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Plant Parasitic Nematodes Associated with Fruit trees in the Newly Reclaimed Soils at El-Sadat Province, Menoufia Governorate

Sweelam, M.E.; Abokorah M. S. and Elsebaay, Wafaa Abdel Rasol

Economic Entomology and Agricultural Zoology Dept., Fac. Agric., Menoufia Univ., Egypt.

Corresponding author email: mesweelam20002000@yahoo.com

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ABSTRACT

This study aimed to identify the most important genera or species of nematodes that associate with some fruit trees and cause remarkable economic losses and to study their seasonal fluctuations in newly reclaimed soil in the city of El-Sadat, Menoufia that focused on four fruit trees, namely orange, mango, grapes and peach. Composite soil samples from the rhizosphere of the tested plants were monthly collected, where the first six months of the year 2017 represented summer period (April 2017 – September 2017) and the others represented winter period (October 2017 – March 2018). Composite soil samples from orange trees variety Naval in summer period revealed that there were four nematode genera or species, *Tylenchulus semipenetrans*, *Pratylenchus* spp., *Hemicycliophora* spp. and *Xiphinema americanum* associated with citrus (orange) trees, where citrus nematode, was the most common representing 51% of the total parasitic nematodes, followed by lesion nematode, *Pratylenchus* spp. as 33.8% and the dagger nematode, *Xiphinema americanum* has the lowest frequency of occurrence (0.1%). As for winter months, the same four previous genera were recorded, but at different frequencies of occurrence %. The most important nematode genera in the soil of mango trees variety Kit were: *Meloidogyne* spp., *Pratylenchus* spp. and *Criconemoides* spp. Root- knot nematodes, *Meloidogyne* spp. recorded the highest frequency of occurrence% of parasitic nematodes associated with mango trees (45.8%) in summer months, followed by *Pratylenchus* spp. with 39.7%, while ring nematodes, *Criconemoides* spp. recorded the lowest incidence (14.6%). As for the winter months, the same three nematode genera in the summer months were recorded, but at different proportions. The most important nematode genera or species in the soil of grape variety Flame Seedless were: *Meloidogyne* spp., *Pratylenchus* spp., *Criconemoides* spp. and *Xiphinema americanum***.** The most important nematode genera or species in the soil of peach trees variety Florida were: *Meloidogyne* spp., *Criconemoides* spp., and *Xiphinema americanum*. Root- knot nematode, *Meloidogyne* spp recorded the highest occurrence % (54.9 %) of the total parasitic nematode in summer months, followed by *Criconemoides* spp. (38.6 %), while the lowest percentage was for dagger nematode (6.5 %). As for the winter months, the same three nematode genera were recorded, but at different proportions.

Keywords: Frequency of occurrence, phytonematodes, fruit crops, summer and winter periods**.**

INTRODUCTION

It is conservatively estimated that diseases, insects and weeds together annually interfere with the production of, or damage between 31-42% of all crops produced worldwide. It has been estimated that, out of the 36.5% total losses, 14.2% by diseases, 10.2% by insects and 12.2% by weeds. Considering that 14.2% of the crop loss by plant diseases alone and the total annual worldwide crop losses from plant diseases were estimated to be about $220 billions. An additional 6-12% losses of crops after harvest, which are particularly high in developing tropical countries like India due to lack of resources like refrigeration, storage, etc. (Giovannucci, 1999; Douthwaite et al., 2009).

Plant parasitic nematodes are considered one of the most dangerous pests in Egypt where they infect all plants including fruit trees, field crops, vegetable plants, as well as, they infect most of weeds which can be reservoir and an alternative host in the absence of the preferable hosts. Korayem and Koura (1993) conducted population studies of plant parasitic nematodes associated with mango in Giza, Egypt. In addition,

Korayem et al. (2014) conducted a survey on the plant parasitic nematodes associated with different plants in North Sinai. Also, Mohamed et al. (2017) studied phytoparasitic nematodes associated with different cultivars of grape grown in two types of soil in Egypt. Furthermore, Taha (2018) studied the abundance and distribution of plant parasitic nematodes associated with some different plant hosts including grapes, banana, apples, peach and lemon. Recently, Abu Habib et al. (2020) studied the plant parasitic nematodes associated with citrus trees and reaction of two citrus cultivars to *Tylenchulus semipenetrans* in Northern Egypt.

