N, P and K at the rate of 200, 150 and 100 kg/fed., respectively was superior to the single additions for increasing green pod yield and improving quality during both seasons of study.

Seed treatment with Rizolex-T+Topsin-M70% resulted the best application for the control of the disease complex; where it reduced the infection and increased green pod yield of okra plants during the two seasons. Fungicides, Moncut and Tachagrin had moderately effect in this respect. While, Previcur-N and Vitavax-T were the lowest in reducing the complex infection and gave lowest green pod yield during the two seasons.

Bioproducts treatments indicated that Promot was the best one for controlling complex disease and increasing green pod yield, Plant-Guard was moderately. Treatment with Rizo-N was the least effective one in this respect, during the two testing seasons (2001 and 2002).

Treatment with three antioxidants cleared that Asparin (Salicylic acid) was the best one to control the complex disease and increasing green pod yield. Oxalic acid was moderate; meantime manitol was the least one, either in decreasing the complex disease or increasing pod green yield of okra plants.

It could be concluded that Rizolex T+Topsin M70% as a best fungicide followed by (Promot) as a bioproduct and Asparin as an antioxidant were the best treatments for controlling root rot and wilt diseases of okra which gave more higher quantity and quality of green pod yield of okra.

Key words: *Okra, root rot and wilt, Rhizoctonia solani, Pythium spp. Fusarium solani and F. oxysporum, control.*

INTR ODUCTION

Okra (*Abelmoschus esculentus* L.) is one of the most popular and common cooking for many people. It is used as green pods, drying, canning or freezing in some countries, the seeds were used as alternative of coffee. Okra fibers that obtained from stems and mature pods were used also, for paper industry. It is riched with riboviavin, niacin, and calcium which contains (0.06mg, 0.09mg, 82.0mg /100g fresh weight, respectively). It contains a medium quantity of (protein, carbohydrate, phosphorous, and ascorbic acid (vitamin C).

Some diseases cause sever damage either in quantity or quality of green pods. Etheshamul *et al.*, (1990) reported that root rot on okra caused by *Rhizoctonia solani, Macrophomina phaseolina* and *Fusarium* spp. was controlled with *Trichoderma harzianum*, which was treated as seed coating or soil drench. Shahida *et al.*, (1994) noticed that infection of okra roots with *M. phaseolina, F. solani* and *R. solani* was suppressed in the presence of *T. harzianum* and *T. koningii.*

Calcium in supper phosphate may play an important role in increasing resistance of the host since it may develop the host tissues forming barrier against the invading of the fungi (Puscasu et al., 1991 and Shata *et al.*, 1984).

Reddy and Reddy (1991) and El- Awadi et al., (1997) found that the best control for damping-off and root-rot diseases of pea was obtained by the application of (Benlate + Ridomil MZ + Rizolex). They found also, that Benlate ranked as the best seed dressing fungicide judged by the lowest disease incidence of lupine roots followed by Rizolex T, Tecto, Topsin M70 and Vitavax Captan, respectively.

Therefore, the objective of this study was carried out for surveying the root rot and wilt diseases in different localities in Egypt. Using different control methods depending on resistant cultivars, sowing dates, levels of nitrogen, phosphorous and potassium (NPK) and comparatively of some bioproducts, antioxidants with some fungicides applied as seed treatments.

MATERIALS AND METHODS

a. Diseases survey:

Occurrence of root rot and wilt diseases on okra plants grown in diffennt governorates in Egypt, i.e., Giza, Kalubia, Sharkia, Esmaelia, Monofiya, Dakhalyia, Behera, and Fayiuom was determined as a percentage of infection and disease severity during the two successive seasons (2000/200' and2001/2002).

Disease assessment:

Percentages of wilt infection = $\frac{\text{Number of diseased plants}}{\text{Total number of plants}} \times 100$

Root rot severity was estimated according to Horsfall and Barratt (1945) 45 days after planting. Green pod yield was also, calculated at the end of total pickings at the end of experiments.

b. Evaluation of okra cultivars for root rot and wilt:

Experiments were conducted at Mashtul El-Soak (Sharkia governorate) during the two successive seasons (2000/2001 and 2001/2002) to evaluate the reaction of eight okra cultivars i.e., Doki-1 hybrid, Doki-2 hybrid, Golden Cost, short Balady, Long Balady, Esmaeli, Artest and White Filfate to root rot and wilt diseases. Experiments were designed in complete randomized block design, each cultivars was grown in three replicates. Each plot was 7 rows each (0.5m width and 6.0m length). Percentages of wilt infection and root rot severity were determined.

