*J. Agric. Sci. Mansoura Univ., 27(11): 7757 - 7766, 2002*

# INTEGRATED CONTROL OF *Meloidogyne incognita* INFECTING PEACH BY CERTAIN ORGANIC AMENDMENTS MIXED WITH *Serratia marcescens*

**El-Sherif,A.G.; A.R.Refaei; Fatma A.Mostafa and A.H.Nour El-Deen**
**Nematology Res. Unit., Faculty of Agric., Mansoura Univ., Egypt.**

## ABSTRACT

Integrated control of *Meloidogyne incognita* infecting Balady peach cv. Meet-Ghamr was practiced using dried powder leaves of periwinkle, castor alone or combined with *Serratia marcescens* in comparison with Oxamyl under greenhouse conditions. All materials tested relatively improved the plant growth parameters and suppressed nematode population to certain extent. *S. marcescens* plus castor application performed the best results in improving plant growth parameters.

Moreover, application of dried powders of castor or periwinkle accomplished the highest % reduction in the rate of nematode build-up and number of galls on peach roots with values of 0.015 or 0.29 and 1.7 or 2.0%, respectively.

However, peach plants treated with *S. marcescens* plus periwinkle gave the highest % reduction in numbers of egg-masses, followed by castor or periwinkle alone with values of 1.6, 1.7 or 3.3%, respectively. Dried powder of periwinkle mixed with *S. marcescens* appeared to be the best treatment tested in suppressing rate of nematode reproduction with value of 0.15% and, in improving plant growth parameters.

**Keywords:** Peach plant, *M. incognita*, periwinkle, castor, *S. marcescens*, Oxamyle, Integrated control.

## INTRODUCTION

Peach (*Prunus persica*, L. Batsch) is one of the most important commercially deciduous fruit trees in Egypt. The cultivated area of peach was 1016 feddans producing 9848 tons in Dakahlia governorate where Meet-Ghamr is the principal commercial peach cultivar grown.

In Egypt, the root-knot nematode, *M. incognita* and *M. javanica* have been considered as serious nematode pests in peach orchards (Oteifa, 1964). Nematode damage has limited the establishment, yield and longevity of peach during the last decades.

Chemical control of the root-knot nematodes has successfully limited the effect of this nematode below damaging levels. However, environmental, health problems, disturbance in the biological balance of nature and high cost of nematicides enhanced scientists to search for another alternatives.

Organic amendments, i.e., dry leave powders, oil cakes and green manure have been reported to suppress root-knot nematodes infecting vegetable crops, fruit trees field crops and ornamental plants (Burman *et al.*, 1995; Anver and Alam, 1996; Kumar and Vadivelu, 1996; Deka and Phukan, 1997; Youssef and Amin, 1997, Alvarez *et al.*, 1998; Parveen and Alam, 1999; Bertrand and Lizot, 2000; Kheir *et al.*, 2000, Nagesh *et al.*, 2001 and El-Sherif *et al.*, 2001).

Burman *et al.* (1995) studied the effect of castor (*Ricinus communis*), neem (*Azadirachta indica*), rayada (*Brassica juncea*) and mustard (*Brassica compestris*) oil cakes at 3% w/w and carbofuran at 1 kg a.i./ha on *M. incognita* multiplication; and growth and water relations of egg plant. They revealed that oil cakes, in general was more efficient in controlling the nematode population, and also in alleviating the adverse effects of nematodes on the growth of egg plants.

In Egypt, Shahda *et al.* (1998) showed that leaves of castor bean (*Ricinus communis*) suppressed egg hatching of *M. arenaria* to certain extents *in vitro*, depending on the concentrations used.

Kheir *et al.* (2000) studied the efficacy of 18 ornamental plant powders including periwinkle in controlling *M. incognita* infecting sunflower, and in improving the plant growth, under greenhouse conditions. Moreover, egg masses and egg production per root were significantly reduced when used such materials. They recorded that the tested powders improved the growth of both shoots and roots of the amended plants.

