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Phytonematode Community Structure and Dynamics on Ornamental Plantations of Egypt

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Abstract

In a survey study, 21 phytonematode genera, *Aphelenchoides, Criconemoides, Brachydorus, Criconema, Ditylenchus, Helicotylenchus, Hemicriconemoides, Hemicycliophora, Heterodera, Hoplolaimus, Longidorus, Meloidogyne, Paratylenchus, Pratylenchus, Rotylenchulus, Scutellonema, Tetylenchus, Tylenchorhyncus, Tylenchulus, Tylenchus* and *Xiphinema* were found infesting rhizosphere of ornamental plantations in 5 Egyptian governorates. As the soil lighten, the nematode genera thrive, populate and diverse. *Helicotylenchus, Hoplolaimus* and *Paratylenchus* were recorded in high abundance and density in peat samples. The surveyed perennials were poor in their infestation. *Helicotylenchus, Rotylenchulus, Tylenchorhynchus* and *Tetylenchus* were in common association with the ornamental trees (Italian cypress, Ficus and Flamboyant). Nematode genera abundance and density were variable in shrubs. Paspalum samples infested with 15 out of the recorded 21 genera.

Dynamics of *Criconemoides, Helicotylenchus, Hoplolaimus* and *Rotylenchulus* on four shrubs (Schefflera, Windoleaf, Dodonea, Lantana) grow in clay loam soil indicate that nematodes achieved high and low seasonal patterns depending on soil temperature, host plant, nematode species and nature of nematode parasitism.

Keywords: Ornamentals, Nematodes, Survey, Dynamics.

Introduction

Economic importance of ornamental plants is increasing in Egypt. Egypt's exports values of ornamental and cut flowers was estimated by EGP 350 million **(Ministry of Agriculture, 2013).** Ornamental and flower culture plantations are severely infested with several stylet bearing nematode genera. *Criconemoides, Tylenchorhynchus, Rotylenchulus, Pratylenchus, Paratylenchus, Helicotylenchus, Heterodera, Xiphinema, Longidorus, Hoplolaimus, Ditylenchus, Criconemella* and *Aphelenchoides* were found infesting rhizosphere of carnation, roses, flower bulbs, chrysanthemum **(Streu *et al.,* 1961; Kim *et al.,* 1987; Nagesh and Reddy 1996; Khanna *et al.,* 1997 and Singh and Sharma 1998).**

The knotting nematode species, *Meloidogyne incognita*, *M. javanica* and *M. arenaria* were identified infecting carnation, chrysanthemum, gladiolus, tulip, narcissus and snapdragon **(Kinshakova, 1968; Sen and Dasgupta, 1977;**

Brezeski *et al*., 1979; Saka and Siddiqi, 1979; Nagesh and Reddy 1996; Tenete, 1996; Jagridar, 2005, Singh and Sharma, 1998; Deimi *et al.,* 2008; Brito *et al.,* 2010 and El-Sherbiny, 2011).

The seasonal effects on the population dynamics of plant parasitic nematodes have been extensively studied on different hosts. The multivariate structure in nematode community is depending on many edaphic and biotic factors, temperatures, soil type, soil moisture, soil depth, pH, organic substance, rainfall, host type and cultivar compatibility, microflora, microfauna, host root distribution and even the interrelationships between two or more of these factors **(Al-Sayed, 1983; Kesba, 1999; Neher *et al.,* 2004; McGroary 2009; Renco *et al.,* 2010 and Gantait and Bhattacharya, 2013).**

The objective of this study was to:

1. Define and document the abundance and density of plant parasitic nematodes associated with some ornamentals.
2. Study the phytonematode community structure and dynamics on ornamental shrubs.

Materials and Methods

Survey, nematode numeration and identification:

Nine hundreds and nine soil and root samples were collected for nematode analysis from different Egyptian governorates (Beheira, Cairo, Giza, Qalyubia and Sharqia) growing fifteen ornamental plant species (Table 1). Each sample was composite of two subsamples obtained from plant rhizosphere at 0-15 cm depth. All samples were kept in polyethylene bags labeled and sent to laboratory for nematode extraction, identification and numeration.

Modifies Cobb's sieving and Baermann funnel technique **(Hooper *et al.,* 2005)** was followed by using a series of sieves for nematode extraction from soil. The suspension containing nematodes was then poured gently over a double layered tissue paper placed over plastic dishes. After 48 hr the nematode suspension was collected and examined under a stereoscopic binocular microscope. The nematode genera were tentatively identified by comparing the characters given by **Mai and Lyon (1975).** They were confirmed by making semi-permanent and permanent slides.

The population densities of different nematode genera in the samples were calculated using the formulae (Norton, 1978):

$$\text{Absolute density} = \frac{\text{Number of individuals of a species in a sample}}{\text{Volume or mass or units of the sample}} \times 100$$

$$\text{Relative frequency} = \frac{\text{Frequency of a species}}{\text{Sum of frequencies of all spp.}} \times 100$$

$$\text{Absolute frequency} = \frac{\text{Number of samples containing a species}}{\text{Number of samples collected}} \times 100$$

Table (1): Scientific, common and arabic names of surveyed ornamental plants.

