

DISTRIBUTION AND OIL CROPS ASSOCIATION OF PLANT PARASITIC NEMATODES IN EGYPTA.M. Korayem^{1*}, M.M. Ahmed², M.M.M. Mohamed¹¹Plant Pathology & Nematology Department, National Research Center, Dokki, Giza, Egypt²Zoology and Nematology Department, Faculty of Agriculture, Al-Azhar University, Egypt

* correspondence address:

Plant Pathology & Nematology Department, National Research Center, Dokki, Giza, Egypt

Abstract: Eleven genera of plant parasitic nematodes associated with rapeseed, peanut, soybean and sunflower oil crops were recovered from ten governorates in Egypt. *Helicotylenchus*, *Hoplolaimus*, *Meloidogyne*, and *Pratylenchus* were the most frequent nematodes occurring with high population densities, frequency of occurrence and prominence values.

Key words: Distribution, plant nematodes, oil crops.

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INTRODUCTION

Plant parasitic nematodes associated with different oil crops have been studied by many investigators. Carpenter and Lewis (1991) studied the distribution of *Meloidogyne* spp. in soybean production areas of South Carolina. *Meloidogyne arenaria* and *M. javanica* were found in 6 of 7 counties surveyed, with some populations consisting of 2 or more species. Sun and Liu (1992) reported that the peanut root-knot nematode (*Meloidogyne* sp.) is one of the most important plant nematode diseases in Tangshan. Mendes and Dickson (1993) found that the *Heterodera glycines* was detected and identified on soybean during a survey made in 65 soybean fields in Brazil. Warner et al., (1994) indicated that, in 1992, a detection survey for *Heterodera glycines* was conducted in 16 counties in Michigan USA. The nematode was detected in 12 counties, with absolute frequencies ranging from 6 to 100%. A total of 149 samples was collected, and 53% were infested with *H. glycines*. Raspudic et al. (1994) demonstrated that in association with soybean crops in Croatia, 19 plant parasitic nematode genera were identified. Of these *Pratylenchus* spp. predominated, the average number/ 100 ml soil being about 100 individuals with a maximum of 3348. Species of the genus were often found in mixed populations. Shujun and SJ. (1996) indicated that the results of a survey showed that race 1 in addition to the earlier reported race 3 of *Heterodera glycines* was present in experimental soybean fields. Smolik et al. (1996) showed that the soybean fields in 12 eastern South Dakota counties were surveyed for *Heterodera glycines* during the 1995 growing season. The 255 fields included in the survey had a 10-to 15-year history of soybean production (primarily in rotation with corn (maize), and were selected with the aid of local extension service agents. In the initial phase of the survey, *H. glycines* was detected in a single field of the 23 sampled in Union County, which is located in South Dakota. Twenty-two additional fields within 2 to 3 km of the original field were assayed for *H. glycines*. The nematode was confirmed in 10 (45%) fields.

In Egypt, peanut and sunflower plants are also subject to the attack with many species of plant parasitic nematodes. Of these nematodes belonging to the genera *Aphelenchus*, *Aphelenchoids*, *Belonolaimus*, *Criconemoides*, *Helicotylenchus*, *Hemicycliophora*, *Heterodera*, *Hoplolaimus*, *Longidorus*, *Meloidogyne*, *Pratylenchus*, *Rotylenchulus* and *Tylenchorhynchus* were reported to be in association with roots of peanut and sunflower crop fields by several investigators (Oteifa 1962, 1964 and EL-Saedy 1975). Also, EL-Shinnawy (1978), Hedy (1979) found that *Helicotylenchus*, *Meloidogyne*, *Pratylenchus*, *Rotylenchulus* and *Tylenchorhynchus* were in association with certain field crops including peanut and sunflower plants. Khalil (1991) found that *Criconemoides*, *Helicotylenchus*, *Hemicycliophora*, *Heterodera*, *Hoplolaimus*, *Longidorus*, *Meloidogyne*, *Pratylenchus*, *Rotylenchulus*, and *Tylenchorhynchus* were reported to be in association with roots of peanut plants. El-Sherif (1983) identified *Meloidogyne* spp. on peanut in Egypt as (*M. incognita*, *M. javanica*, *M. arenaria* and *M. thamesi*) and their percentages of occurrence were 26%, 46%, 19% and 9% respectively. El-Sherif (1992) showed that the most important nematode affecting peanut production in Egypt is root knot nematode, *Meloidogyne* spp. Other nematode species are not severe

pathogens on peanut under local field conditions, but may cause damage where large population occurs. The aim of this research is to study the distribution of plant parasitic nematodes in certain oil crop in Egypt.