Rangaswamy *et al.* (2000) evaluated the efficacy of *Pasteuria penetrans*, *Trichoderma viride*, and oil cakes of neem and castor in controlling *M. incognita* in tomatoes under glasshouse conditions. They found that *P. penetrans,* alone or in combination with neem cake had parasitized the nematode juveniles and adults, whereas *T. viride,* alone or in combination with either neem or castor cake was most effective in parasitizing the egg masses of the nematode.

Mukhtar and Ahmad (2000) studied the combined efficacy of *Pasteuria penetrans* and leaf extracts of *Azadirachta indica, Calotropis procera, Datura stramonium, Ricinus communis* or *Tagetes minuta* on *M. javanica* in pot experiments. They recorded that the combination of *P. penetrans* and leaf extracts of *A. indica, R. Communis* and *T. minuta* improved tomato plant growth over the control, while the extracts of *C. procera* or *D. stramonium* were phytotoxic when combined with *P. penetrans*. They also indicated that leaf extracts of all the 5 plants together with *P. penetrans* reduced the number of galls and egg masses produced by *M. javanica*.

Nagesh *et al.* (2001) revealed that application of inorganic fertilizers, nitrogen, phosphorus and potassium along with oil cakes of castor (*Ricinus communis*) or neem (*Azadirachta indica*) was beneficial to the endozoic antagonistic fungus (*Paecilomyces lilacinus*) and the plant host (tomato) and also enhanced the antagonistic potential of *P. lilacinus* against root-knot nematode, *M. incognita* under nursery conditions.

Therefore, the present investigation was carried out to determine the nematicidal properties of certain plant products, i.e. castor (*Ricinus communis*) and periwinkle (*Catharanthus roseus* = *Vinca rosea*) as organic amendments in combination with *S. marcescens* against *M. incognita* infecting seedlings of Balady peach cv. Meet-Ghamr.

## MATERIALS AND METHODS

A greenhouse experiment was conducted in order to determine the impact of dried powdered leaves of periwinkle and castor plants as organic amendments integrated with *S. marcescens* in controlling *M. incognita* infecting peach seedlings.

Fresh leaves of periwinkle, (*Catharanthus roseus* = *Vinca rosea*) and castor, (*Ricinus communis*) were obtained from the greenhouse of Nematology Research unit and Ornamental greenhouse, Faculty of Agriculture, Mansoura University, sun-dried and powdered.

Twenty four seeds of Balady peach cv. Meet-Ghamr was stratified for three months in polyethylene bags filled with mixture of peatmoss and sand (1:1, v:v) and kept in refrigerator. Individually, each seed was then planted in plastic pot 25-cm-d. containing steam-sterilized sandy loam soil (1:1, v:v).

Bacterial inocula of *S. marcescens* were prepared (Mostafa *et al*., 2002). Nine seedlings of peach were inoculated with *S. marcescens*. Bacterial inocula were introduced three times in this experiment at the rate of 100 ml of $10^8$ cfu $ml^{-1}$/pot as follows; the first time with *S. marcescens* strain NRRL.B. 959 after 45 days from planting, the second time with strain BJL.200 after 15 days from nematode inoculation, and the third time with strain YPL.1 after 45 days from nematode inoculation.

After 45 days from planting, tested amendments at the rate of 4 g/pot were incorporated into 12 pot soils around the seedlings alone or in combination with bacterial inocula. Pots were then watered to keep soil moist and left for 10 days to facilitate the above materials decomposition. Ten days later, twenty one seedlings were infected with 3000 $J_2$s of *M. incognita* which was obtained from a pure culture of *M. incognita* propagated on coleus plants in the same greenhouse.

Nematodes were extracted from soil by sieving and modified Baermann technique (Goodey, 1957).

Oxamyl (Vydate 10% G) was applied at the recommended dose (0.6 g/pot) in a single application after 5 days from nematode inoculation. Three seedlings, were kept untreated and uninoculated to serve as control.