Plant group	Scientific name*	Common name	Arabic name
Lawns	*Paspalum vaginatum*	Paspalum 10	نجيل بسبالم
	Chrysanthemum morifolium	Chrysanthemum	الارولا
Perennials	*Epipremnum aureum*	Pothos	البوتس
	Solidago sp.	Goldenrod	السيليداجو
	Aralia spinosa	Devil's walking stick	أراليا
	Codiaeum variegatum	Croton	كروتن
	Cordyline fruticosa	Cordyline	كوردالين
Shrubs	*Cycas revoluta*	Sago palm	سيكاس
	Dracaena fragrans	Corn Plant	الدراسينا
	Gardenia jasminoides	Gardenia	الجاردنيا
	Rosa spp	Rose	الورد
	Schefflera arboricola	Schefflera	شيفليرا
	Cupressus macrocarpa	Italian cypress	سرو ليموني
Trees	*Delonix regia*	Flamboyant	بوانسيانا
	Ficus benjamina	Ficus	فيكس

* www.desert-tropicals.com/Plants/sci_names_D.html
* www.floridata.com/lists/contents.cfm?alphaLetter=Z

Nematode seasonal fluctuation:

Fluctuations of plant parasitic nematodes associated with 4 ornamental plant species (Schefflera, Dodonaea, Lantana and Window leaf) were conducted in a clay loam soil (coarse sand 17.8%, fine sand 22.2%, silt 20.0%, clay 40.0%, pH 8.2 and E.C. 10.9), weed-free area at Aquatic garden, Faculty of Agriculture, Cairo university, Giza Governorate. For it to work out the sampled plants were selected at random and labeled as permanent sampling sites. From each plant, a total of 3 soil sub-samples were taken at each sampling site to form a composite soil sample of 250 g each at 0 – 25 cm depth, were collected at monthly intervals for one year (Starting November, 2011 to October, 2012) by using manual auger. In all cases, the soil samples collected were in close contact with the plant roots. Soil temperature was recorded monthly at the sampling time by assistance of Soil Department, Faculty of Agriculture, Cairo University (Fig. 1). Soil samples were processed for nematode extraction by means of centrifugal-flotation technique (Jenkins, 1964) and counted using Hawksley counting slid. Population density of nematode genera was determined throughout the period of investigation.

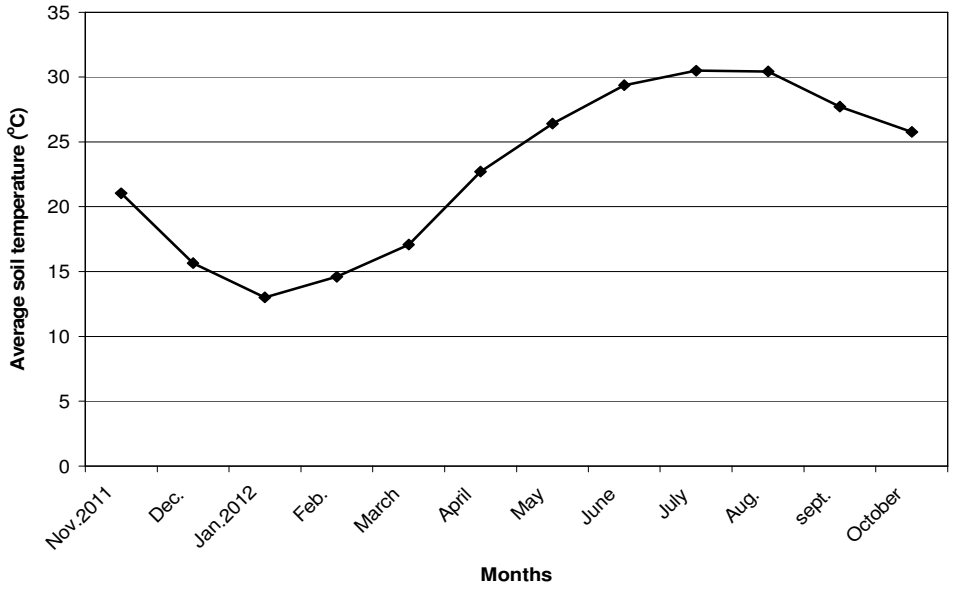

Fig. (1): Average soil temperature at sampling sites during November, 2011 to October, 2012.

Results

Data in table (2) reveal that 21 phytonematode genera were recovered from 909 soil samples collected from 15 ornamental plant species grown in five Egyptian governorates. The nematode genera, *Criconemoides, Helicotylenchus* and *Rotylenchulus* were the most prevalent in all surveyed localities ranging from high to low population density. Most nematode genera were recovered from nurseries and ornamental plantations of Cairo, Giza followed by Sharqia governorates. Only four genera, *Criconemoides, Helicotylenchus, Pratylenchus* and *Rotylenchulus* were detected in Qalyubia. *Brachydorus* and *Scutellonema* were recovered in Sharqia. Each of *Criconema, Hemicriconemoides, Hemicycliophora, Ditylenchus* and *Heterodera* were recovered from Cairo, Giza and Beheria, respectively.

With regard to the nematode distribution according to soil type (Table 3), sandy soils were rich in their infestation with nematode genera. The spiral, ring followed by reniform and root-knot nematodes distributed and populated highly in sandy soils. It is interesting to notice that the nematode genera *Helicotylenchus, Hoplolaimus* and *Paratylenchus* were recovered in high population density and frequencies of occurrence in peat samples. *Meloidogyne* and *Rotylenchulus* were rather low. Sandy soils were free from *Aphelenchoides, Brachydorus, Ditylenchus* and *Tetylenchus.* Sandy loam soils exhibited high levels of infestations and density of *Criconemoides* and *Helicotylenchus*. High to relatively low infestations with *Helicotylenchus* and *Rotylenchulus* were exhibited by clay soils.

