

## Indigenous plant parasitic nematodes associated with ornamental palms from Egypt

Ismail, A. E. and Eissa, M. F. M.\*

### 1 Introduction

Ornamental palms are used increasingly to decorate parks, home gardens and roads. The area used for production of these trees is small in comparison with the total land area under cultivation, despite the cash return being high because of their high sale value. Many workers have recorded the presence of numerous plant parasitic nematode genera associated with ornamental palms all over the world. In Florida VAN WEERDT et al. (1959) showed distribution of the following nematode genera on coconut palm, *cocos nucifera*; *Aphelenchoides*, *Criconemoides*, *Helicotylenchus*, *Hemicriconemoides*, *Hemicycliophora*, *Heterodera*, *Hoplolaimus*, *Meloidogyne*, *Pratylenchus*, *Radopholus similis*, *Rotylenchulus reniformis*, *Rotylenchus*, *Trichodorus*, *Tylenchorhynchus* and *Xiphinema*. SHER (1963) reported that *Sabal palmetto*, in England was injured by *Peltamigratus christiei*. GOODEY et al. (1965) found *Meloidogyne incognita acrita* on lady palm, *Rhapis* sp. and Washington palm, *Washingtonia* sp. in North Carolina - RUEHLE (1967) stated that *Meloidogyne* sp. was associated with *Livistona chinensis* and *Washingtonia* sp. In Egypt, OTEIFA et al. (1970) reported infection of date palm, *Phoenix dactylifera* by *M. arenaria*, *M. incognita*, *M. incognita acrita* and *M. javanica*. In Algeria, LAMBERTI et al. (1975) reported the occurrence of *Meloidogyne* sp. and *Pratylenchus penetrans* on date palm, *Phoenix dactylifera*. In India many different nematodes have been found to be associated with *Cocos nucifera* (GOVINDANKUTTY and KOSHY, 1978 and 1979), but the major nematode disease affecting the crop is red ring disease caused by *Rhadinaphelenchus cocophilus*. They added that the only other nematode known to cause damage to coconut is *Radopholus similis*. Red ring disease has been found in many various palm trees (GRIFFITH and KOSHY, 1990), including: *Acrocomia aculeata* *A. intumescens*, *Phoenix canariensis*, *P. dactylifera*, *Roystonea oleracea*, *R. regia* and *Sabal palmetto*. Dasgupta and Rama (1987) found *Radopholus similis* on *Arecastrum romanofianum*, *Chamaedorea cataractarum*, *Cocos nucifera*, *Phoenix canariensis*, *P. dactylifera*, *Rhapis excelsa* and *Roystonea regia*.

Thus, the objective of conducting this study was to provide information on the distribution of phytonematode genera in three botanical gardens in Egypt where ornamental palms are extensively grown.

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\* Department of Plant Pathology, National Research Centre, Dokki, Cairo, Egypt

## 2 Material and Methods

The present detection of plant parasitic nematodes was carried out in three botanical gardens namely, Kasr El-Manial, Orman and Zohria. Soil and root samples were collected from the root zones of various palm species 25 - 30 years old at a depth of 60 - 70 cm by using a manual auger. The required depth for screwing the auger into the rhizosphere was indicated when the roots became more brittle. Samples were mixed thoroughly and taken in line with CHRISTIE and PERRY's (1951) sieving and decanting method. Nematodes were finally extracted from the soil suspensions by the centrifugal flotation technique (JENKINS, 1964). The number of nematodes per ml suspension was determined and identified to the generic level according to GOODEY (1963).

## 3 Results and Discussion

Data concerning plant parasitic nematodes associated with different palm species in three botanical gardens are presented in Tables (1 - 3). The soil samples of Kasr El-Manial garden showed the presence of ten nematode genera (Table 1). The reniform nematode, *Rotylenchulus reniformis*, the spiral nematode, *Helicotylenchus*, the bulb nematode, *Ditylenchus* and the ring nematode, *Criconemoides*, which appeared to be the most dominant genera encountered. The highest incidence of *Rotylenchulus reniformis* was on *Chrysalidocarpus lutescense*, *Thrinax parviflora* and *Phoenix dactylifera* and the lowest on *Washingtonia filifera*, but this nematode was totally absent in some samples including: *Caryota urens*, *Chameolaria humilis*, *Kentia belmoreana*, *Rhapis humilis*, *Trachycarpus fortunei* and *Walichia sp.* (Table 1).

Seven plant parasitic nematodes were only detected in soil samples of Orman garden (Table 2), viz., *Helicotylenchus*, *Rotylenchulus reniformis*, *Criconemoides*, *Ditylenchus*, *Tylenchus*, *Longidorus* and *Diphtherophora* in a decreasing order. Spiral nematodes were highly populated on *Thrinax parviflora*, *Phoenix canariensis* and *Rhapis flabelliformis* and the lowest population on *Sapal palmetto* and totally absent on *Kentia sp.* and *Ptecosperma elegans*.