c. Effect of sowing date on root rot and wilt disease of okra plants:

Okra seeds, cv. Short Balady were sown at Mashtul El-Soak in different planting dates i.e., January, February, March, April and May (2000/2001 and 2001/2002 seasons). Percentages of wilt infection and root rot severities as well as green pod yield were estimated as mentioned before.

d. Effect of N, P and K rates:

Three rates of ammonium sulfate (20.5%N), Calcium supper phosphate (15.5% P_2O_5) and potassium sulfate (48.0% K_2O), either singl or in combination were applied. Seeds of the cv. Short Balady were grown under field condition in three replicated plots. Each plot comprised 14 rows. The three levels of the first two fertilizers were 200, 150 and 100kg/fed for N1, N2 and N3 or P1, P2 and P3, respectively. As regards to K fertilizer, at rate of 100, 75, and 50kg/fed were used for K1, K2 and K3, respectively. Mixed amounts of the same rates were applied for N1+P1+K1, N2+P2+K2 and N3+P3+K3 treatments; three plots were left without any fertilizer as control treatment. The above mentioned data were also estimated by the same methods.

d. Comparison of certain fungicides with bioproducts and antioxidants:

Five fungicides, i.e., Rizolex/Thiram (3.0g/kg), Vitavax/Thiram (1.0g/kg), Previcur N(2.5ml/kg), Tachgarin (2.0ml/kg) and Moncut (3.0g/kg). Three bioproducts i.e., Promot (4.0g/kg), Plant Guard (3.0ml/kg) and Rizo-N (3.0g/kg). Three antioxidants i.e., Aspirin (Salicylic acid) (0.09g/kg), Oxalic acid (0.82g/kg) and Manitol (0.138 g/kg). Seeds of the cultivar Short Balady were used after dressing. Experiments were carried out under field condition at Mashtul El-Soak during the treatment in complete randomized block design. Experimental plot included 14 rows each 0.5-m in width and 6.0 m in length. Each row contained 20 hills each was planted at the rate of 3 seeds/hill.

All the recommended agricultural practices were implicated. Percentages of infection, disease severity were estimated after 45 days of planting as mentioned before. Total green pod yield was calculated after all harvesting times till the end of the crop during the two successive seasons.

Statistical analysis:

Data obtained were statistically analyzed using the split plot design (Snedecor and Cochran 1967). Averages were compared at 0.05 level of probability using the least significant difference (L.S.D) as mentioned by Fisher 1948.

RESULTS AND DISCUSSION

Survey of root rot and wilt diseases on okra:

Survey of okra root rot and wilt diseases was carried out in several cultivated areas during the two successive seasons (2000/2001 and2001/2002) the diseases were found in all inspected plantations respectively eight governorates in Egypt, viz. Giza, Kalubia, Sharkia, Esmaelia, Menufiya, Dakhalyia, Behera and Fayioum.

It is obvious from data presented in Table (1) that percentage of wilt infection and root rot severity varied according to the different governorates. Percentages of naturally infected plants ranged from 15.9 to 30.6% in different plantations. Meantime, root rot severity ranged from 12.1 to 20.8%. The highest disease severity was observed in Dakhalyia and Menufiya governorates, followed by Behera and Kalubia. The lowest incidence of the disease was shown at Sharkia, Esmaelia governorates. Meantime, Giza and Fayiuom had moderately infection rates. Generally, the mean of infection was higher in 2000/2001 than 1999/2000.

Table (1): Mean percentages of wilt infection and root rot severity on naturally infected okra plants under field conditions during the survey of two successive seasons (2000/2001 and 2001/2002).