MATERIAL AND METHOD

A total of 855 samples of soil and roots were collected for nematode analysis from the studied oil crops (rapeseed, peanut, soybean and sunflower) fields of five Governorates in the Nile Delta viz., Beheria, Gharbia, Kafer El-Sheikh, Ismailia and Sharkia and five Governorates in the Upper Egypt (Aswan, Beni Suif, Fyoom, Giza and Sohag) during 2000-2003 growing seasons. Each soil sample was taken from the rhizosphere of plants at soil depth of 20 cm. Root samples were also collected by carefully lifting the plants with a towel. All samples were kept in polyethylene bags, labeled and transferred directly to the laboratory for nematode extraction and identification.

Then soil samples were carefully mixed and an aliquot of 200 gm from each sample were processed for nematode extraction by sieving and decanting methods (Goodey, 1963a). The nematode water suspension was concentrated to 40 ml in a glass vial by using a 325 mesh sieve. The various nematode genera present in each soil sample were counted and identified under a stereo-microscope using Hawksely nematode counting slide (Goodey, 1963b). Nematodes identification were made after referring to the keys of Seinhorst (1966), Netscher and Seinhorst (1969), Tarjan (1963) and Siddiqui and Alam (1985). Root samples were carefully washed with tap water and cut into small pieces, then a 5 g root from each sample were incubated according to the incubation method of Young (1954). The population density, frequency of occurrence and prominence value were calculated for each nematode genus. Prominence value (PV) was estimated according to Norton (1978), where $PV = \text{Nematode density} \times \text{square root of frequency of occurrence}$ to ascertain the relative quantitative values among nematodes.

Species of *Meloidogyne* infecting peanut grown in Governorates of Beheira, Beni-suef and Ismailia were identified on the basis of methods according to Esbenshade and Triantaphyllou (1987).

RESULTS

Population density, frequency of occurrence and prominence values of nematode genera associated with some oil crop fields in Egypt governorates were calculated for each nematode species. Data indicated that certain plant parasitic nematodes were found in the collected samples with different population densities, frequencies of occurrence and prominence values. These nematodes are *Aphelenchoides* spp., *Criconemoides* spp., *Ditylenchus* spp., *Helicotylenchus* spp., *Heterodera* spp., *Hoplolaimus* spp., *Longidorus* spp., *Meloidogyne* spp., *Pratylenchus* spp., *Rotylenchulus* spp., *Tylenchorhynchus* spp. and *Tylenchus* spp. (Tables 1, 2, 3 and 4).

As for nematode genera associated with rapeseed fields in Nile Delta Governorates (Table 1), the average population densities of the surveyed nematodes ranged from 8 for *Heterodera* spp., to 379 for *Tylenchorhynchus* spp. Other genera, *Ditylenchus* spp., *Helicotylenchus* spp. and *Tylenchus* spp. had different population densities. Their frequencies of occurrence were different as follows: *Heterodera* spp. had the lowest one (25%) whereas *Tylenchorhynchus* spp. had the highest occurrence (85%). Other genera, *Ditylenchus* spp., *Helicotylenchus* spp., and *Tylenchus* spp. had different occurrence values. Regarding prominence values, they ranged from 6 for *Heterodera* spp. to 374 for *Tylenchorhynchus* spp. Other genera, *Ditylenchus* spp., *Helicotylenchus* spp., and *Tylenchus* spp. approximately had the same prominence values.