At Saudi Arabia, Mokbel (2014) over a 2-year period (2012-2013) a nematological survey was done to identify the occurrence and densities of the plant parasitic nematodes associated with different host plants cultivated in Abu-Arish governorate, Jazan province, southwest Saudi Arabia which include, 6 fruit trees, 11 vegetables and field crops and 9 ornamental plants. Casanueva et al. (2016) reported that several species of plant parasitic nematodes are associated with banana and plantain in producing countries, where they can cause yield losses of up to 20%. Eisvand et al. (2019) surveyed plant parasitic nematodes fauna in citrus orchards in Khuzestan province. In their management, different practices that include the use of healthy planting material, soil tillage, fallowing, chemical and biological substances are carried out. In all cases, they come to prevent nematodes from penetrating into plants and establishing in production systems. However, these parasites have survival mechanisms that allow them to spend some time without food in the absence of crop, and there are alternative hosts as weeds. Nicol et al. (1999) & Stirling et al. (1992) reported that grapevines, like most other crops and especially horticultural crops, suffer from attacks by plant pathogenic nematodes.

This study aimed to identify the most important genera and species of nematodes that associate with or infect some fruit trees namely: orange, mango, grapes, and peach that cause remarkable economic losses, as well as to study their seasonal fluctuations along one year at the new reclaimed soils of El-Sadat Province, Menoufia Governorate, Egypt.

MATERIALS AND METHODS

The main purpose of the experiments was to study and find out the abundance of nematode genera in the soil of the fruit trees (orange, mango, grape and peach). This study was conducted on private orchards in El-Sadat city, Menoufia governorate, Egypt.

1-Sampling Procedures:

Soil samples were collected around plants, using a hand trowel where the dried surface of soil was removed and samples were taken from the wetted rhizosphere region of the soil and transferred to the laboratory to extract nematodes and determine the population density (PD), frequency of occurrence (FO %) and dynamics of each genus or species and to identify plant parasitic nematode genera or species.

Monthly, soil samples were collected along 12 months with three replicates for fruit trees. Soil samples of about 1 kg were collected from the rhizosphere of growing trees by digging the soil to a depth of 30-50 cm. From each sampling site, three subsamples were collected and thoroughly mixed to form a composite sample, representing the whole replicate. The collected samples were kept in polyethylene bags and sent to the laboratory for nematode extraction, numeration and identification.

2- Nematode Extraction and Numeration:

Each soil sample was carefully mixed, and an aliquot of 100 cm^3 was processed for nematode extraction according to methods described by Christie and Perry (1951) and Southey (1970) as follows: About 300-400 ml of water were added to the soil in a glass beaker (1000 ml) and the mixture was agitated by glass stalk, after few seconds. The suspension was poured onto a 60 mesh-sieve and passing suspension was collected in another clean glass beaker. Materials caught on the 60 mesh-sieve were discarded, while the collected suspension was then poured onto a 200 mesh-sieve. Materials remained on the sieve were thoroughly washed by a gentle stream of water into a 200 ml beaker. The resulting suspension containing nematodes was then, transferred to a Modified Baermann pan (Goodey,1963) fitted with soft tissue paper for the separation of active nematodes from debris and fine soil particles. After 72 hrs, nematode water suspension was collected and concentrated to 20 ml in a vial by using a 350 mesh-sieve. Nematode counts and identification to generic level were done by stereomicroscope based on morphology of the adult and juvenile forms, according to the description of Goodey (1963) and Mai and Lyon (1975).

3- Statistical analysis:

Data were subjected to the analysis of variance test (ANOVA) as randomized complete blocks design. The least significant differences (LSD) at the 5% level were determined using a computer program (Costat, 6400, 2008) and Duncan's Multiple Range test was used to compare the total averages and LSD 5% values were used to compare the average or mean numbers (population density).

RESULTS AND DISCUSSION

1-Population density (PD), Frequency of Occurrence (FO%) and population dynamics of plant parasitic nematode genera or species in the soil rhizosphere of orange, *Citrus sinensis* trees var. Naval.

1-1 Summer period:

The obtained results in Table (1) showed population density, dynamics and occurrence % of plant parasitic nematode genera or species in the soil rhizosphere of orange *Citrus sinensis* trees var. Naval along summer period. Statistical analysis of the obtained data indicated that there were significant differences in the population density of plant parasitic nematodes between August month and all other months, while there were no significant differences in the density of plant parasitic nematodes among April, May and June months. Moreover, there were no significant differences in the numbers (population densities) of plant parasitic nematodes between July and September months. As for the population density of each nematode genera and species, statistical analysis indicated that there were significant differences in the density among the four registered species and genera in Table (1).