Table (2): Distribution, occurrence and density of plant parasitic nematodes encountered in different ornamental locations.

Nematode Genera	Beheira (69)		Cairo (60)		Giza (698)		Qalyubia (35)		Sharqia (47)	
	P.D.	F.O.	P.D.	F.O.	P.D.	F.O.	P.D.	F.O.	P.D.	F.O.
Aphelenchoides (Fischer, 1894)	0	0	0	0	440	0.29	0	0	0	0
Brachydorus (de Guiran and Germani, 1968)	0	0	0	0	0	0	0	0	550	2.13
Criconemoides (Tylor, 1936)	1950	28.99	2710	35.00	522	0.86	544	14.29	0	0
Criconema (Hofmanner and Menzel, 1914)	0	0	660	3.33	0	0	0	0	0	0
Ditylenchus (Filipjev, 1936)	0	0	0	0	83	1.15	0	0	0	0
Helicotylenchus (Steiner, 1945)	1667	8.70	952	35.00	897	23.21	230	2.86	8276	19.15
Hemicriconemoides (Chitwood and Birchfield, 1957)	0	0	825	16.67	0	0	0	0	0	0
Hemicycliophora (de Man, 1921)	0	0	0	0	400	0.43	0	0	0	0
Heterodera (Schmidt, 1871)	300	2.90	0	0	0	0	0	0	0	0
Hoplolaimus (Daday, 1905)	0	0	563	20	1036	7.88	0	0	0	0
Longidorus (Filipjev, 1934)	800	8.70	300	1.67	550	0.14	0	0	0	0
Meloidogyne (Göldi, 1892)	1200	1.45	413	5.00	627	7.02	0	0	340	8.51
Paratylenchus (Micoletzky, 1922)	0	0	165	1.67	4308	9.03	0	0	0	0
Pratylenchus (Filipjev, 1936)	0	0	1087	13.33	374	3.58	310	5.71	575	4.26
Rotylenchulus (Linford and Oliveira, 1940)	400	1.45	1320	3.33	634	12.18	914	17.14	1320	4.26
Scutellonema (Andrassy, 1958)	0	0	0	0	0	0	0	0	1050	2.13
Tetylenchus (Filipjev, 1936)	0	0	0	0	621	1.00	0	0	71	2.13
Tylenchorhynchus (Cobb, 1913)	500	5.80	330	3.33	65	2.29	0	0	0	0
Tylenchulus (Cobb, 1913)	0	0	0	0	400	0.29	0	0	0	0
Tylenchus (Bastian, 1865)	0	0	495	3.33	186	1.58	0	0	242	6.38
Xiphinema (Cobb, 1913)	400	1.45	0	0	366	2.01	0	0	560	2.13

P.D. = Population density (Absolute density).

F.O. = Frequency occurrence (Absolute frequency).

Table (3): Distribution, occurrence and density of plant parasitic nematodes encountered in different ornamental soil types.

Nematode Genera	Sandy (395)			Sandy loam (127)			Clay (185)			Peat (202)		
	P.D.	F.O.	R.F.	P.D.	F.O.	R.F.	P.D.	F.O.	R.F.	P.D.	F.O.	R.F.
Aphelenchoides	0	0	0	220	1.57	2.70	88	0.54	0.64	0	0	0
Brachydorus	0	0	0	550	0.79	1.35	0	0	0	0	0	0
Criconemoides	2264	10.94	16.83	1360	1.57	2.70	396	3.24	3.82	0	0	0
Criconema	660	0.51	0.78	0	0	0	0	0	0	0	0	0
Ditylenchus	0	0	0	0	0	0	122	2.16	2.54	44	1.98	2.28
Helicotylenchus	618	15.01	23.10	1793	37.01	63.51	1189	16.22	19.08	1075	31.19	35.85
Hemicriconemoides	825	2.54	3.91	0	0	0	0	0	0	0	0	0
Hemicycliophora	400	0.76	1.17	0	0	0	0	0	0	0	0	0
Heterodera	300	0.51	0.78	0	0	0	0	0	0	0	0	0
Hoplolaimus	136	4.58	7.05	120	3.15	5.41	68	0.54	0.64	1289	20.30	23.33
Longidorus	807	1.78	2.74	0	0	0	0	0	0	0	0	0
Meloidogyne	111	7.12	10.96	0	0	0	61	4.86	5.72	106	8.42	9.67
Paratylenchus	444	2.04	3.13	0	0	0	339	4.32	5.09	5660	23.27	26.74
Pratylenchus	168	4.83	7.44	442	3.15	5.41	273	8.11	9.54	0	0	0
Rotylenchulus	639	7.89	12.14	811	7.09	12.16	631	28.65	33.70	53	1.98	2.28
Scutellonema	1000	0.25	0.39	1050	0.79	1.35	0	0	0	0	0	0
Tetylenchus	0	0	0	511	0.79	1.35	635	3.24	3.82	0	0	0
Tylenchorhynchus	362	2.29	3.52	330	2.36	4.05	358	4.86	5.72	0	0	0
Tylenchulus	400	0.51	0.78	0	0	0	0	0	0	0	0	0
Tylenchus	339	1.02	1.57	0	0	0	303	4.32	5.09	0	0	0
Xiphinema	467	2.29	3.52	0	0	0	170	3.24	3.82	0	0	0

P.D. = Population density (absolute density).