As for nematodes associated with rapeseed fields in Upper Egypt Governorates (Table 1), the population densities of the surveyed nematodes ranged from 3 for *Meloidogyne* spp. to 96 for *Tylenchus* spp. Other genera, *Criconemoides* spp., *Ditylenchus* spp., *Helicotylenchus* spp., *Hoplolaimus* spp., *Longidorus* spp., *Pratylenchus* spp., *Rotylenchulus* spp. and *Tylenchorhynchus* spp. had different population densities. As for nematode occurrence, it ranged from 7 % for *Longidorus* spp. to 68% for *Pratylenchus* spp. Other genera, *Criconemoides* spp., *Ditylenchus* spp., *Helicotylenchus* spp., *Hoplolaimus* spp., *Meloidogyne* spp., *Rotylenchulus* spp. and *Tylenchorhynchus* spp. had different occurrence values. As for prominence values, they ranged from 1 for *Meloidogyne* spp. to 72 for *Pratylenchus* spp. Other genera, *Criconemoides* spp., *Ditylenchus* spp., *Helicotylenchus* spp.,

Hoplolaimus spp., *Longidorus* spp., *Rotylenchulus* spp. and *Tylenchorhynchus* spp. had different prominence values.

As for the total average of population density of nematodes associated with rapeseed, the surveyed nematode ranged from 2 for *Meloidogyne* spp. to 186 for *Tylenchorhynchus* spp. Other genera, *Criconemoides* spp., *Ditylenchus* spp., *Helicotylenchus* spp., *Hoplolaimus* spp., *Longidorus* spp., *Pratylenchus* spp., *Rotylenchulus* spp. and *Tylenchus* spp. had different population densities. As for total average of occurrence, it ranged from 2% *Meloidogyne* spp. to 69% for *Tylenchorhynchus* spp. Other genera, *Criconemoides* spp., *Ditylenchus* spp., *Helicotylenchus* spp., *Hoplolaimus* spp., *Longidorus* spp., *Pratylenchus* spp., *Rotylenchulus* spp. and *Tylenchorhynchus* spp. had different occurrence values. As for total average of prominence values of nematodes, it ranged from 0.6 for *Meloidogyne* to 178 for *Tylenchorhynchus* spp. Other genera, *Criconemoides* spp., *Ditylenchus* spp., *Helicotylenchus* spp., *Hoplolaimus* spp., *Longidorus* spp., *Pratylenchus* spp., *Rotylenchulus* spp. and *Tylenchorhynchus* spp. had different prominence values.

Regarding nematodes associated with peanut fields in Nile Delta Governorates (Table 2), the population densities of the surveyed nematodes ranged from 10 for *Ditylenchus* spp. to 340 for *Meloidogyne* spp. Other genera, *Pratylenchus* spp., *Tylenchorhynchus* spp. and *Tylenchus* spp. had different population densities. As for nematode frequencies of occurrence, they ranged from 20% for *Ditylenchus* spp. to 97% for *Meloidogyne* spp. Other genera *Pratylenchus* spp., *Tylenchorhynchus* spp. and *Tylenchus* spp. had different occurrence values. As for nematode prominence, it ranged from 8 for *Ditylenchus* spp. to 333 for *Meloidogyne* spp. Other genera, *Pratylenchus* spp., *Tylenchorhynchus* spp. and *Tylenchus* spp. had different prominence values.

As for nematode associated with peanut fields in Upper Egypt Governorates (Table 2), the population densities of the surveyed nematodes ranged from 1 for *Helicotylenchus* spp. to 360 for *Meloidogyne* spp. Other genera, *Criconemoides* spp., *Hemicycliophora* spp., *Pratylenchus* spp., *Rotylenchulus* spp., *Tylenchorhynchus* spp., and *Tylenchus* spp. had different population densities. As for nematode occurrence, it ranged from 1% for *Helicotylenchus* spp. to 76% for *Meloidogyne* spp. Other genera, *Criconemoides* spp., *Hemicycliophora* spp., *Pratylenchus* spp., *Rotylenchulus* spp., *Tylenchorhynchus* spp., and *Tylenchus* spp. had different occurrence values. As for prominence values, they ranged from 0.25 for *Helicotylenchus* spp. to 319 for *Meloidogyne* spp. Other genera, *Criconemoides* spp., *Hemicycliophora* spp., *Helicotylenchus* spp., *Pratylenchus* spp., *Rotylenchulus* spp., *Tylenchorhynchus* spp., and *Tylenchus* spp. had different prominence values.