Each treatment was replicated three times. Treatments were as follows: 1- *C. roseus* + *S. marcescens* + *M. incognita*, 2- *R. communis* + *S. marcescens* + *M. incognita*, 3- *C. roseus* + *M. incognita*, 4- *R. communis* + *M. incognita*, 5- *S. marcescens* + *M. incognita*, 6- Oxamyl + *M. incognita*, 7- Nematode alone and 8- Plant free of nematode or any treatment (ck).

Pots were randomly arranged on a greenhouse bench at 35 $\pm$ 5°C. Plants were received water and a conventional pesticide as needed. After 90 days from inoculation, plants were harvested. Data on lengths, diameters and weights of shoot and root as well as shoot dry weight and number of branches were determined and recorded.

Roots were stained and stages of *M. incognita*, females, galls and egg masses were counted and recorded. *M. incognita* ($J_2$s) were extracted from soil, then counted and recorded. Data were then subjected to analysis of variance (ANOVA) (Gomez and Gomez, 1984) followed by Duncan's multiple range test to compare means (Duncan, 1955).

## RESULTS

Data in Table (1) documented growth response of peach seedlings infected with *M. incognita* as influenced by the addition of dried powder leaves of periwinkle, *Catharanthus roseus* (*Vinca rosea*) or castor, *Ricinus communis* alone or in combination with *S. marcescens* in comparison with Oxamyl under greenhouse conditions. It is evident that all materials tested, relatively improved the fresh weight of whole plant as well as shoot dry weight to certain extent. As for single application, *S. marcescens* gave the moderest values for percentage of increase of the fresh weight of whole plant (55.19%) and shoot dry weight (59.5%), whereas, Oxamyl performed the least values for the same plant growth parameters which were 4.5% and 29.72%, respectively, followed by periwinkle (17.8% and 12.4%) and castor (18.8% and 35.3%) respectively.

In concomitant treatments, pots receiving *S. marcescens* plus dried powder of castor significantly overwhelmed those receiving *S. marcescens* plus periwinkle with values of 98.5% and 100.3% for the former and with values amounted to 48.1% and 45.7% for the later. Oxamyl significantly increased root length over other treatments. *S. marcescens* plus castor showed significant results in the number of shoot branches and leaves followed by castor, *S. marcescens* then periwinkle, respectively (Table 1).

As a whole, it can be concluded that *S. marcescens* plus castor performed the best result in improving plant fresh weight of Balady peach and shoot dry weight as well followed by single application of *S. marcescens* then *S. marcescens* plus periwinkle.

Data presented in Table (2) show reduction percentages in nematode counts in soil and roots and number of galls as well as egg masses on peach plants. It is evident that total number of nematode was significantly affected by all materials tested when compared with those of the check. Application of dried powders of castor, periwinkle or Oxamyl accomplished the highest reduction percentage in nematode population recording values of the nematode build-up amounted to 0.015, 0.29 and 0.34, respectively. However, *S. marcescens* combined either with castor or periwinkle achieved values of 1.01 and 0.96, respectively followed by that of the single application of *S. marcescens* (0.92) as compared to that of the check treatment where it was 1.49 (Table 2).

Moreover, a significant reduction in number of galls on peach root was achieved with root gall indices ranging from 1.7 to 5.0 (Table 2). Among all materials tested, castor or periwinkle alone significantly decreased numbers of galls on peach roots with root gall index values of 1.7 and 2.0, respectively as compared to that of the nematode alone treatment (5.0). However, *S. marcescens* alone or combined with castor achieved the least percentage of reduction in gall numbers with values of 42.5% and 23.03%, respectively.

Regarding egg mass numbers, a significant reduction was also obtained with all treatments as compared to that of nematode alone (Table 2). It was also evident that peach plants treated with *S. marcescens* plus periwinkle gave the highest reduction in numbers of egg masses over other treatments, followed by castor and periwinkle in single applications with values of 1.6, 1.7 and 3.3, respectively (Table 2).