Governorate	2000/2001		2001/2002	
	Wilt infection %	Root rot severity %	Wilt infection %	Root rot severity %
1- Giza	10.50	7.20	10.40	7.50
2- Kalubia	12.40	8.30	12.30	8.10
3- Sharkia	7.80	5.20	8.10	6.20
4- Esmaelia	9.20	6.50	9.50	6.10
5- Menufiya	14.30	8.90	13.10	9.70
6- Dakhalyia	15.20	10.20	14.20	10.10
7- Behera	13.80	8.10	12.10	9.30
8- Fayiuom	10.70	7.80	11.20	7.10
Mean	11.08	17.20	13.10	8.50
LSD at 5%	0.50	0.70	1.04	0.80

The higher incidence of these diseases may be due to the absence of suitable agricultural practices, which played an important role in the diseases protection. Planting in the same soil areas for many years without sterilization; neglecting the sanitary lands from debris, planting seeds without diseases protection treatments and the absence of satisfactory control program during the growth seasons are the most important practices, Hilal (1994)

b. Varietal reaction:

Data in Table (2) reveal that all the tested okra cultivars were different in their reaction to okra root rot and wilt diseases. Results clear that Doki-1 hybrid, Doki- 2 hybrid and Golden Cost were the most resistant ones.

Table (2): Evaluation of eight okra cultivars for their reaction against root rot and wilt diseases grown at Mashtul El. Soak, Sharkia governorate during the two successive seasons (2000/2001&2001/2002).

Cultivar	2000/2001			2001/2002		
	Wilt infection %	Root rot severity %	Yield Ton/Fed	Wilt infection %	Root rot severity %	Yield Ton / fed
Golden Cost	10.30	6.50	5.00	13.10	6.90	4.90
White Filfate	15.50	10.60	4.70	18.70	12.80	4.40
Artest	13.60	8.70	4.90	15.80	9.90	4.60
Balady(long)	30.50	20.30	3.20	33.10	21.50	3.00
Balady(short)	35.20	24.10	3.00	37.30	26.20	2.90
Esmaeli	25.70	16.50	4.30	28.10	17.50	4.10
Hyprid Doki1	7.20	4.60	5.20	9.50	4.80	5.00
Hyprid Doki2	4.40	3.80	5.20	6.70	3.10	5.40
LSD at 5%	0.60	0.60	0.40	0.50	0.50	0.50

In contrast, Balady (short), Balady (long) and Esmaeli were the most susceptible ones. Meantime, Artest and White Filfate were moderately susceptible.

Such differences in cultivars reaction might be due to the generic differences between the tested cvs. and the environmental conditions which varied from one locality to another. Also, different in soil texture and soil components, these results were agreement with those obtained by Mostafa and Khafagi (1992) , El Mougy, Nehal(1995) Abd El-Wanis, Mona (2001) and Shehata(2001).

c. Effect of sowing dates on root rot and wilt diseases of okra cv. Short Balady under field conditions:

Data presented in Table (3) show that sowing dates significantly affected the severity of root rot infection and percentages of wilt disease as well as green pod yield of okra plants. In this respect, the two sowing dates (February andMarch) were the best ones for planting where significant reduction in wilt infection and root rot severity were achieved. Therefore, green pod yield was increased during the two successive seasons (2000/2001&2001/2002). On contrary, the two early sowing dates (January) as well as the two lately sowing dates (April, May and June) increased the infection with root rot and wilt diseases and gave low green pod yield, during the two seasons. These differences may be due to the changes of environmental conditions. These results are in agreement with those obtained by Shata *et al.*, (1984).

Table (3): Effect of sowing date on percentage of wilt infection and root rot severity on okra plants cv. Balady (short) at Mashtul El Soak (Sharkia Governorate) during the two successive seasons (2000/2001&2001/2002).

Sowing date	2000/2001			2001/2002		
	Wilt infection %	Root rot severity %	Yield Ton/Fed	Wilt infection %	Root rot severity %	Yield Ton/Fed
January	10.1	5.1	1.60	9.8	4.3	1.50
February	8.5	4.3	2.50	6.2	7.1	2.30
March	10.1	5.1	3.10	9.3	3.7	3.00
April	12.2	8.2	2.70	13.1	7.9	2.70
May	15.1	6.2	2.30	14.2	5.1	2.10
June	20.0	7.3	2.00	15.2	6.2	1.90
LSD at 5%	0.6	0.3	0.4	0.6	0.70	0.30

d. Effect of different levels of N, P and K fertilizers on okra root rot and wilt diseases:

The aim of fertilizer application was to increase the natural fitness of okra plants to disease infection, if we consider plant nutrition as one of the possibilities enhancing other control measures against a given pathogens and can incorporate it into the integrated control systems. Our effort should be resulted in higher yield.