As for the total average of population density of nematodes associated with peanut, the surveyed nematode ranged from 1 for *Helicotylenchus* spp. to 350 for *Meloidogyne* spp. Other genera *Criconemoides* spp., *Hemicycliophora* spp., *Heterodera* spp., *Pratylenchus* spp., *Rotylenchulus* spp., *Tylenchorhynchus* spp. and *Tylenchus* spp. had different population densities. As for total average of occurrence, it ranged from 2% for *Hemicycliophora* spp. to 87% for *Meloidogyne* spp. Other genera *Criconemoides* spp., *Helicotylenchus* spp., *Heterodera* spp., *Pratylenchus* spp., *Rotylenchulus* spp., *Tylenchorhynchus* spp. and *Tylenchus* spp. had different occurrence values. As for total average of prominence values of nematodes, it ranged from 0.14 for *Helicotylenchus* spp. to 326 for *Meloidogyne* spp. Other genera *Criconemoides* spp., *Hemicycliophora* spp., *Heterodera* spp., *Pratylenchus* spp., *Rotylenchulus* spp., *Tylenchorhynchus* spp. and *Tylenchus* spp. had different prominence values.

Regarding nematodes associated with soybean fields in Nile Delta Governorates (Table 3), the population densities of the surveyed nematodes were ranged from 4 for *Ditylenchus* spp. to 249 for *Tylenchus* spp. Other genera, *Aphelenchoides* spp., *Helicotylenchus* spp., *Pratylenchus* spp., and *Tylenchorhynchus* spp. had different population densities. As for nematode occurrence, it ranged from 25% for *Pratylenchus* spp. and *Ditylenchus* spp. to 100% for *Tylenchus* spp. Other genera, *Aphelenchoides* spp., *Ditylenchus* spp., *Helicotylenchus* spp., and *Tylenchorhynchus* spp. had different occurrence values. As for prominence values of nematodes, they ranged from 3 for *Ditylenchus* spp. to 249 for *Tylenchus* spp. Other genera, *Aphelenchoides* spp., *Helicotylenchus* spp., *Pratylenchus* spp., and *Tylenchorhynchus* spp. had different prominence values.

Regarding nematodes associated with soybean fields in Upper Egypt Governorates the population densities of the surveyed nematodes ranged from 14 for *Tylenchus* spp. to 130 for *Tylenchorhynchus* spp. Other genera, *Aphelenchoides* spp., *Helicotylenchus* spp., *Heterodera* spp., *Longidorus* spp. and *Pratylenchus* spp. had different population densities. As for occurrence, it ranged from 19% for *Tylenchus* spp. to 82% for *Tylenchorhynchus* spp. Other genera, *Aphelenchoides* spp.,

Heterodera spp., *Helicotylenchus* spp., *Longidorus* spp. and *Pratylenchus* spp. had different occurrence values. As for prominence values, they ranged from 9 for *Tylenchus* spp. to 104 for *Tylenchorhynchus* spp. Other genera, *Aphelenchoides* spp., *Heterodera* spp., *Helicotylenchus* spp., *Longidorus* spp. and *Pratylenchus* spp. had different prominence values.

As for the total average of population density of nematodes associated with soybean, the surveyed nematode ranged from 2 for *Ditylenchus* spp. to 132 for *Tylenchus* spp. Other genera, *Aphelenchoides* spp., *Heterodera* spp., spp., *Longidorus* spp., and *Tylenchorhynchus* spp. had different population densities. As for total average of occurrence, it ranged from 13 % for *Ditylenchus* spp. to 75 % for *Tylenchorhynchus* spp. Other genera, *Aphelenchoides* spp., *Heterodera* spp., spp., *Longidorus* spp., and *Tylenchus* spp. had different occurrence values. As for total average of prominence values of nematodes, they ranged from 1.25 for *Ditylenchus* spp to 129 for *Tylenchus* spp. . Other genera, *Aphelenchoides* spp., *Heterodera* spp., spp., *Longidorus* spp., and *Tylenchorhynchus* spp. had different prominence values.

As for nematodes associated with sunflower fields in Nile Delta Governorates (Table 4), the population densities of the surveyed nematodes ranged from 2 for *Pratylenchus* spp. to 90 for *Helicotylenchus* spp. Other genera, *Ditylenchus* spp., *Tylenchorhynchus* spp. and *Tylenchus* spp. had different population densities. As for nematode occurrence, it ranged from 3% for *Pratylenchus* spp. to 100% for *Helicotylenchus* spp. Other genera, *Ditylenchus* spp., *Tylenchorhynchus* spp. and *Tylenchus* spp. had different occurrence values. As for prominence values, they ranged from 1.1 for *Pratylenchus* spp. to 90 for *Helicotylenchus* spp. Other genera, *Ditylenchus* spp., *Tylenchorhynchus* spp. and *Tylenchus* spp. had different prominence values. The genus *Tylenchorhynchus* spp. had the highest prominence values, whereas the genera *Ditylenchus* spp., *Pratylenchus* spp. and *Tylenchus* spp. had the lowest ones.