Table (1): Impact of dried powdered leaves of periwinkle, *Catharanthus roseus* and castor, *Ricinus communis* applied alone or in combination with *Serratia marcescens* on the growth of Balady peach cv. Meet-Ghamr infected with *Meloidogyne incognita* under greenhouse conditions.

| Treatments | Plant growth response | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Length (cm) | | Fresh weight (g) | | Diameter (cm) | | No. of shoot branches | No. of shoot leaves | Fresh wt. of the whole plant (g) | Increase % | Shoot dry weight (g) | Increase % |
| | Shoot | Root | Shoot | Root | Shoot | Root | | | | | | |
| *S. marcescens* + *M. incognita* | 73.7a | 40.5c | 21.28ab | 23.10b | 0.39a | 0.56ab | 4.3cd | 122.7ab | 44.38b | 55.2 | 14.76abc | 59.6 |
| *C. roseus* + *M. incognita* | 47.8b | 41.7bc | 17.57b | 16.11cd | 0.32a | 0.39cd | 5.3bcd | 106.7bc | 33.68bcd | 17.8 | 10.40c | 12.4 |
| *R. communis* + *M. incognita* | 70.0a | 49.8b | 20.80ab | 13.16d | 0.35a | 0.42bcd | 7.7ab | 135.7a | 33.96bcd | 13.8 | 12.52bc | 35.3 |
| *C. roseus* + *S. marcescens* + *M. incognita* | 69.5a | 41.3bc | 19.15ab | 23.19b | 0.37a | 0.49abcd | 3.0d | 99.7cd | 42.34bc | 48.1 | 13.48abc | 45.7 |
| *R. communis* + *S. marcescens* + *M. incognita* | 75.1a | 41.6bc | 27.13a | 29.64a | 0.46a | 0.53abc | 10.0a | 138.0a | 56.76a | 98.5 | 18.53a | 100.3 |
| Oxamyl + *M. incognita* | 70.1a | 63.1a | 15.91b | 13.97d | 0.35a | 0.42bcd | 6.7bc | 88.0cd | 29.88cd | 4.5 | 12.00bc | 29.7 |
| Uninoculated and untreated plant | 70.9a | 43.9bc | 21.14ab | 21.14bc | 0.40a | 0.62a | 6.0bcd | 103.7bcd | 42.28bc | 47.9 | 16.78ab | 81.4 |
| Nematode alone (ck) | 70.0a | 44.0bc | 15.96b | 12.63d | 0.33a | 0.37d | 6.7bc | 84.7d | 28.59d | -- | 9.25c | -- |

Each value presented the mean of three replicates.
Means in each column followed by the same letter(s) did not differ at $P < 0.05$ according to Duncan's multiple-range test.

Table (2): Effect of periwinkle, *Catharanthus roseus* and castor, *Ricinus communis* powders alone or in combination with *Serratia marcescens* on *Meloidogyne incognita* infecting Balady peach cv. Meet-Ghamr under greenhouse conditions.

| Treatments | Nematode population in | | | Total | *Rate of buildup | Redu-ction % | Galls | Redu-ction % | RGI** | Egg masses | Redu-ction % | EGI** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Soil | Root | | | | | | | | | | |
| | | Develo-pmental stages | Females | | | | | | | | | |
| *S. marcescens* | 0.0 e | 567.7a | 2198.7a | 2766.3c | 0.92 | 38.2 | 313.0c | 42.46 | 5.0 | 22.0 b | 72.2 | 3.3 |
| *C. roseus* | 856.0 c | 11.0 f | 28.0 e | 895.0 d | 0.29 | 80.0 | 5.0 f | 99.08 | 2.0 | 3.3 c | 95.8 | 0.7 |
| *R. communis* | 0.0 e | 25.3 ef | 19.7 e | 45.0 e | 0.015 | 98.9 | 3.7 f | 99.32 | 1.7 | 1.7 c | 97.8 | 1.0 |
| *C. roseus* + *S. marcescens* | 1503.0b | 246.3 d | 1131.0c | 2880.7bc | 0.96 | 0.96 | 164.0d | 69.85 | 5.0 | 1.7 c | 97.8 | 1.0 |
| *R.communis*+*S. marcescens* | 608.3 d | 388.3b | 2038.3b | 3035.0b | 1.01 | 32.2 | 418.7b | 23.03 | 5.0 | 27.3 b | 65.4 | 3.3 |
| Oxamyl | 625.0 d | 64.7 e | 330.0d | 1019.7d | 0.34 | 77.2 | 71.7 e | 86.82 | 4.0 | 7.3 c | 90.7 | 2.0 |
| Nematode alone (ck) | 1882.7a | 333.3 c | 2259.7a | 4475.7a | 1.49 | -- | 544.0a | -- | 5.0 | 79.0 a | -- | 4.0 |

Each value presented the mean of three replicates.