F.O. = Frequency occurrence (Absolute frequency).

R.F. = Relative frequency.

Data on the population and frequency of occurrence of stylet bearing nematode genera associated with different ornamental species are shown in tables 4 & 5. Data indicate that 15 genera were recovered from Paspalum 10 *Criconemoides, Helicotylenchus, Pratylenchus* and *Rotylenchulus* were found to be the most nematode genera inhabiting paspalum rhizosphere. *Helicotylenchus, Rotylenchulus, Tetylenchus* and *Tylenchorhynchus* were the dominant on trees, Italian cypress, Ficus and Flamboyant. *Paratylenchus* was found in high population and frequency of occurrence on Ficus. *Aphelenchoides* and *Brachydorus* were recovered only from Italian cypress samples.

The perennials sampled were poor in their infestation with phyto-nematodes. The ring and reniform nematodes were abundant in chrysanthemum samples while the root-knot occurred in 66% of golden rod samples with high population density. 20% of Pothos samples were infested with *Meloidogyne* in relatively high density. *Paratylenchus* was also, found in low occurrence.

In shrubs, spiral and lance nematodes occurred in more than 50% of Brassica samples with relatively high population density, followed by reniform and root-knot nematodes. The root knot was recovered from 32% of Devil's walking stick samples. The dagger nematode occurred in 19% of sago palm samples with rather low population density followed by lance nematode. 73% of corn plant samples were infested with the reniform nematode in moderate population density. *Aphelenchoides, Criconemoides* and *Tylenchorhynchus* were found in very low infestation levels in rose samples. More than 50% of croton samples contained *Paratylenchus* with very high population density followed by *Pratylenchus* with 10% frequency of occurrence and rather low density. Almost 10% of gardenia samples were infested with *Meloidogyne* in rather high density followed by the spiral and dagger nematodes.

Temporal dynamics of four plant parasitic nematode genera encountered on four ornamental shrub species grown in one site of non-disturbed clay loam soil in a garden located at faculty of agriculture at Giza were determined in monthly intervals starting in November 2011 to October 2012. Nematode diversity and the population dynamics of *Criconemoides, Helicotylenchus, Hoplolaimus* and *Rotylenchulus* were estimated inclusive together with monthly recording of soil temperature.

Data as shown in Figs. (2, 3, 4 & 5) indicate that the nematodes populations varied widely according to host type and nematode genera during the investigation period. Despite variation in temperature and host type on which seasonal fluctuations mainly depend, nearly all the nematode populations studied remained active in varying degrees during the year. The nematode population had at least two peaks and two drops in their soil populations which were more or less correlated with soil temperature and surely with host compatibility.

The ring nematode, *Criconemoides* peaked in November on Schefflera and sharply decreased in December up to May where a slight increase was recorded then a gradual decrease to September. *Criconemoides* population increased

Table (4): Distribution, occurrence and density of plant parasitic nematodes encountered in some perennials, trees and lawns.

Nematode Genera	Perennials						Trees				Lawns	
	Pothos		Goldenrod		Chrysanthemum		Italian cypress		Ficus		Flamboyant		Paspalum 10	
	P.D	F.O.	P.D	F.O.	P.D	F.O.	P.D	F.O.	P.D	F.O.	P.D	F.O.	P.D	F.O.
Aphelenchoides	0	0	0	0	0	0	880	1.37	0	0	0	0	0	0
Brachydorus	0	0	0	0	0	0	550	1.37	0	0	0	0	0	0
Criconemoides	0	0	0	0	844	7.58	0	0	240	0.93	330	10.53	2353	25.63
Criconema	0	0	0	0	0	0	0	0	0	0	0	0	660	1.25
Ditylenchus	0	0	0	0	0	0	122	5.48	0	0	0	0	0	0
Helicotylenchus	0	0	0	0	0	0	1717	61.64	1651	63.55	457	15.79	929	23.75
Hemicriconemoides	0	0	0	0	0	0	0	0	0	0	0	0	825	6.25
Heterodera	0	0	0	0	0	0	0	0	0	0	0	0	200	1.88
Hoplolaimus	0	0	0	0	0	0	0	0	490	9.53	0	0	563	7.5
Longidorus	0	0	0	0	0	0	0	0	0	0	0	0	706	5
Meloidogyne	500	20	1740	66.67	0	0	0	0	191	6.54	0	0	598	3.13
Paratylenchus	300	6.67	0	0	0	0	0	0	1411	18	0	0	165	0.63
Pratylenchus	0	0	0	0	0	0	0	0	421	5.6	0	0	818	8.75
Rotylenchulus	0	0	0	0	735	3.03	720	1.37	412	7.47	1173	31.6	693	5.63
Scutellonema	0	0	0	0	0	0	1050	1.37	0	0	0	0	100	0.63
Tetylenchus	0	0	0	0	0	0	769	5.48	257	2.8	575	5.3	0	0
Tylenchorhynchus	0	0	0	0	0	0	110	1.37	379	3.73	362	26.32	462	5
Tylenchus	0	0	0	0	0	0	272	5.48	241	1.87	0	0	339	2.5
Xiphinema	0	0	0	0	0	0	0	0	393	1.87	0	0	400	0.63

P.D. = Population density (Absolute density).