Nematodes associated with sunflower fields in Upper Egypt Governorates were illustrated in Table 4. The population densities of the surveyed nematodes ranged from 2 for *Heterodera* spp. to 1547 for *Meloidogyne* spp. Other genera, *Ditylenchus* spp., *Helicotylenchus* spp., *Heterodera* spp., *Hoplolaimus* spp. *Rotylenchulus* spp., and *Tylenchorhynchus* spp., had different population densities . As for nematode occurrence, it ranged (Table 4) from 3% for *Heterodera* spp. to 89% for *Meloidogyne* spp. Other genera, *Ditylenchus* spp., *Helicotylenchus* spp., *Hoplolaimus* spp. *Rotylenchulus* spp., and *Tylenchorhynchus* spp., had different occurrence values. As for prominence values, they ranged (Table 4 and Fig. 1), from 0.36 for *Heterodera* spp. to 1504 for *Meloidogyne* spp. Other genera, *Ditylenchus* spp., *Helicotylenchus* spp., *Hoplolaimus* spp. *Rotylenchulus* spp., and *Tylenchorhynchus* spp., had different prominence values.

As for the total average of population density of nematodes associated with sunflower, the surveyed nematode ranged from 1 for *Heterodera* spp. to 1160 for *Meloidogyne* spp. Other genera, *Ditylenchus* spp., *Hoplolaimus* spp., *Helicotylenchus* spp., *Longidorus* spp., *Pratylenchus* spp., *Rotylenchulus* spp *Tylenchorhynchus* spp. and *Tylenchus* spp., had different population densities. As for total average of occurrence, it ranged from 2% *Tylenchus* spp to 67% for *Meloidogyne* spp. Other genera, *Ditylenchus* spp., *Hoplolaimus* spp., *Helicotylenchus* spp. ,*Longidorus* spp., *Pratylenchus* spp., *Rotylenchulus* spp and *Tylenchorhynchus* spp. had different occurrence values. As for total average of prominence values of nematodes, they ranged from 34 for *Longidorus* spp. to 1128 for *Meloidogyne* spp. Other genera, *Ditylenchus* spp., *Hoplolaimus* spp., *Helicotylenchus* spp., *Pratylenchus* spp., *Rotylenchulus* spp and *Tylenchorhynchus* spp. had different prominence values.

Identification of *Meloidogyne* spp., by using Phast System Isozymes Apparatus, indicated that only *Meloidogyne javanica* was the dominant species from all root peanut samples collected from three Governorates i.e. Beni Suef, Ismailia and Beheira (Table 5).

Discussion

Injury to some oil crops caused by certain pathogenic nematodes has been reported in many countries (Carpenter and lewis (1991); Fulling and Sinclair (1991); Mendes and Dickson (1993), Chhabra et al.; (1992), Jaehn et al. (1998) and Sun and Liu (1992). The present work demonstrated that there were thirteen nematode genera viz., *Aphelenchoides*, *Criconeoides*, *Diphtherophora*, *Ditylenchus*, *Helicotylenchus*, *Heterodera*, *Hoplolaimus*, *Longidorus*, *Meloidogyne*, *Pratylenchus*, *Rotylenchulus*, *Tylenchorhynchus* spp. and *Tylenchus* spp., associated with soil of the studied crops (rapeseed, peanut, soybean and sunflower). In this study, most of surveyed fields had population of

over 200 individuals of *Meloidogyne spp.* per 200 gram soil, except rapeseed crop fields. This population level was generally higher than those reported by certain authors in the world countries (Amaranatha and Krishnappa (1989a,b), Oever *et al.*; (1998) and Zazzerini and Tosi (1997) and Idowu *et al.* (1999). *Criconemoides*, *Diphtherophora*, *Ditylenchus*, *Helicotylenchus*, *Heterodera*, *Hoplolaimus*, *Longidorus* and *Tylenchorhynchus* nematode genera had also been found to be associated with some oil crop fields. The damage of the previous nematodes to some oil crops are not well documented, however, they cause root decay and reduction in plant growth parameters (Fulling and Sinclair, 1991; Smolik *et al.*, 1996; Warner *et al.*, 1994).