Means in each column followed by the same letter(s) did not differ at $P < 0.05$ according to Duncan's multiple-range test.

Initial population (Pi) = 3000 $J_2$

$$\text{*Rate of build-up} = \frac{\text{Final population (Pf)}}{\text{Intial population (Pi)}}$$

**Root gall index (RGI) or Egg mass index (EGI): 0 = no galling or egg masses; 1 = 1-2 galls or egg masses; 2 = 3-10 galls or egg masses; 3 = 11-30 galls or egg masses; 4 = 31.100 galls or egg masses and 5 = more than 100 galls or egg masses.

Data presented in Table (3) recorded that rate of reproduction of *M. incognita* was influenced by most treatments tested. It is clear that all materials reduced rate of reproduction of *M. incognita* as compared with nematode alone except that of periwinkle or castor alone. Dried powder of periwinkle integrated with *S. marcescens* appeared to be the best treatment tested in suppressing rate of reproduction of *M. incognita* infecting peach seedlings with value of 0.15% as compared to that of nematode alone (Table 3).

**Table (3): Development of *M. incognita* on Balady peach cv. Meet-Ghamr treated with dried powders of periwinkle, *C. roseus* and castor, *R. communis* alone or in combination with *S. marcescens* under greenhouse conditions.**

| Treatments | Young stages | Females | Egg masses | **Rate of reproduction (R.R) % |
|---|---|---|---|---|
| *S. marcescens* | 567.7 d | 2198.7 a | 22.00 b | 0.99 |
| *C. roseus* | 867.0 c | 28.0 e | 3.33 c | 10.63 |
| *R. communis* | 25.33 e | 19.7 e | 1.71 c | 7.81 |
| *S. marcescens* + *C. roseus* | 1749.7 b | 1131.0 c | 1.61 c | 0.15 |
| *S. marcescens* + *R. communis* | 996.7 c | 2038.3 b | 27.33 b | 1.32 |
| Oxamyl | 689.7 d | 330.0 d | 7.33 | 2.17 |
| Nematode alone | 2216.0 a | 2259.7 a | 79.00 a | 3.38 |

**Each value presented the mean of three replicates.**
**Means in each column followed by the same letter(s) did not differ at $P < 0.05$ according to Duncan's multiple-range test.**

$$\text{** Rate of reproduction (R.R)} = \frac{\text{Count of egg masses}}{\text{Total counts of females + egg masses}} \times 100$$

## DISCUSSION

With respect to the effect of dried powdered leaves of periwinkle, castor alone or in combination with the prokaryotic bacterium, *S. marcescens* on growth response of Balady peach as well as nematode population. Periwinkle powder integrated with *S. marcescens* appeared to be the best treatment in suppressing nematode reproduction and in improving plant growth parameters. The present results agreed with the findings of El-Sherif *et al.* (2001) who reported that the dried powder of periwinkle, *V. rosea* integrated with Oxamyl gave significant increase in sunflower growth parameters as well as reduction in *R. reniformis* population density, rate of build-up and egg-mass numbers over either Oxamyl or *V. rosea* or nematode alone.

Castor alone significantly decreased number of galls and egg masses on peach roots infected with *M. incognita*. The present result confirms the findings of (Patel and Thakur, 1989; Butool *et al.*, 1998 and Mostafa, 2000) who recorded the nematicidal properties of castor (*Ricinum communis*) on *Tylenchorhynchus vulgaris, Tylenchulus semipenetrans, M. incognita* and *Meloidogyne spp.*, respectively.