F.O=Frequency occurrence (Absolute frequency).

Table (5): Distribution, occurrence and density of plant parasitic nematodes encountered in some shrubs.

Nematode Genera	Shrubs															
	Brassaia		Sago palm		Devil's walking stick		Corn Plant		Rose		Croton		Cordyline		Gardenia	
	P.D	F.O.	P.D	F.O.	P.D	F.O.	P.D	F.O.	P.D	F.O.	P.D	F.O.	P.D	F.O.	P.D	F.O.
Aphelenchoides	0	0	0	0	0	0	0	0	88	1.52	0	0	0	0	0	0
Criconemoides	162	1.6	0	0	0	0	0	0	22	1.61	0	0	0	0	0	0
Ditylenchus	44	6.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Helicotylenchus	614	51.61	0	0	220	4	0	0	0	0	0	0	400	23.81	600	4.55
Hemicycliophora	0	0	0	0	0	0	0	0	0	0	400	4.62	0	0	0	0
Hoplolaimus	480	54.83	256	11.36	0	0	119	7.7	0	0	0	0	0	0	0	0
Meloidogyne	201	20.97	0	0	715	32	80	3.84	0	0	0	0	0	0	725	9.09
Paratylenchus	720	1.61	0	0	0	0	50	3.84	0	0	6717	55.38	0	0	0	0
Pratylenchus	0	0	0	0	0	0	0	0	331	9.52	457	10.77	330	4.76	0	0
Rotylenchulus	823	25.8	0	0	0	0	484	73.07	0	0	266	4.62	417	28.57	0	0
Tylenchorhynchus	110	1.61	0	0	0	0	0	0	88	2.38	0	0	0	0	0	0
Tylenchulus	0	0	400	4.55	0	0	0	0	0	0	0	0	0	0	0	0
Tylenchus	300	3.22	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Xiphinema	162	1.61	400	3.64	0	0	45	3.84	0	0	0	0	50	4.76	800	2.27

P.D. = Population density (absolute density).

F.O=Frequency occurrence (absolute frequency).

sharply depicting highest values in October reaching its second peak. Dodonaea seems to be incompatible host to ring nematode where it recorded low populations most of the year except November its population was relatively moderate.

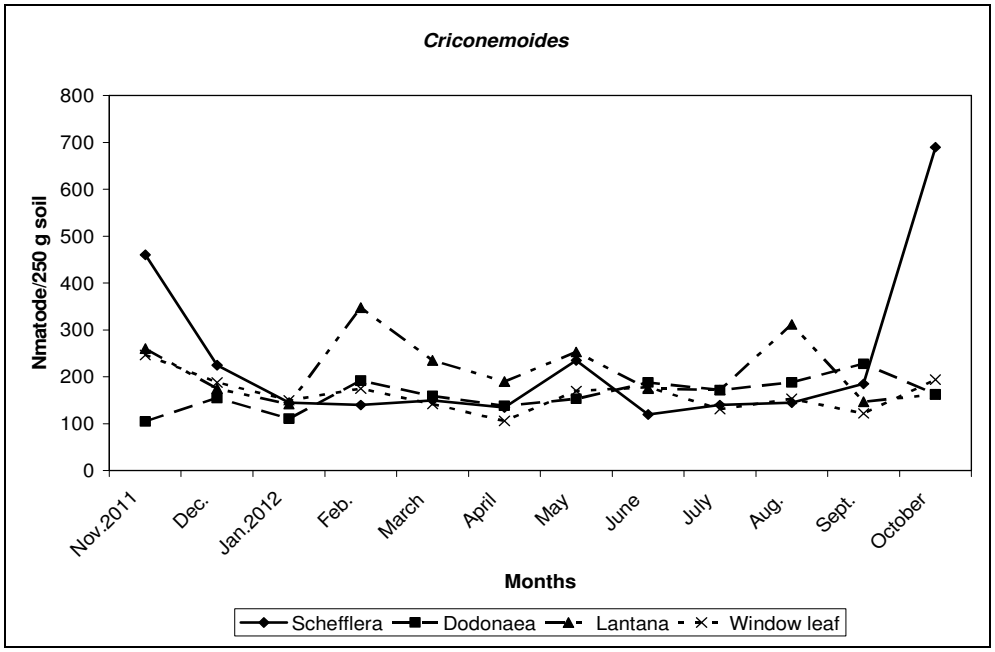

Fig. (2): *Criconemoides* seasonal population changes on four ornamental plants.