Results indicated that there were four plant parasitic nematode genera or species: citrus nematode, *Tylenchulus semipenetrans*, lesion nematode, *Pratylenchus*, sheath nematode *Hemicycliophora*, and dagger nematode, *Xiphinema americanum* with occurrence percentages of 51.0, 33.8, 13.5 and 0.1 %, respectively (Table 1).

Table 1: Population density, dynamics and frequency of occurrence % of plant parasitic nematode genera or species in the soil rhizosphere of orange trees along six months **(**summer period).

Months	Average number (population density PD*) of plant parasitic nematodes / 100 cm^3 soil				
	Tylenchulus semipenetrans	*Pratylenchus*	*Hemicycliophora*	*Xiphinema americanum*	Total
April 2017	923.3 (52.2)*	703.3 (39.8)	141.0 (7.9)	0.0 (0.0)	1767.6 c
May 2017	996.3 (55.6)	682.6 (38.1)	110.0 (6.1)	2.0 (0.1)	1790.9 c
June 2017	1102.6 (54.2)	691.0 (33.9)	235.0 (11.6)	5.0 (0.2)	2033.6 c
July 2017	1330.0 (51.8)	804.3 (31.3)	429.0 16.7	6.0 (0.2)	2569.3 b
August 2017	1466.6 (47.4)	1014.6 (32.9)	607.6 (19.6)	5.0 (0.2)	3093.8 a
September 2017	1205.0 (45.0)	954.0 (35.6)	513.0 (19.2)	4.0 (0.1)	2676.0 b
Total	7023.8 a (51.0)	4849.8 b (33.8)	2035.6 c (13.5)	22.0 d (0.1)	-
LSD 5%	61.4				340.5

Values are averages of 3 replicates. PD*= Total number of individuals of a particular genus ÷ number of positive samples. Values between brackets are frequency of occurrence % (FO %) = (number of positive samples containing a genus ÷ number of total samples) ×100. Means in each column or row followed by the same letter are not significantly different at 5%

1-2. Winter period:

The obtained results in Table (2) showed the population density, occurrence and dynamics of plant parasitic nematode genera in the soil rhizosphere of orange trees, *Citrus sinensis* var. Naval along winter period. Statistical analysis of the obtained data indicated that there were significant differences in the numbers of plant parasitic nematodes between October month and all other months, while there were no significant differences in the numbers (population densities) of plant parasitic nematodes among November, December and January months. Moreover, there were no significant differences in the numbers of plant parasitic nematodes between February and March months. As for the population density of each nematode species, statistical analysis indicated that there were significant differences in the numbers (PD) among the four registered species Table (2).

Results indicated that there were four plant parasitic nematode genera or species: *Tylenchulus semipenetrans*, *Pratylenchus*, *Hemicycliophora*, and *Xiphinema americanum* with occurrence percentages of 54.9, 27.9, 15.5 and 0.1 %, respectively.

Table 2: Nematode genera or species in the soil rhizosphere of orange trees along six months **(**winter period).

Months	Average number (Population density PD) of plant parasitic nematodes / 100 cm^3 soil				
	Tylenchulus semipenetrans	*Pratylenchus*	*Hemicycliophora*	*Xiphinema americanum*	Total
October 2017	1395.0 (48.6)	830.0 (28.9)	638.0 (22.2)	5.0 (0.2)	2868.0 A
November 2017	1435.0 (51.9)	804.0 (20.1)	520.0 (18.8)	4.0 (0.1)	2763.0 Ab
December 2017	1607.0 (58.1)	761.0 (27.5)	395.0 (14.3)	1.0 (0.1)	2764.0 Ab
January 2018	1503.6 (61.2)	650.0 26.4)	302.0 (12.3)	2.0 (0.1)	2457.6 Bc
February 2018	1246.0 (56.2)	672.0 (30.3)	295.0 (13.3)	3.0 (0.1)	2216.0 Cd
March 2018	1010.3 (53.6)	641.0 (34.0)	230.0 (12.2)	2.0 (0.1)	1883.3 D
Total	8196.9 a (54.9)	4358 b (27.9)	2380 c (15.5)	17 d (0.1)	-
LSD 5%		352.3			355.8

Values are averages of 3 replicates. Values between brackets are frequency of occurrence %.
Means in each column or row followed by the same letter are not significantly different at 5%.