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Distribution and oil crops association of plant parasitic nematodes in Egypt

Table 1

Population density (PD), % frequency of occurrence (FO) and prominence value (PV) of plant parasitic nematodes associated with rapeseed in Nile Delta and Upper Egypt

Nematode genera	Nile Delta									Upper Egypt											Total averages					
	El-Ghurbia			Kafr El-Sheaikh			Averages			Beni-Suef			Giza			Sohag			Averages							
	PD	FO	PV	PD	FO	PV	PD	FO	PV	PD	FO	PV	PD	FO	PV	PD	FO	PV	PD	FO	PV	PD	FO	PV	PD	FO
<i>Criconemoides</i>	-	-	-	-	-	-	-	-	-	-	-	-	84	60	65	-	-	-	28	20	22	17	12	13		
<i>Ditylenchus</i>	63	60	49	-	-	-	32	30	25	17	27	9	35	53	26	44	40	28	32	40	63	32	36	22.4		
<i>Helicotylenchus</i>	45	70	38	60	50	42	53	60	40	-	-	-	-	-	-	70	67	27	70	67	27	35	37	21.4		
<i>Heterodera</i>	15	50	11	-	-	-	8	25	6	7	13.3	3	-	-	-	8	6.6	2	5	7	2	6	14	3		
<i>Hoplolaimus</i>	-	-	-	-	-	-	-	-	-	16	27	8	18	15	3	45	90	44	23	44	18	16	26.4	11		
<i>Longidorus</i>	-	-	-	-	-	-	-	-	-	-	-	-	30	20	13	-	-	-	10	7	4	6	4	3		
<i>Meloidogyne</i>	-	-	-	-	-	-	-	-	-	-	-	-	9	10	3	-	-	-	3	3.3	1	2	2	0.6		
<i>Pratylenchus</i>	-	-	-	-	-	-	-	-	-	70	63.3	53.3	127	95	123	44	47	30	80	68	72	48	41	41		
<i>Rotylenchulus</i>	-	-	-	-	-	-	-	-	-	20	3	11	-	-	-	30	90	28	25	67	20	10	17	8		
<i>Tylenchorhynchus</i>	704	100	704	53	70	44	379	85	374	50	60	38	98	95	95	24	20	10	57	58	48	186	69	178		
<i>Tylenchus</i>	47	50	33	86	30	47	67	40	40	-	-	-	157	100	157	130	27	16	96	42.3	58	84	41	21		

Table 2

Population density (PD), % frequency of occurrence (FO) and prominence value (PV) of plant parasitic nematodes associated with peanut in Nile Delta and Upper Egypt

Nematode genera	Nile delta												Upper Egypt													Total averages						
	Ismailia			El-Beheira			El-Sharkia			Averages			Aswan			Beni-Suef			El-Fyoum			Giza			Averages							
	PD	FO	PV	PD	FO	PV	PD	FO	PV	PD	FO	PV	PD	FO	PV	PD	FO	PV	PD	FO	PV	PD	FO	PV	PD	FO	PV	PD	FO	PV	PD	FO
<i>Criconemoides</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	154	100	154	5	5	1	40	26	39	23	15	22		
<i>Ditylenchus</i>	29	60	23	-	-	-	-	-	-	10	20	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	9	3.3		
<i>Hemicycliophora</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	85	12	20	-	-	-	21	3	5	12	2	3		
<i>Helicotylenchus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	5	1.0	1	1	0.25	1	0.71	0.14		
<i>Meloidogyne</i>	390	90	370	280	100	280	350	100	350	340	97	333	300	100	300	250	55	185	280	60	217	609	90	572	360	76	319	350	87	326		
<i>Pratylenchus</i>	20	40	13	130	70	109	-	-	-	50	37	41	-	-	-	-	-	-	250	100	250	328	80	293	145	45	136	104	41	95		
<i>Rotylenchulus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50	30	27	-	-	-	90	30	49	35	15	19	20	8	11			
<i>Tylenchorhynchus</i>	250	80	224	-	-	-	90	50	64	113	43	96	24	100	24	158	55	117	81	100	81	240	22	110	126	69	83	120	58	89		
<i>Tylenchus</i>	35	50	37	-	-	-	46	40	29	27	30	22	27	100	27	50	30	27	62	100	62	22	8	6	40	60	31	35	47	27		