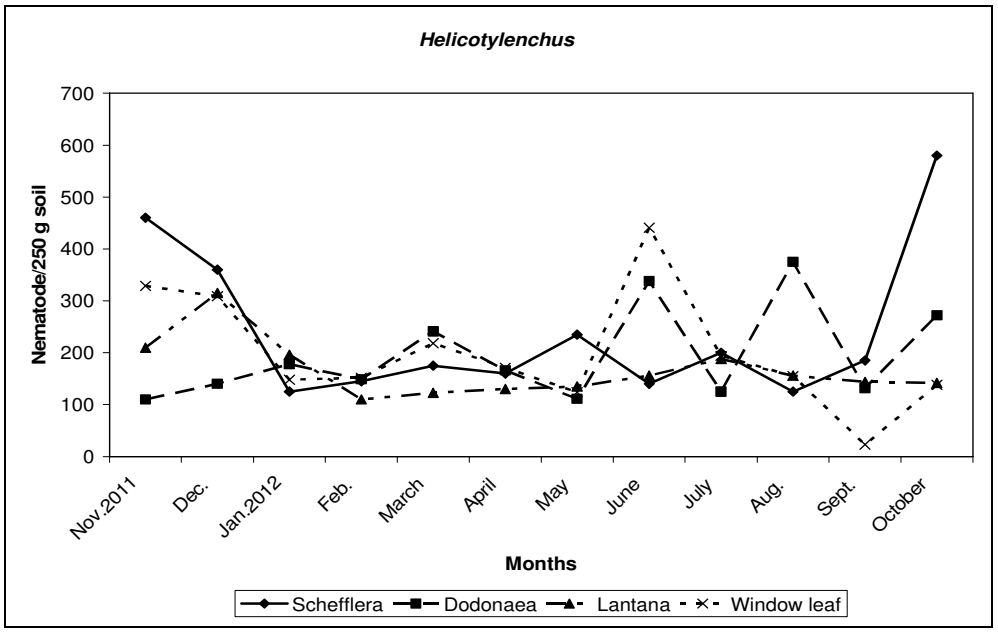

Fig. (3): *Helicotylenchus* seasonal population changes on four ornamental plants.

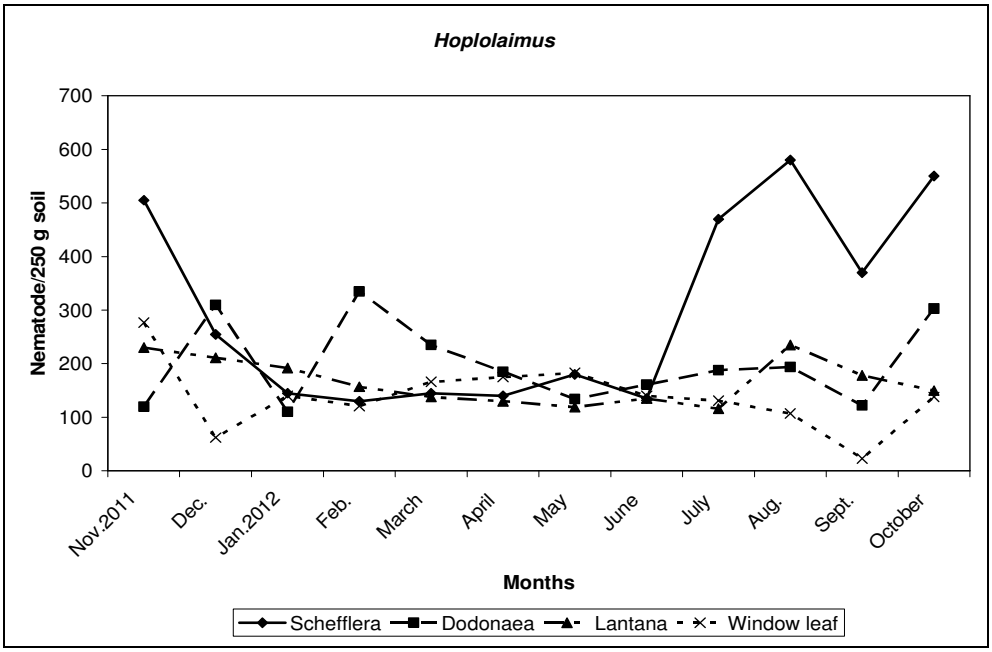

Fig. (4): *Hoplolaimus* seasonal population changes on four ornamental plants.

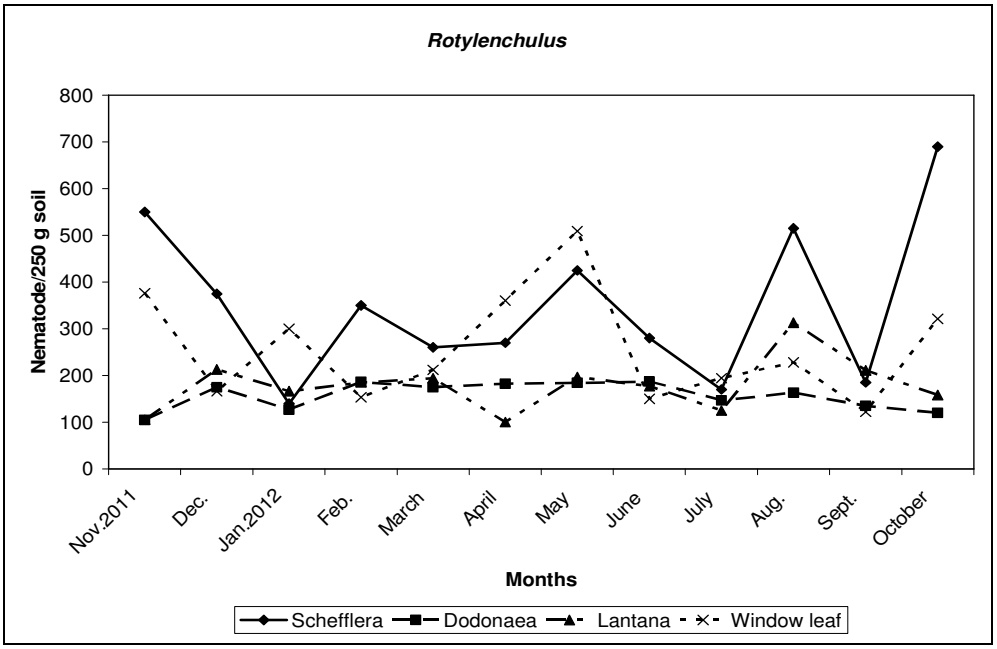

Fig. (5): *Rotylenchulus* seasonal population changes on four ornamental plants.