2- Population density (PD), Frequency of Occurrence (FO%) and dynamics of plant parasitic nematode in the soil rhizosphere of mango, *Mangifera indica* trees var. Sukkary

2-1 Summer period:

The obtained results in Table (3) showed the population density, occurrence and dynamics of plant parasitic nematode genera in the soil rhizosphere of mango trees along summer period. Statistical analysis of the obtained data indicated that there were significant differences in the densities of plant parasitic nematodes among August, September, and July months and June, May and April months, while there were no significant differences in the densities of plant parasitic nematodes among April, May and June months. As for the population density of each nematode genus, statistical analysis indicated that there were significant differences among the three registered genera (Table 3).

Results indicated that there were three plant parasitic nematode genera: root- knot nematode, *Meloidogyne*, lesion nematode, *Pratylenchus*, and ring nematode, *Criconemoides* with occurrence percentages of 45.8, 39.7 and 14.6 %, respectively (Table 3).

2-2. Winter period:

The obtained results in Table (4) showed the population density, occurrence and dynamics of plant parasitic nematode genera in the soil rhizosphere of mango trees along winter period. Statistical analysis of the obtained data indicated that there were significant differences in the numbers of plant parasitic nematodes among October & November months and December, January and February months, while there were no significant differences in the numbers of plant parasitic nematodes between October

Table 3: Population density, dynamics and occurrence % of plant parasitic nematode genera in the soil rhizosphere of mango trees along six months **(**summer period).

Months	Average number (Population density PD) of plant parasitic nematodes / 100 cm^3 soil			
	Meloidogyne	*Pratylenchus*	*Criconemoides*	Total
April 2017	856.0 (48.6)	703.0 (39.9)	203.0 (11.5)	1762.0 C
May 2017	829.0 (44.5	768.0 (41.2)	268.0 (14.4)	1865.0 C
June 2017	939.0 (46.9	804.0 (40.2)	257.0 (12.9)	2000.0 Bc
July 2017	1009.0 (44.4	893.0 (39.3)	368.0 (16.2)	2270.0 Ab
August 2017	1187.0 (45.7	1011.0 (38.9)	402.0 (15.5)	2600.0 A
September 2017	1091.0 (44.6	943.0 (38.6)	411.0 (16.8)	2445.0 A
Total	5911 a (45.8	5122 b (39.7)	1909 c (14.6)	
LSD 5%		182		355.8

Values are averages of 3 replicates. Values between brackets are frequency of occurrence % .
Means in each column or row followed by the same letter are not significantly different at 5%.

Table 4: Population density, dynamics and occurrence % of plant parasitic nematode genera in the soil rhizosphere of mango trees along six months **(**winter period).

Months	Average number (Population density PD) of plant parasitic nematodes / 100 cm^3 soil			
	Meloidogyne	*Pratylenchus*	*Criconemoides*	Total
October 2017	1012.0 (40.8)	997.0 (40.2)	470.0 (19.0)	2479.0 A
November 2017	1015.0 (44.7)	934.0 (41.1)	322.0 (14.2)	2271.0 Ab
December 2017	810.0 (42.2)	912.0 (47.5)	196.0 (10.2)	1918.0 Bc
January 2018	863.0 (47.6)	794.0 (43.8)	156.0 (8.6)	1813.0 C
February 2018	886.0 (50.2)	709.0 (40.2)	169.0 (9.6)	1764.0 C
March 2018	909.0 (52.7)	676.0 (39.2	140.0 (8.1)	1725 C
Total	5495 a (46.4)	5022 b (42.0)	1453 c (11.6)	
LSD 5%		327.2		355.8

Values are averages of 3 replicates. Values between brackets are frequency of occurrence %.
Means in each column or row followed by the same letter are not significantly different at 5%

and November months. Moreover, there were no significant differences in the densities of plant parasitic nematodes among December, January, February and March months. As for the population density of each nematode genus, statistical analysis indicated that there were significant differences among the three registered species genera (Table 4).

Results indicated that there were three plant parasitic nematode genera: root- knot nematode, *Meloidogyne*, lesion nematode, *Pratylenchus*, and ring nematode, *Criconemoides* with occurrence percentages of 46.4, 42.0 and 11.6 %, respectively (Table 4).