Table 3

Population density (PD), % frequency of occurrence (FO) and prominence value (PV) of plant parasitic nematodes associated with soybean in Nile Delta and Upper Egypt

Nematode genera	Nile Delta									Upper Egypt											
	El-Gharbia			Kafr El-Sheaikh			Averages			Beni-Suef			Giza			Averages			Total averages		
	PD	FO	PV	PD	FO	PV	PD	FO	PV	PD	FO	PV	PD	FO	PV	PD	FO	PV	PD	FO	PV
Aphelenchoids	35	100	35	72	50	50	54	75	43	19	23.3	9.17	22	83.3	20.2	21	54	15	37	64	29
<i>Ditylenchus</i>	7	50	5	-	-	-	4	25	3	-	-	-	-	-	-	-	-	-	2	13	1.25
<i>Helicotylenchus</i>	8	53.3	6	-	-	-	4	26	3	63	47	43	-	-	-	32	23	22	18	25	12
<i>Heterodera</i>	-	-	-	-	-	-	-	-	-	27	27	13	35	77	31	31	52	22	16	26	11
<i>Longidorus</i>	-	-	-	-	-	-	-	-	-	21	30	12	22	63	17	21	46	15	11	23	7
<i>Pratylenchus</i>	10	50	6	-	-	-	5	25	3	48	40	25	5	13.3	2	27	26	14	16	26	8
<i>Tylenchorhynchus</i>	10	100	10	58	33	33	34	67	22	194	73	166	65	90	42	130	82	104	82	75	63
<i>Tylenchus</i>	12	100	12	486	100	486	249	100	249	28	37	17	-	-	-	14	19	9	132	59	129

Table 4

Population density (PD), % frequency of occurrence (FO) and prominence value (PV) of plant parasitic nematodes associated with sunflower in Nile Delta and Upper Egypt

Nematode genera	Nile Delta						Upper Egypt														
	El-Sharkia			Averages			Beni-Suef			El-Fyoum			Giza			Averages			Total averages		
	PD	FO	PV	PD	FO	PV	PD	FO	PV	PD	FO	PV	PD	FO	PV	PD	FO	PV	PD	FO	PV
<i>Ditylenchus</i>	9	11	3	9	11	3	22	33	13	-	-	-	11	6	3	11	13	5	11	13	5
<i>Helicotylenchus</i>	90	100	90	90	100	90	-	-	-	-	-	-	125	100	125	42	33.3	42	54	50	54
<i>Heterodera</i>	-	-	-	-	-	-	-	-	-	-	-	-	5	6	1.1	2	3	36	1	2	34
<i>Hoplolaimus</i>	-	-	-	-	-	-	-	-	-	-	-	-	15	10	5	5	3	2	4	3	1.25
<i>Longidorus</i>	-	-	-	-	-	-	-	-	-	-	-	-	5	6	1.1	2	3	36	1	2	34
<i>Meloidogyne</i>	-	-	-	-	-	-	238	66.6	112	2889	100	2889	1514	100	1514	1547	89	1504	1160	67	1128
<i>Pratylenchus</i>	2	3	1.1	2	3	1.1	36	33.3	21	-	-	-	-	-	-	12	11	7	10	9	6
<i>Rotylenchulus</i>	-	-	-	-	-	-	22	33.3	13	118	100	118	70	100	70	70	78	67	53	58	50
<i>Tylenchorhynchus</i>	40	37	24	40	37	24	55	33.3	31	168	100	168	150	100	150	124	78	116	93	58	87
<i>Tylenchus</i>	5	8	1.4	5	8	1.4	-	-	-	-	-	-	-	-	-	-	-	-	1	2	35

Table 5

Species of *Meloidogyne* recovered from the infested peanut roots collected from different localities of Egypt

Locality	% frequency of occurrence of <i>Meloidogyne</i> species		
	<i>M. arenaria</i>	<i>M. javanica</i>	<i>M. incognita</i>
Beheira	-	100	-
Beni suef	-	100	-
Ismailia	-	100	-