Apparently, the present investigation proved the potential of the rhizobacterium *S. marcescens* as a bioferitlizer and a biocontrol agent for controlling root-knot nematodes infecting peach seedlings and improving the plant growth. Biofertilizers and organic amendments may play an important role in improving soil structure, promoting plant growth and activating different organisms such as bacteria, predators and parasites of the target nematode. The safety of such material and its low cost is one of its advantages. However, additional researches are needed using plant or animal organic amendments and the indigenous bacterium *S. marcescens* in microplot and field experiments to ensure their effective ness in integrated pest management (IPM) programs.

## REFERENCES


Alvarez, C.G.; E. Torres and R. De Vis (1998). Effect of the incorporation of antagonistic plants on the parasitic activity of the root-knot nematode *Meloidogyne hapla* in a greenhouse carrot crop. Agronomia Colombiana, 15 (2/3): 137 – 142.

Anver, S. and M.M. Alam (1996). Effect of some oilseed cakes against *Meloidogyne incognita* and *Rotylenchulus reniformis* infecting okra. Ann. Plant Port. Sci., 4(2): 176 – 178.

Bertrand, C. and J.F. Lizot (2000). Root knot nematode control in organic farming: a method based on oilseed cakes. IFOAM 2000: the world growers organic. Proceedings 13th International IFOAM Scientific Conference, Basel, Switzerland, 28 to 31 August, 2000, P. 123.

Burman, U.; R.K. Kaul and P. Kumar (1995). Soil amendment induce changes in growth and physiology of nematode infested *Solanum melonhena*. Afro-Asian J. Nematol., 5(2): 213 – 217.

Butool, F.; A. Haseeb and P.K. Shukla (1998). Management of root-knot nematode, *Meloidogyne incognita*, infesting Egyptian henbane, *Hyoscyamus muticus* 1., by the use of nematicides and oilcakes. International J. Pest Management, 44(4): 199 – 202.

Deka, U. and P.N. Phukan (1997). Management of root-knot nematode, *Meloidogyne incognita* on tomato through soil amendments. Journal of the Agricultural Science Society of North East India, 10(1): 91 – 94.

Duncan, D.B. (1955). Multiple range and multiple, F-test Biometrics, 11: 1-42.

El-Sherif, A.G.; Fatma, A.M. Mostafa and A.A. Khalil (2001). Impact of *Vinca rosea* powder and Oxamyl on controlling *Rotylenchulus reniformis* (Abstract). IV International Nematology Symposium, Moscow, Russia.

Gomez, K.A. and A.A. Gomez (1984). Statistical Procedures for Agricultural Research 2nd Ed., John Wiley and Sons. Inc. New York.

Goodey, J.B. (1957). Laboratory methods for work with plant and soil nematodes. Tech. Bull. No. 2 Min. Agric. Fish Ed. London pp. 47.

Kheir, A.M.; A.A. Al-Sayed and H.I. El-Naggar (2000). Nematicidal potential of some dry ground ornamental plants against *Meloidogyne incognita* on sunflower. Egyptian J. Agronomatol., 4(1 and 2): 31 – 40.

Kumar, S. and S. Vadivelu (1996). Evaluation of organic amendments for the management of root-knot and reniform nematodes infecting brinjal, as compared with carbofuran. Pest Management in Horticultural Ecosystems, 2(2): 71 – 74.

Mostafa, Fatma A.M. (2000). Integrated control of root-knot nematodes, *Meloidogyne spp.* infecting sunflower and tomato. Pakistan Journal of Biological Sciences, 4(1): 44 – 46.

Mostafa, Fatma A.M.; A.G. El-Sherif, A.R. Refaei and A.H. Nour El-Deen (2002). Impact of certain Biofertilizers and *Serratia marcescens* on *Meloidogyne incognita* infecting peach plants. J. Agric. Sci. Mansoura Univ. 27(6): 4145 – 4154.

Mukhtar, T. and Raiz Ahmad (2000). Combined efficacy of *Pasteuria penetrans* and leaf extracts on the biocontrol of *Meloidogyne javanica* on tomato. Pakistan J. Phytopathology, 12(1): 56-61.