3- Population density (PD), Frequency of Occurrence (FO%) and dynamics of plant parasitic nematode in the soil rhizosphere of grape, *Vitis vinifera* trees var. Flame Seedless

3-1- Summer period:

The obtained results in Table (5) showed the population density, occurrence and dynamics of plant parasitic nematode genera in the soil rhizosphere of grape trees along summer period. Statistical analysis of the obtained data indicated that there were significant differences in the densities of plant parasitic nematodes among July, August and September months and May and June months, while there were no significant differences in the densities of plant parasitic nematodes between May and June months. Moreover, there were no significant differences in the densities of plant parasitic nematodes between July, August and September months. As for the population density of each nematode genus, statistical analysis indicated that there were significant differences in the densities between *Meloidogyne* spp., and *Pratylenchus* spp. and the other two genera and species, *Criconemoides* spp., and *Xiphinema americanum* (Table 5).

Table 5: Population dynamics and occurrence % of plant parasitic nematode genera or species in the soil rhizosphere of grape trees along six months **(**summer period).

Months	Average numbers (Population density PD) of plant parasitic nematodes / 100 cm^3 soil				
	Meloidogyne	*Pratylenchus*	*Criconemoides*	*Xiphinema americanum*	Total
April 2017	1586.0 (45.2)	1603.0 (45.7)	310.0 (8.8)	12.0 (0.3)	3511.0 bc
May 2017	1369.0 (43.6)	1513.0 (48.2)	299.0 (9.5)	11.0 (0.4)	3138.0 d
June 2017	1613.0 (47.5)	1530.0 (45.0)	243.0 (7.1)	13.0 (0.4)	3399.0 cd
July 2017	1802.0 (47.8)	1684.0 (44.2)	307.0 (8.1)	13.0 (0.3)	3806.0 a
August 2017	1826.0 (45.7)	1795.0 (44.9)	360.0 (9.0)	15.0 (0.4)	3996.0 a
September 2017	1703.0 (45.4)	1767.0 (47.1)	276.0 (7.4)	9.0 (0.2)	3755.0 ab
Total	9899 a (45.9)	9892 a (45.9)	1795 b (8.3)	73 c (0.3)	
LSD 5%			568.5		261.9

Values are averages of 3 replicates. Values between brackets are frequency of occurrence %.
Means in each column or row followed by the same letter are not significantly different at 5%.

Results indicated that there were four plant parasitic nematode genera or species: *Meloidogyne*, *Pratylenchus*, *Criconemoides* and *Xiphinema americanum* with occurrence percentages of 45.9, 45.9, 8.3 and 0.3 %, respectively (Table 5).

3-2- Winter period:

The obtained results in Table (6) showed the population density, occurrence and dynamics of plant parasitic nematode genera in the soil rhizosphere of grape trees along winter period. Statistical analysis of the obtained data indicated that there were significant differences in the densities of plant parasitic nematodes among October & March months and November & December, January, February months, while there were no significant differences in the densities of plant parasitic nematodes between October & March months. Moreover, there were no significant differences in the densities of plant parasitic nematodes between December & January months. As for the population densities of nematode genera and species, statistical analysis indicated that there were significant differences in the densities among *Meloidogyne* spp., *Pratylenchus* spp., *Criconemoides* spp., and *Xiphinema americanum* (Table 6).

Results indicated that there were four plant parasitic nematode genera or species: *Meloidogyne*, *Pratylenchus*, *Criconemoides* and *Xiphinema americanum* with occurrence percentages of 47.0, 40.9, 11.2 and 0.9 %, respectively (Table 6).

Table 6: Population density, dynamics and occurrence % of plant parasitic nematode genera and species in the soil rhizosphere of grape trees along six months **(**winter period).

Months	Average number (Population density PD) of plant parasitic nematodes / 100 cm^3 soil				
	Meloidogyne	*Pratylenchus*	*Criconemoides*	*Xiphinema americanum*	Total
October 2017	1523.0 (46.9)	1401.0 (43.2)	305.0 (9.4)	16.0 (0.5)	3245.0 a
November 2017	1291.0 (47.9)	1138.0 (42.2)	249.0 (9.2)	19.0 (0.7)	2697.0 b
December 2017	1153.0 (51.2)	863.0 (38.4)	207.0 (9.2)	27.0 (1.2)	2250.0 c
January 2018	1083.0 (47.3)	898.0 (39.2)	288.0 (12.6)	23.0 (1.0)	2292.0 c
February 2018	1207.0 (44.7)	1104.0 (40.8)	364.0 (13.5)	28.0 (1.1)	2703.0 b
March 2018	1367.0 (44.2)	1292.0 (41.7)	416.0 (13.4)	20.0 (0.6)	3095.0 a
Total	7624 a (47.0)	6696 b (40.9)	1829 c (11.2)	133 d (0.9)	
LSD 5%			645.2		342.6

Values are averages of 3 replicates. Values between brackets are frequency of occurrence %
Means in each column or row followed by the same letter are not significantly different at 5%.