Data in Table (4) indicate that the different rates of tested fertilizers significantly decreased root rot and wilt diseases development compared with unfertilized treatment. Generally, nitrogenous fertilizer significantly affected root-rot and wilt diseases incidence comparatively to potassium and phosphorous fertilizers with significant differences between the three tested rates. The highest rate of (P3) significantly reduced both diseases when compared with P1 and P2 or the check treatment. The calcium in supper phosphate may play a role in increasing resistance of the host, since it may develop the host tissues forming barrier against the invading o the fungi (Puscasu *et al.*, 1991 and Shata *et al.*, 1984).

As for potassium, significant effect on root-rot and wilt diseases incidence was observed, however, no significant effect could be detected among the three of potassium rates. In general, potassium does not incorporate in any organic matter within the plant tissues and act only as a calulyst for physiological reactions with plant cell, Danallov *et al*, (1970).

Table (4): Effect of three levels of NPK fertilizers on the percentage of wilt infection, root rot severity and green pod yield of okra plants at Sharkia (Mashtul El-Soak) during the two seasons (2000/2001&2001/2002).

Treatment	2000/2001				2001/2002			
	Wilt Infection %	Root rot severity %	Yield Ton/Fed	Increasing in yield %	Wilt infection %	Root rot severity %	Yield Kg/fed	Increasing in yield %
N1	25.5	16.5	1.70	78.9	24.3	16.1	1.80	89.5
*N2	19.3	12.8	2.45	157.9	18.4	12.3	2.55	168.4
N3	28.2	18.3	1.50	57.9	26.1	18.1	1.60	68.4
P1	25.7	16.1	2.00	110.5	22.5	16.0	2.10	121.1
*P2	21.4	14.2	2.20	131.6	20.7	14.1	2.30	142.1
P3	18.1	12.5	2.65	178.9	17.2	12.2	2.70	184.2
K1	21.8	14.3	2.25	144.0	20.1	14.2	2.30	142.1
*K2	18.3	12.7	2.50	163.2	16.9	12.3	2.66	173.7
K3	15.5	10.3	2.70	184.2	14.3	10.1	2.80	194.7
N1+P1+K1	9.3	6.5	3.10	226.3	8.5	6.3	2.15	231.6
N2+P2+K2	6.1	4.9	3.20	336.8	5.8	4.4	3.30	247.4
N3+P3+K3	13.6	8.3	2.90	205.3	12.2	8.1	3.00	215.8
Control	35.7	24.1	0.95	—	33.5	22.8	1.00	—
LSD at 5%	0.6	0.8	0.7		0.5	1.1	0.3	

N2= 200kg/fed P2=150kg/fed K2=100kg/fed.

Nitrogen + Phosphorous + Potassium (NPK) as a combinations were more effective in decreasing root rot severity and wilt incidence as compared with each fertilizer alone or with the check treatment. Phosphorous in the presence of K2 decreased root-rot and wilt. The best combination was N2+P2+K2 that satisfactory decreased root-rot and wilt diseases. These findings coincide with those obtained by Shata *et al.*, (1984).

Also the different combinations of N, P and K were capable of producing higher green pod yields if compared with any single element at any rate of application. Green pod yield of okra was significantly higher as compared with those of the check treatment. However, the highest green pod yield was obtained by N2+P2+K2.

e. Effect of certain fungicides, bioproducts and antioxidant on root rot and wilt of okra plants under filed conditions:

Fungicides:

Five treatments of fungicides tabulated in Table (5) reduced significantly the percentage of wilt infection and root rot severity.

Severity of root rot and wilt complex disease as well as increasing green pod yield compound with the check treatment, during the two successive seasons (2000/2001&2001/2002). (Rizolex/T + Topsin M70%) treatment gave the best control of complex disease and increased green pod yield of okra plants. Meantime, the two fungicides (Moncut and Tachagrin) were moderately. On contrary, the two fungicides (Previcur N and Vitavax/T) were the least ones in this respect. Reddy and Reddy (1991) and El- Awadi et al., (1997) found that the best control for damping-off and root-rot diseases of pea was obtained by the application of (Benlate + Ridomil MZ + Rizolex). Also, carbendazim + Thiram + Captan) showed the most effective for seedlings vigour, enhancing seed germination, shoot and root growth and total dry wt/plant. They found also, that Benlate ranked as the best seed dressing fungicides judged by the lowest disease incidence of lupin plants followed by Rizolex/T, Tecto. Topsin M70% and Vitavax/Captan respectively.