The same trend was also noticed in El-Zohria garden, whereas the spiral nematodes were the highest in terms of population, followed by reniform and ring nematodes (Table 3). The highest population density of the spiral nematodes was on *Phoenix dactylifera* and the lowest population density was on *Caryota mitis* and they were totally absent on *Arecastrum romanzoffianum*, *Binanga gracilior*, *Livistona australis*, *Phoenix sp.* and *Walichia*. The ring nematodes' highest population was on *Livistona australis*, followed by *Phoenix canariensis* and negligible population densities were detected on *Walichia sp.* (Table 3).

The data shows that ornamental palm species are favourable hosts for plant parasitic nematode genera, particularly *Criconemoides*, *Helicotylenchus* and *Rotylenchulus reniformis*. Whereas all the ornamental palm species were associated with the previous mentioned nematode genera.

In general, it was concluded that the collected soil of different palm species from botanical gardens revealed the presence of certain predominant nematode genera as followed: *Criconemoides*, *Ditylenchus*, *Helicotylenchus*, *Rotylenchulus reniformis* and *Tylenchus*. The two genera *Helicotylenchus* and *Rotylenchulus reniformis* were detected in almost all the processed samples in higher population densities than any other nematode. Based on this study, the remarkable poor growth in some ornamental palms could be attributed to the presence of these ecto-, semiendo- and endo parasitic forms of nematodes.

**This work is considered as a step towards the clarification of the pathogenic role which these nematodes might be playing in the economic production and protection of ornamental palm species in Egypt.**

#### **4 Summary**

Samples of 24 available ornamental palm rhizosphere were analysed from the major botanical gardens in Cairo, Egypt (Kasr-El-Manial, Orman and Zohria). The dominant nematode genera under the examined ornamental palm trees were *Criconemoides*, *Ditylenchus*, *Helicotylenchus* and *Rotylenchulus reniformis*.

#### **Einheimische pflanzenparasitierende Nematoden an Zierpalmen Ägyptens**

24 bedeutende Zierpalmen der botanischen Gärten in Kairo wurden auf Nematoden untersucht. Dabei konnten insgesamt 10 verschiedene Arten festgestellt werden. Die bedeutsamsten Arten waren *Criconemoides*, *Ditylenchus*, *Helicotylenchus* und *Rotylenchulus*. Die beiden Arten *Helicotylenchus* und *Rotylenchulus* wiesen bei sämtlichen Palmen die höchste Dichte auf. Die einzelnen Nematodenarten traten an den meisten Palmen vergesellschaftet auf. Es zeigte sich, daß die Ursachen für das unbefriedigende Wachstum der Palmen die Anwesenheit ekto-, semiendo- und endoparasitischer Nematoden waren.

#### **Nematodos autóctonos parasitarios vegetales en palmeras de adorno egipcias**

En 24 palmeras de adorno de los jardines botánicos de El Cairo se realizaron investigaciones sobre la presencia de nematodos. De esta manera se pudieron registrar 10 especies diferentes. Las especies más significativas fueron *Criconemoides*, *Ditylenchus*, *Helicotylenchus* y *Rotylenchulus*. La mayor concentración en todas las palmeras investigadas fué registrada con las especies *Helicotylenchus* y *Rotylenchulus*. Las diferentes especies de nematodos se presentaron en forma asociada en la mayoría de las palmeras. Se comprobó que los motivos del crecimiento poco satisfactorio de las palmeras fueron la presencia de nematodos de acción ekto, semiendo y endoparasitaria.

Table 1: Population density of plant-parasitic nematode genera recovered from different palm species in Kasr El-Manial garden<sup>1</sup>

Palm species	Number of nematode genera in kg soil*									
	Crecone- moides	Diphther- ophora	Ditylen- chus	Helicoty- lenchus	Longi- dorus	Meloid ogyne	Rotylen chulus	Tricho- dorus	Tylen- chus	Xiphen- ema
<i>Acrocomia sclerocarpa</i>	-	76	76	1216	-	-	532	-	76	76
<i>Arecastrum romanzoffianum</i>	-	-	-	-	-	-	336	-	-	-
<i>Arenga saccharifera</i>	92	-	92	644	-	-	92	92	184	-
<i>Bactris sp.</i>	460	-	92	644	-	-	92	-	92	368
<i>Butia capitata</i>	76	-	-	228	-	76	1140	-	-	-
<i>Caryota mitis</i>	88	176	-	176	-	88	88	-	-	-
<i>Caryota urens</i>	-	-	-	128	-	64	-	-	64	-
<i>Chaemeolaria elegans</i>	-	84	-	-	-	-	252	-	-	-
<i>Chamaerops humilis</i>	-	-	-	780	-	-	-	-	60	-
<i>Chrysalidocarpus lutescense</i>	-	-	-	140	-	-	3192	-	-	-
<i>Kentia belmoreana</i>	72	-	-	72	-	-	-	-	-	-
<i>Linospadix monostachya</i>	-	-	72	-	72	-	720	-	-	72
<i>Livistona australis</i>	504	-	-	-	-	152	760	-	-	-
<i>Mascarenhesis versafellii</i>	-	-	-	576	-	-	648	-	-	-
<i>Phoenix canariensis</i>	380	-	-	152	-	-	76	-	-	-
<i>Phoenix dactylifera</i>	96	-	-	96	-	-	1632	-	96	-
<i>Ptechosperma elegans</i>	-	-	-	-	-	-	720	-	-	-