4-Population density (PD), Frequency of Occurrence (FO%)and dynamics of plant parasitic nematode in the soil rhizosphere of peach, *Prunus persica* trees var. Sukkary

4-1 Summer period

The obtained results in Table (7) showed the population density, occurrence and dynamics of plant parasitic nematode genera in the soil rhizosphere of peach trees along summer period. Statistical analysis of the obtained data indicated that there were significant differences in the densities of plant parasitic nematodes among August month and April, May, and June months, while there were no significant differences in the densities of plant parasitic nematodes among April, May and June months. Moreover, there were no significant differences in the densities of plant parasitic nematodes among July, August and September months. As for the population numbers of each nematode genus, statistical analysis indicated that there were significant differences in the densities among the 3 registered genera (Table 7).

Results indicated that there were three plant parasitic nematode genera or species: root-knot nematode, *Meloidogyne* , ring nematode, *Criconemoides*, and dagger nematode, *Xiphinema americanum,* with occurrence percentages of 54.9, 38.6 and 6.5 %, respectively (Table 7).

Table 7: Population density, dynamics and occurrence % of plant parasitic nematode genera in the soil rhizosphere of peach trees along six months **(**summer period).

Months	Average number (Population density PD) of plant parasitic nematodes / 100 cm^3 soil			
	Meloidogyne	*Criconemoides*	*Xiphinema americanum*	Total
April 2017	630.0 (52.2)	493.0 (40.9)	83.0 (6.9)	1206.0 B
May 2017	593.0 (53.7)	447.0 (40.5)	64.0 (5.8)	1104.0 B
June 2017	718.0 (60.4)	397.0 (33.4)	73.0 (6.1)	1188.0 b
July 2017	768.0 (57.2)	482.0 (35.9)	93.0 (6.9)	1343.0 ab
August 2017	809.0 (52.6)	623.0 (40.5)	106.0 (6.9)	1538.0 a
September 2017	681.0 (53.4)	514.0 (40.3)	80.0 (6.3)	1275.0 ab
Total	4199 a (54.9)	2956 b (38.6)	499 c (6.5)	
LSD 5%		282.5		308.1

Values are averages of 3 replicates. Values between brackets are frequency of occurrence %. Means in each column or row followed by the same letter are not significantly different at 5% .

4-2- Winter period

The obtained results in Table (8) show the occurrence and population dynamics of plant parasitic nematode genera in the soil rhizosphere of peach trees along winter period. Statistical analysis of the obtained data indicated that there were significant differences in the densities of plant parasitic nematodes between October & November months, and

December, January, February & March months, while there were no significant differences in the densities of plant parasitic nematodes between October & November months. Moreover, there were no significant differences in the densities of plant parasitic nematodes among December, January, February, and March months.
As for the population numbers of each nematode genus or species, statistical analysis indicated that there were significant differences in the densities among the three registered genera or species (Table 8).

Results indicated that there were three plant parasitic nematode genera or species, root- knot nematode, *Meloidogyne,* ring nematode, *Criconemoides* and dagger nematode, *Xiphinema americanum,* with occurrence percentages of 49.1, 40.5 and 10.5 %, respectively (Table 8).

Table 8: Population density, dynamics and occurrence % of plant parasitic nematode genera or species in the soil rhizosphere of peach trees along 6 months **(**winter period).

Months	Average number (Population density PD) of plant parasitic nematodes / 100 cm^3 soil			
	Meloidogyne	*Criconemoides*	*Xiphinema americanum*	Total
October 2017	649.0 (50.5)	541.0 (43.3)	94.0 (7.3)	1284.0 A
November 2017	473.0 (37.7)	613.0 (48.9)	167.0 (13.0)	1253.0 A
December 2017	312.0 (35.8)	447.0 (51.3)	112.0 (12.9)	871.0 Bc
January 2018	329.0 (47.9)	284.0 (41.3)	74.0 (10.8)	687.0 C
February 2018	497.0 (62.0)	213.0 (26.6)	92.0 (11.5)	802.0 bc
March 2018	584.0 (60.8)	305.0 (31.8)	71.0 (7.4)	960.0 B
Total	2844 a (49.1)	2403 b (40.5)	610 c (10.5)	
LSD 5%		323		251.6

Values are averages of 3 replicates. Values between brackets are frequency of occurrence %. Means in each column or row followed by the same letter are not significantly different at 5%.