Bioproducts:

Three bioproducts i.e., Plant Guard, Promot and Rizo-N Table (5) reduced significantly the percentages of wilt infection and root rot severity as well increasing green pod yield of okra plants compared with the check treatment. Promot was the best for controlling the diseases. Meantime, Plant Guard was moderately in this respect. Rizo-N was the least one. Shahzad and Ghaffar (1984) and Siddiqui *et al.*, (2000) found that *Paecilomyces lilacinus, Bradyrhizobium* sp and *Rhizoctonia meliloti* when used as seed dressing or soil drench significantly suppressed root-rot infection caused by *Macrophomina phaseolina , F. solani* and *R. solani* in okra plants. Also, El-teshamul *et al.*, (1990), Abo El-Ela (1992) and Nassar *et al.*,(1997) reported that *Trichoderma harzianum* , Bacillus subtilis and *Streptomyces* sp. reduced

Table (5): Effect of some fungicides, bioproducts and antioxidants on the percentage of wilt infection, root rot severity and green pod yield of okra grown at Mashtul El-Soak (Sharkia Gov.) during the two successive seasons (2000/2001&2001/2002).

Treatment	2000/2001				2001/2002			
	Wilt infection %	Root rot severity %	Yield Ton/Fed	increasing in yield %	Wilt infection %	Root rot severity %	Yield Kg/fed	increasing in yield %
a. Fungicides:								
Moncut	7.30	4.20	3.00	400.00	6.10	4.00	3.20	326.70
Previcure N	15.30	10.10	2.20	266.70	13.90	9.60	2.30	206.70
Rizolex/Thiram +	5.10	2.50	3.20	433.30	4.20	2.20	3.30	340.00
Topsin M70%	9.70	5.80	2.70	350.00	8.30	5.30	2.80	373.30
Tachagrin	16.10	11.20	1.70	183.30	14.80	10.70	1.80	140.00
Vitavax/Thiram								
b. Bioproducts:								
Plant Guard	18.30	12.80	1.50	150.00	16.50	11.50	1.65	120.00
Promot	10.10	6.70	2.50	316.70	9.00	6.10	2.60	146.70
Rizo-N	26.50	18.30	1.00	66.70	24.80	17.80	1.10	64.70
c. Antioxidants:								
Aspirin(Salicylic	14.20	9.30	2.00	233.30	12.70	9.00	2.10	180.00
acid)	30.60	20.70	0.80	33.30	27.10	19.20	0.90	20.00
Manitol	20.10	14.80	1.20	100.00	18.90	13.60	1.35	80.00
Oxalic acid								
Control	40.80	28.10	0.6	———	37.60	26.30	0.75	———
L.S.D. at 5%	1.30	1.10	0.40	———	1.30	0.70	0.70	———

significantly root-rot caused by *M. phaseolina*, *R. solani* and *Fusarium* spp. on okra , carnation and cucumber plants.

C- Antioxidant:

Three antioxidant i. e. Aspirin, Manitol, and oxalic acid, Table (5), reduced significantly the percentages of wilt infection and root rot severity as well as increasing green pod yield, compared with check treatment during the two testing seasons.

Data also, show that Aspirin was the best effective one for controlling the disease complex followed by Oxalic acid . Meantime, Manitol was the least one in this respect. Galal and Abdon (1996) reported that ascorbic acid induced protection against *F.moniliforme* , *F. oxysporum* and *F. solani* individually or in combination. Salicylic acid provided cowpea plants against *F. oxysporum* and *F. solani*, Also, El Kollaly Ghada (2003) found that Asparin (salicylic acid), ascorbic acid and manitol were effective in controlling root and crown rot in strawberry plants.

REFERENCES

Abd El-Wanis, Mona M.E. (2001). Studies on grafting pepper and tomato on some root stocks belonging to Family Solanceae and its effect on disease resistance and crop yield. M.Sc. Thesis, Fac. of Agric., Cairo Univ., 201pp.

Abo-El-Ela, A. M. (1992). Pathological studies on some important diseases of carnation in Egypt. Ph.D. Thesis, Fac., Agric. (Ismaelia), Suez Canal Univ., 265pp.