On Lantana ring nematode peaked in February and August and fluctuated from March to July. The nematode was active during October and November and populated highly, there after a gradual decrease till April and slight increase in May and June on Window leaf.

The spiral nematode, *Helicotylenchus* soil population varied markedly and found in considerable density in November on Schefflera and window leaf then decreased sharply in January. The spiral nematode achieved its second peak on window leaf in June and in October on Schefflera. Two noticeable minima in spiral nematode population in May and September on window leaf. The nematode behaved differently on Dodonaea where its population increased steadily from March to April. The nematode density dropped in May, July and September and achieved two peaks in June and August. The spiral nematode population raised on Lantana during November-December, then decreased sharply in January and February, a gradual but slight increase from March up to July. It reached its highest level in December.

The lance nematode, *Hoplolaimus* populated highly in November on Schefflera then curtailed sharply in the subsequent three months. A slight increase was noticed in spring months. A remarkable increase was observed in July and more numerous were recorded in August. A relapse in nematode population was detected in September. A month later, the nematode population recorded its second peak. On Dodonaea, the lance nematode achieved three moderate peaks in December, February and October, and three drops in November, January and September. A gradual decline in nematode population from March to May then steady increase as soil temperature increase in the three subsequent months.

On window leaf the nematode recorded two sharply drops in December and September. A rise in nematode population during spring and gradual decrease in summer months were obvious. The nematode population was activated by October and a moderate peak was obtained by November. Lantana seems to be unfavorable host to *Hoplolaimus,* the nematode population decline gradually from December to July. One moderate peak was detected from samples collected in August. The reniform nematode, *R. reniformis* population density is strongly influenced by soil temperature and host type. Schefflera maintained the nematode densities at high levels at the end of the season (October-November). Nematode abundance declined rapidly by January. Three gradual peaks with more numerous densities were recorded in February, May and August. Nematode density reached its maxima in October. On window leaf the nematode behaved differently, lowest nematode numbers were recorded in December, February, June and September. Highest peak was reported in May. A steady increase was observed in October and November. On Dodonea almost constant density was observed from February to June, there after a gradual decline in population occurred towards the end of the season. Lantana supported the reniform population poorly, a moderate rise was recorded in August and lowest numbers were recovered in April.

Discussion

Many ornamentals (perennials, lawns, shrubs and trees) are listed as hosts to phytonematofauna with various degrees of infestation all over the world **(Jagirdar, 2005; Deimi *et al.,* 2008; Brito *et al.,* 2010 and El-Sherbiny, 2011).** Our results indicate that the surveyed nurseries and ornamental plantations in 4 governorates in Egypt are subjected to attack by 21 phytonematode genera *Aphelenchoides, Brachydorus, Criconemoides, Criconema, Ditylenchus, Helicotylenchus, Hemicriconemoides, Hemicycliophora, Heterodera, Hoplolaimus, Longidorus, Meloidogyne, Paratylenchus, Pratylnchus, Rotylenchulus, Scutellonema, Tetylenchus, Tylenchorhynchus, Tylenchus* and *Xiphinema.* Their frequencies of occurrence and population densities were variable according to locality, soil and host types. Nurseries and ornamental plantations of Cairo and Giza registered most of the nematode genera recorded. The nematode genera *Criconemoides, Helicotylenchus, Rotylenchulus* and *Scutellonema* were the most dominating in areas of sandy and sandy loam soils. At Beheria governorate, a sandy soil area, recorded *Criconemoides, Helicotylenchus, Longidorus* and *Meloidogyne* in common association with ornamentals. As the soil lighten, the nematode genera diverse. Spiral and reniform nematodes achieved the highest frequencies of occurrence and population densities in areas of clay soils. No wonder that peat samples were infested with *Helicotylenchus, Hoplolaimus* and *Paratylenchus* in highly abundance and density. It is interesting that the spiral nematode was the most dominant in all soil types. However, the surveyed perennials were poor in their infestation with nematode genera, pothos and golden rod were highly infested with the root-knot nematode. *Criconemoides* and *Rotylenchulus* were the only genera recovered in chrysanthemum samples. The nematode genera, *Helicotylenchus, Rotylenchulus, Tylenchorhynchus* and *Tetylenchus* were in common association with ornamental trees (Italain cypress, Ficus and Flamboyant). The landscapes (Paspalum 10) samples were the richest and recorded 15 nematode genera. *Criconemoides, Helicotylenchus, Hemicriconemoides, Pratylenchus* and *Rotylenchulus* were the most abundant. Nematode genera abundance and density were variable in shrubs; *Hoplolaimus, Helicotylenchus, Rotylenchulus* and *Meloidogyne* were high in their frequency of occurrence on Schefflera, *Hoplolaimus* and *Xiphinema* on sago palm, *Meloidogyne* on Devil's walking stick, *Rotylenchulus* on corn plant, *Pratylenchus* and *Paratylenchus* on croton, *Helicotylenchus* and *Rotylenchulus* on cordyline and *Meloidogyne* on gardenia. Our results confirm that occurrence diversity of P.P.N. recovered by many environmental conditions, soil type and host species in particular. Our result were coming along to great extent with those of **Ahuja and Arora 1980; Al-Sayed 1983; Tenete 1996; Khan *et al.,* 1997; Chandel *et al.,* 1997; Ditimiet *et al.,* 2008; Brito *et al.,* 2010; Chatansk and Skwircs, 2011 and El-Sherbiny 2011.**