The obtained results are in harmony with those conducted by Korayem and Koura (1993) who collected soil and root samples from the rhizosphere of 6 cultivars of mango in Giza, Egypt and classified nematode populations of 11 genera i.e. *Rotylenchulus reniformis, Helicotylenchus dihystera* and *Criconemella* sp. which were very common and their population densities were higher than those of the other nematode genera.
In addition, Korayem et al. (2014) conducted a survey in some villages of North Sinai Governorate during 2013/2014 to study distribution and dissemination of plant parasitic nematodes associated with vegetables and field crops, fruit. Data showed the presence of fourteen plant parasitic nematode genera and species as: *Criconema* sp., *Criconemoides* sp., *Ditylenchus* sp., *Hemicriconemoides* sp., *Heterodera* sp., *Hoplolaimus* sp., *Longidorus* sp., *Meloidogyne* sp., *Pratylenchus* sp., *Rotylenchulus reniformis, Tylenchorhynchus* sp., *Tylenchulus semipenetrans, Tylenchus* sp. and

Xiphinema sp. For all surveyed villages, stunt nematode was the first in its general average percentage frequency of occurrence of 29.1% followed by that of root knot nematode (27.3%), stubby nematode (13.9%) and lesion nematode. (12.5%).
Mohamed et al. (2017) conducted a survey in Giza, Qualiabia and Behaira governorates of Egypt during 2010-2011 seasons, to study the occurrence and population density of phytoparasitic nematodes associated with grapes. A total number of 160 soil and root samples were collected from the rhizosphere of six grape cultivars, Bez-Alanza, Flame seedless, King Ruby, Romy Red, Superior and Thomoson seedless were collected. The results indicated the presence of ten phytonematode genera, *Criconemoides, Ditylenchus, Helicotylenchus, Hoplolaimus, Meloidogyne, Pratylenchus, Rotylenchulus, Tylenchorhynchus, Tylenchulus* and *Xiphinema*. Frequency and population density of each nematode genera was differed according to grape cultivars and soil type. The root knot nematode (*Meloidogyne*) was prevalent nematode in all cultivars and localities as 77.32% of total samples. Also root knot nematode (*Meloidogyne*) was frequent in (FO=72.5%) than in clay soil (16.77%), while the citrus nematode (*Tylenchulus*) was more frequent in clay soil (66.71) than in sandy soil (0.67%).

Taha (2018) studied the abundance and distribution of plant parasitic nematodes associated with some different plant hosts including: grapes, banana, apples, peach and lemon, and the predominant genera of plant parasitic nematodes which recovered from soil samples were *Meloidogyne*., *Helicotylenchus*, *Pratylenchus*, *Paratylenchus*, *Rotylenchulus, Hoplolaimus, Tylenchorhynchus, Tylenchulus* and *Xiphinema*.
Recently, Abu Habib et al. (2020) studied the plant parasitic nematodes associated with citrus trees of two cultivars in Northern Egypt, and found that citrus nematode, *Tylenchulus semipenetrans* was the dominant species infecting the tested varieties.

From the previous results, it could be reported that all tested fruit crops were infected with plant parasitic nematodes and may cause dangerous effects on its yield, as well as help other pathogens to infect the roots of trees; therefore, a program to control plant parasitic nematodes must be designed in the newly reclaimed soils especially at Elsadat Province.

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الملخص العربى

النيماتودا النباتية التى تصيب أشجار الفاكهة فى الاراضى المستصلحة حديثا فى منطقة السادات ـ محافظة المنوفية

محمد الامين محمد سويلم – محمد سعيد ابو قورة– وفاء عبد الرسول السباعى
كلية الزراعة – جامعة المنوفية – شبين الكوم – مصر