Danalov, Mikhilova B. and S. Vanew (1970). The influence of N,P and K on resistance of grapevine to *Uncinula necator*. Rastit. Zaahat., 18:15-18 (c.f. Plant Pathol., 50:42)

El-Awadi, F.A; I.A. Ismaeil and E.A. Esmat Sadin (1997). Evaluation of lupin entries and fungicides against root rot and wilt diseases of lupin 8th Congress of the Egyptian Phytopathol., Soc., Cairo, P: 393-398.

El. Kollaly Ghad, A.I. (2003). Pathological studies on root and crown rots of strawberry in Egypt. Ph. D. thesis, fac of Agric. Cairo.

El-Mougy Nehal, S. (1995). Studies on wilt and root rot diseases of tomato in Egypt and their control by modern methods. M.Sc. thesis. Fac., Agric., Cairo Univ., 127pp.

El-teshamul, H.S.; A. Ghaffar and M.J. Zaki (1990). Biochemical control of root rot diseases of okra, sunflower, soybean and mungbean. Pakistan Journal of Botany 22:2, 121-124 (c.f. Computer Search).

Fisher, R. A. (1948). Statistical Methods Research Workers. Oliver and Boyd London. U.K.

Galal, A.A. and E.S. Abdou (1996). Antioxidants for the control of Fusarial disease in cowpea . Egypt J. Phytopathol. 24:1-12.k

Hilal, A.A; M.A. Abd El-Sattar; M.A. Baraka and A.M. Abo El-Ela (1994). Studies on soil borne fungal diseases of carnations. Proc. 1st Conf. of Ornamental Hort. 22-24th October, Fac. Agric., Cairo Univ. Giza, Egypt, vol.2, P. 690-712.

Horsfall, J.F. and R.W. Barratt (1945). An improved grading system for measuring plant diseases. Phytopathology, 35:55.

Moustafa, S.E.S. and Y.S. Khafagi (1992). Reaction of certain tomato cultivars to Fusarium wilt and root rot diseases caused by *Fusarium oxysporum*, f. sp. *lycopersici* and *Rhizoctonia solani*. Assiut J. of Agric. Sci., 23:199-207.

Nassar, H.H.; J.P. Hill and W.M. Brown (1997). Screening of *Trichoderma* and *Cladosporum* isolates for biological control of Fusarium wilt (*F. o.* f.sp. *cucumerinum*). International Conference of Plant Pathology Res. Inst. ARC., Giza, Egypt, Sept. 15-18.

Reddy, G.R. and A.G.R. Reddy (1991). Effect of Different seed dressing fungicides against certain seed borne fungi of ground nut. Journal of oil seeds Research, 8:79 (c.f. Seed Pathology and Microbiology, 5:21).

Shahzad, S. and A. Ghaffar (1981). Use of *Paecilomyces lilacinus* in the control of root rot and root knot disease complex of okra and mungbean. Pakistan Journal of Nematology, 7:1, 47-53.

Shata, H.M.; H.A. Mahamed; A.M. El-Fahal and I.A. Ismaeil (1984). Agricultural practices and chemical control of faba bean rust. Agric., Res. Rev., Cairo, 62:157-167.

Shehata, M.M. (2001) Studies on tomato root-rot diseases and their control. M.Sc., Thesis, Fac., of Agric., Al-Azhar, Univ. 105pp.

Siddiqui, I.A; H.S. Ehteshamul; M.J. Zaki and A. Ghaffar (2000). Greenhouse evaluation of rhizobia as a biocontrol agent of root infecting fungi in okra. Acta Agrobotanica 2000, 53:1, 13-22.

Snedecor, G.W and M. Cochran (1967). Statistical Methods 6th ed. the Iowa State Univ. Press, Amer., Lowa, U.S.A.

طرق مكافحة مرضى عفن جذور وذبول الباميا فى مصر

أحمد سيف الإسلام ، محمد نجيب خليل ، فاطمة سيد أحمد ، نورجيهان محمد عيسى ، يحيى سالم خفاجى

معهد بحوث أمراض النباتات – مركز البحوث الزراعية – جيزة – مصر

الملخص العربى

تـم إجراء حصر لأمراض أعفان جذور وذبول الباميا فى بعض محافظات مصر سواء فـى الوجـه الـبحرى أو القـبلى ، وتبيـن من هذا الحصر أن المرضين متواجدين فى معظم المحافظـات التى تم إجراء الحصر بها ويشكل كلا المرضين خطورة على المحصول سواء من ناحية الكم أو النوع.