A study on nematode population dynamics of the most abundant nematode

genera recorded on four shrubs species grown in clay loam soil was carried out starting from November 2011 to October 2012. We infer from our data that the nematode dynamics related to soil temperature and host plant species and there were recognizable high and low seasonal patterns. There were apparent differences of each nematode population on the four hosts and this may attributable to how much compatible or incompatible each host to each nematode population.

High population values of *Criconemoides* were recorded on Schefflera and window leaf in November, Declined in December and fluctuated up to achieve lowest values in April and moved up again in May. However, highest density was found in October, less values of increase were observed on window leaf. On Lantana, three moderate peaks were recorded in February, May and August. It seems that Dodonaea was incompatible host despite a slight gradual increase from May to September was noticed.

The spiral nematode acted differently and soil temperature influence was noticeable. An increase in numbers of nematode was corresponded by increase in soil temperature. *Helicotylenchus* peaked during June on Dodonaea and window leaf and peaked again on the later in August. Highest values of spiral nematode populations were found at the end of the season. Low numbers were recorded on lantana in November, increased to January, dropped in February and a steady slight increase from March to July then declined again up to October. Al-Sayed 1983 reported that *Helicotylenchus* increased gradually on Jasmine as soil temperature increase and reached to remarkable peak in May and July. Pinochet and Cisneros 1986 noticed maximum increase of *Helicotylenchus* during summer months on grape.

The lance nematode populated highly on Schefflera, Dodonaea and window leaf in October and November but in different degrees. Low numbers were recorded on the three hosts in September. Two moderate peaks were noticed on Dodonaea in winter months. Two noticeable drops were observed on window leaf during December and September. Acute fluctuation of the reniform nematode population was recognized according to soil temperature. Schefflera showed more or less similar pattern to that of window leaf. Schefflera was more compatible to *R. reniformis* than window leaf. *R. reniformis* peaked on the two hosts in May when the temperature rise above 30 ºC and related to high precipitation months of Autumn (October-November). The opposite was found on Lantana and Dodonaea, where the low population values were recorded in autumn (October-November). The reniform nematode peaked twice during June and October on Jasmine **(Al-Sayed, 1983)** highest nematode counts were frequently accompanied by high soil temperature and vice versa.

The nematode soil population fluctuations are inversely or positively related to several biotic and abiotic factors such as soil temperature, rainfall, soil structure,

organic substances, microflora, management practices, soil depth, soil moisture, soil pH, soil root interaction, growth and distribution of host roots during growing season **(Siddiqi, 1963; Bakonyi and Nagy, 2000; Neher *et al.,* 2004; McGroary, 2009; Fajardo *et al.*, 2011 and Gantait and Bhattacharya, 2013)** we add nematode plant compatibility, nematode species and nature of nematode parasitism.

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الملخص العربي

التركيب المجتمعي وديناميكية نيماتودا النبات على نباتات الزينة في مصر

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في دراسة حصرية تبين وجود ٢١ جنس *Criconemoides, Brachydorus, Aphelenchoides*, *Helicotylenchus, Hemicriconemoides, Criconema, Ditylenchus*, *Hemicycliophora, Heterodera, Hoplolaimus, Longidorus, Meloidogyne, Paratylenchus, Pratylenchus, Rotylenchulus, Scutellonema, Tetylenchus, Tylenchorhyncus, Tylenchulus, Tylenchus, Xiphinema* تتطفل نباتيًا في منطقة جذور زراعات نباتات الزينة في خمس محافظات مصرية، وقد تبين أن التنوع في المجتمع النيماتودي وكثافته كان مرتبطاً بنوع التربة ونوع العائل النباتي، وقد كانت أجناس النيماتودا الحلزونية والرمحية والدبوسية أعلى الأجناس في نسب ظهورها وكثافتها العددية في عينات البيت. كما سجلت أقل نسب ظهور وكثافة من أجناس النيماتودا علي نباتات الزينة الحولية. وقد كانت أجناس النيماتودا الحلزونية والكلوية والتقزم قاسماً مشتركاً في جميع أشجار الزينة كما اختلفت نسب ظهورها وكثافتها علي شجيرات الزينة . وكانت عينات النجيل أغناها بأجناس النيماتودا وكثافتها العددية.

وبدراسة التغير الموسمي للنيماتودا الحلقية والحلزونية والرمحية والكلوية علي أربعة أنواع من شجيرات الزينة لمدة عام وجد أن كل جنس له علي الأقل مرتان يزيد فيهما العدد كثيرًا ومرتان يقل فيهما كثيراً وأن ذلك كان مرتبطًا بحرارة التربة ونوع العائل النباتي ونوع النيماتودا وطبيعة تطفلها.