تهدف هذه الدراسة الى التعرف على أهم أجناس النيماتودا التي تصيب أشجار الفاكهة وكذلك تقلباتها الموسمية في منطقة السادات بمحافظة المنوفية فى أربعة محاصيل فاكهة (البرتقال – المانجو – العنب – الخوخ).
١- **أشجار البرتقال** تم عمل حصر لأهم الأجناس المتطفلة على أشجار البرتقال صنف أبوسرة وذلك لمدة عام بداية من شهر ابريل (٢٠١٧) وحتى شهر مارس (٢٠١٨) وذلك عن طريق أخذ عينات شهرية من منطقة الجذور وقد وجد خلال الفترة الصيفية اجناس نيماتودا الموالح والتقرح والغمدية والخنجرية وسجلت نيماتودا الموالح أعلى نسبة (٥١٪) يليها نيماتودا التقرح (٣٣,٨٪) وسجلت النيماتودا الخنجرية أقل نسبة تواجد (٠,١٪). أما بالنسبة للأشهر الشتوية فقد تم تسجيل نفس الأربع أجناس السابق تسجيلها حيث سجلت نيماتودا الموالح (٥٤,٩٪) ونيماتودا التقرح (٢٧,٩٪) ثم النيماتودا الغمدية (١٥,٥٪) وأخيرا النيماتودا الخنجرية (٠,١٪).
٢ ـ **أشجار المانجو** تم عمل حصر للأجناس المتطفلة على أشجار المانجو صنف الكيت وذلك لمدة عام بداية من شهر ابريل (٢٠١٧) وحتى شهر مارس (٢٠١٨) حيث وجد خلال الفترة الصيفية اجناس تعقد الجذور والتقرح والحلقية وسجلت نيماتودا تعقد الجذور أعلى نسبة في النيماتودا المتطفلة حيث بلغت ٤٥,٨٪ من إجمالي النيماتودا المتطفلة التي تصيب أشجار المانجو يليها نيماتودا التقرح (٣٩,٧٪) وسجلت النيماتودا الحلقية أقل نسبة تواجد (١٤,٦٪). أما بالنسبة للأشهر الشتوية فقد تم تسجيل نفس الثلاث أجناس السابق تسجيلها حيث سجلت نيماتودا تعقد الجذور ٤٦,٤٪ يليها نيماتودا التقرح (٤٢,٠٪) يليها الحلقية (١١,٦٪).
٣ ـ **أشجار العنب** حيث تم عمل حصر لأهم الأجناس المتطفلة على أشجار العنب صنف فليم سيدلس وذلك لمدة عام بداية من شهر ابريل (٢٠١٧) وحتى شهر مارس (٢٠١٨) حيث وجد خلال الفترة الصيفية اجناس تعقد الجذور والتقرح والحلقية والخنجرية وسجلت نيماتودا تعقد الجذور نفس نسبة نيماتودا التقرح (٤٥,٩٪) بينما سجلت النيماتودا الحلقية ٨,٣٪ أما النيماتودا الخنجرية كانت ٠,٣٪. أما بالنسبة للشهور الشتوية فقد تم تسجيل نفس الأربع أجناس السابق تسجيلها حيث سجلت نيماتودا تعقد الجذور ٤٧,٠٪ يليها نيماتودا التقرح حيث بلغت نسبتها ٤٠,٩٪ يليها بنسبة (١١,٢٪) بينما النيماتودا الخنجرية وصلت نسبتها إلى ٠,٩٪.
٤ ـ **أشجار الخوخ** تم عمل حصر لأهم الأجناس المتطفلة على أشجار الخوخ صنف فلوريدا وذلك لمدة عام بداية من شهر ابريل (٢٠١٧) وحتى شهر مارس (٢٠١٨) حيث وجد خلال الفترة الصيفية اجناس تعقد الجذور والحلقية والخنجرية وسجلت نيماتودا تعقد الجذور أعلى نسبة في النيماتودا المتطفلة (٥٤,٩٪) يليها النيماتودا الحلقية (٣٨,٦٪) وسجلت النيماتودا الخنجرية أقل نسبة تواجد (٦,٥٪) أما بالنسبة للأشهر الشتوية فقد تم تسجيل نفس الثلاث أجناس السابق تسجيلها حيث سجلت نيماتودا تعقد الجذور ٤٩,١٪ يليها النيماتودا الحلقية بنسبة ٤٠,٥٪ بينما النيماتودا الخنجرية وصلت نسبتها إلى ١٠,٥٪.
من النتائج السابقة يوصى البحث بضرورة وضع برنامج لمكافحة النيماتودا المتطفلة على أشجار الفاكهة فى الاراضى المستصلحة حديثا بمنطقة السادات والتى ثبت اصابتها بعديد من أجناس النيماتودا المتطفلة وذلك لمحاولة التقليل من تعدادها واصابتها للنباتات حيث لها مدى عائلى كبير وخسائرها مدمرة .