تـم إجـراء تجارب لمكافحة هذين المرضين فى مشتول السوق (محافظة الشرقية) خلال موسمين متتاليين (١٩٩٩ / ٢٠٠٠ ، ٢٠٠٠ / ٢٠٠١) وذلك لاختبار مقاومة الأصناف حيـث كانـت الأصناف هجين دقى ١ ، هجين دقى ٢، والصنف جولدن كوست أكثرها مقاومة وبالـتالى أعطـت محصـولاً مـرتفعاً ، وعلى العكس كانت الأصناف بلدى قصير، بلدى طويل والأسـماعيلى أكـثرها قابلية للإصابة وفى نفس الوقت كان الصنفين أرتست ، هويت فلفيتس فكانت متوسطة فى درجة أصابتها بالأعفان والذبول وبالتالى أعطت محصولاً متوسطاً أيضا.

كمـا تـم إجـراء تجـارب لمعرفة أنسب مواعيد الزراعة فى الموسمين (٢٠٠٠ / ٢٠٠١ ، ٢٠٠١ / ٢٠٠٢) وتبيـن أن أنسـب مـيعاد للزراعة هو (مارس ، أبريل) حيث قلت نسبة الإصابة بالذبول وشدة الأصابه بعفن الجذور. أما الميعادين المبكرين (فبراير ومارس) وكذلك الميعاديـن المتأخريـن (مايو ويونية) فكانت غير مناسبة حيث زادت الإصابة بالذبول وعفن الجذور وبالتالى تم الحصول على محصول منخفض فى منطقة التجريب بالشرقيه.

وقد أدت الزيادة فى استخدام سماد سلفات الأمونيوم حتى ٣٠٠ كجم / فدان إلى زيادة شـدة الإصـابة بأعفان الجذور والنسبه المئويه للذبول وبالتالى نقص المحصول الناتج . على العكـس مـن ذلـك أدت إلـى زيـادة الكميات المضافه من الأسمدة الفوسفاتية أو البوتاسية

(٢٢٥ كجم / فدان ١٥٠ كجم / فدان على التوالى)إلى خفض نسبة وشدة الأصابه بالذبول وأعفان الجذور على الترتيب. تبين أن إضافة خليط من الأسمدة النتروجينية والفوسفاتية والبوتا سية بمعدل ٢٠٠ ، ١٥٠ ، ١٥٠ كجم / فدان على التوالى أفضل من إضافة أى من هذه الأسمدة على حدة.

ووجد أن معاملة بذور الباميا بمبيد الرايزولكس/ ثيرام + توسين M ٧٠% كانت أفضل المعاملات فى خفض نسبة وشدة الأصابه بالذبول وأعفان الجذور على الترتيب وبالتالى زيادة محصول القرون الخضراء. كذلك أوضحت النتائج أن المبيدين مون كت والتشجارين كانا متوسطين فى مقاومتهما لكلا المرضين وبالتالى المحصول الناتج من القرون الخضراء، أما المبيدين بريفيكيور N والفيتافاكس/ كابتان كانا أقل المعاملات سواء فى مقاومة أعفان الجذورأو الذبول وبالتالى قلة محصول القرون الخضراء.

أما بالنسبه لاستعمال المبيدات الحيويه فقد كان البروموت هو أفضل المركبات الحيويه فى الحد من انتشار الاصابه بأعفان الجذور والذبول وبالتالى زيادة المحصول الناتج من القرون الخضراء وتلاه بلانت جارد. أما الريزو N فكان أقل المواد المختبره كفاءه سواء فى مقاومة هذه الأمراض أو فى كمية محصول القرون الخضراء.

وبخصوص مضادات الأكسدة المستخدمة لهذا الغرض فقد أشارت النتائج الى أن الأسبرين كان أفضل المواد المستخدمه فى خفض نسبة وشدة الأصابه بأعفان الجذور ونسبةالذبول وبالتالى زيادة محصول القرون الخضراء. أما حمض الأوكساليك فكان متوسطا فى تأثيره وكان سكر المانيتول أقل هذه المواد فى الحد من الأصابه.

عموما كانت المعامله بالرايزولكس/ ثيرام + توبسين M ٧٠% (مبيد فطرى) تلاها البروموت (مبيد حيوى) ثم الأسبرين (كمضادة أكسدة) هى أفضل المعاملات من حيث خفض شدة الإصابة بأعفان الجذور و نسبة الذبول وبالتالى زيادة المحصول.