Nagesh, M.; P.P. Reddy and N. Rama (2001). Influence of oil cakes in combination with inorganic fertilizers on growth and sporulation of *Paecilomyces lilacinus* and its antagonism on *Meloidogyne incognita* infecting tomato. Nematologia Mediterranean, 29(1): 23 – 27.

Oteifa, B.A. (1964).A taxonomic guide to the common genera of soil and plant nematodes with a supplement on current known economic parasitic species of U.A.R. contribution of the National Research Center, Nematology Unit, Gia, U.A.R.

Parveen, G. and M.M. Alam (1999). Efficacy of neem products for the management of root-knot nematode on tomato, in soil polluted with heavy metals, cadmimum and lead. Azadirachta indica A. Juss: 235 – 244.

Patel, P.N. and N.A. Thakar (1989). Organic amendments in control of the stunt nematode, *Tylenchorhynchus vulgaris* on wheat. Indian J. Nematol., 19(1): 81 – 82.

Rangaswamy, S.D.; P.P. Reddy and M. Nagesh (2000). Evaluation of bio-control agents (*Pasteuria penetrans* and *Trichoderma viride*) and botanicals for the management of root-knot nematode, *Meloidogyne incognita* infecting tomato. Pest Management in Horticultural Ecosystems, 6(2): 135 – 138.

Shahda, W.T.; O.I. Dawood and I.K.A. Ibrahim (1998). Effect of certain fungal and plant extracts on egg hatching of *Meloidogyne spp.* Alexandria J. Agricultural Research, 43(3): 159 – 166.

Youssef, M.M.A. and W.A. Amin (1997). Effect of soil amendment in the control of *Meloidogyne jawanica* and *Rotylenchulus reniformis* infection of cowpea. Pakistan J. Nematol., 15(1/2): 55 – 63.

**المكافحة المتكاملة لنيماتودا تعقد الجذور "ميليدوجين إنكوجنيتا" التى تصيب نبات الخوخ بمواد عضوية معينة مع بكتريا "سيراتيا ماركينس"**

**أحمد جمال الشريف ، عبد الفتاح رجب رفاعى ، فاطمة عبد المحسن مصطفى وأحمد حماد نور الدين**
**وحدة بحوث النيماتولوجى – كلية الزراعة – جامعة المنصورة.**

أوضحت المكافحة المتكاملة لنيماتودا تعقد الجذور "ميليدوجين انكوجنيتا" التى تصيب نبات الخوخ البلدى صنف ميت غمر بمساحيق الأوراق الجافة لكل من نبات الونكا والخروع بمفردها أو مع بكتريا "سيراتيا ماركينس" بالمقارنة مع مبيد الفايديت تحت ظروف الصوبة أن كل المواد المختبرة أدت إلى تحسن نسبى لكل مقاييس نمو النبات كما خفضت أعداد النيماتودا بدرجات متفاوتة.

لقد أعطت المعاملة بالبكتريا مع مسحوق أوراق الخروع الجافة أفضل النتائج فى تحسين مقاييس نمو النبات وزيادة على ذلك لقد أنتجت معاملات الخروع أو الونكا بمفردها أعلى نسب خفض فى معدل نمو أعداد النيماتودا وكذا أعداد العقد النيماتودية على جذور الخوخ بقيم ١٥ر٠، ٢٩ر٠، ٧ر١ و ٠ر٢ على التوالى، لكن نباتات الخوخ المعاملة بالبكتريا مع الونكا أعطت أعلى معدل نقص فى أعداد كتل البيض يليها معاملة الخروع ثم الونكا بمفردها بقيم ٦ر١، ٧ر١ ثم ٣ر٣ على التوالى.

ولقد أظهرت معاملة الونكا مع البكتريا أفضل النتائج فى خفض معدل تكاثر نيماتودا تعقد الجذور بنسبة ١٥ر٠% مع زيادة ملحوظة فى مقاييس نبات الخوخ المختبرة.