Table 1 - Continuation: Population density of plant-parasitic nematode genera recovered from different palm species in Kasr El-Manial garden

Palm species	Number of nematode genera in kg soil*									
	Crecone- moides	Diphther- ophora	Ditylen- chus	Helicoty- lenchus	Longi- dorus	Meloid ogyne	Rotylen- chulus	Tricho- dorus	Tylen- chus	Xiphen- ema
<i>Rhapis humilis</i>	-	480	2400	1056	192	96	-	-	-	288
<i>Roystonea regia</i>	-	84	-	1680	-	-	84	-	168	-
<i>Sabal palmetto</i>	120	-	-	480	-	76	608	-	-	-
<i>Thrinax parviflora</i>	152	-	760	152	-	-	1672	-	-	-
<i>Trachycarpus fortunei</i>	84	-	-	252	84	-	-	-	-	84
<i>Wallichia sp.</i>	64	-	-	-	64	320	-	64	-	256
<i>Washingtonia filifera</i>	128	-	-	320	-	-	64	-	-	-

<sup>1</sup> Each value is a mean of four replicates

Table 2: Population density of plant-parasitic nematode genera recovered from different palm species in Orman garden.<sup>2</sup>

Palm species	Number of nematode genera in kg soil*						
	Crecone- moides	Diphtherop- hora	Ditylenchus	Helicaty- lenchus	Longidorus	Rotylenchu- lus	Tylenchus
<i>Acrocomia sclerocarpa</i>	-	-	-	80	80	360	40
<i>Arecastrum romanzoffianum</i>	144	-	-	288	-	72	-
<i>Borassus flabellifer</i>	-	-	-	112	-	112	-
<i>Brahea roezlii</i>	128	-	-	576	-	-	-
<i>Butia capitata</i>	-	-	-	40	-	400	-
<i>Calamus rotang</i>	-	-	-	156	-	52	-
<i>Caryota mitis</i>	72	72	-	72	-	72	-
<i>Chrysalidocarpus letescens</i>	-	-	-	204	-	424	68
<i>Kentia sp.</i>	48	-	-	-	-	192	-
<i>Livistona chinensis</i>	-	-	-	480	-	-	-
<i>Livistona decipiens</i>	-	-	-	420	-	-	-
<i>Mascarenhesia versafellii</i>	-	-	-	320	-	480	-
<i>Phoenix sp.</i>	-	-	-	192	48	-	48
<i>Phoenix canariensis</i>	240	-	-	840	-	-	-
<i>Phoenix dactylifera</i>	-	-	-	476	-	680	-
<i>Ptecosperma elegans</i>	72	-	-	-	144	144	-
<i>Rhapis flabelliformis</i>	120	-	-	800	-	40	160
<i>Roystonea regia</i>	-	-	-	144	-	72	72
<i>Sabal feregrina</i>	192	-	512	576	-	512	-
<i>Sabal palmetto</i>	-	-	-	52	-	72	-
<i>Thrinax parviflora</i>	72	-	576	864	144	72	144
<i>Trachycarpus fortunei</i>	192	-	-	144	-	-	-
<i>Washingtonia filifera</i>	336	-	-	84	-	84	-
<i>Washingtonia robusta</i>	-	-	-	216	-	432	-

<sup>2</sup> Each value is a mean of four replicates

Table 3: Population density of plant-parasitic nematode genera recovered from different palm species in El-Zohria garden<sup>3</sup>

Palm species	Number of nematode genera in kg soil*							
	Crecone- moides	Ditylen- chus	Helicoty- lenchus	Pratylen- chus	Rotylen- chulus	Tylencho- rhynchus	Tylenchus	Xiphenem a
<i>Arecastrum romanzoffianum</i>	-	-	-	60	180	-	-	-
<i>Binanga gracilior</i>	72	-	-	-	144	-	-	-
<i>Borassus flabellifer</i>	-	-	44	-	200	-	200	-
<i>Brahea roezlii</i>	60	-	600	120	60	-	-	120
<i>Calamus rotang</i>	204	-	68	-	-	-	-	136
<i>Caryota mitis</i>	144	-	40	-	216	-	720	72
<i>Kentia sp.</i>	220	-	44	88	176	-	176	264
<i>Livistona australis</i>	364	-	-	-	1664	-	-	52
<i>Livistona chinensis</i>	104	-	320	-	-	-	-	-
<i>Phoenix sp.</i>	-	-	-	-	-	-	76	-
<i>Phoenix canariensis</i>	300	-	480	-	-	-	-	120
<i>Phoenix dactylifera</i>	-	-	1144	52	52	208	-	52
<i>Ptecosperma elegans</i>	52	-	104	104	780	-	-	-
<i>Rhapis flabelliformis</i>	60	-	600	-	240	-	360	60
<i>Roystonea regia</i>	-	-	120	-	360	-	60	-
<i>Sabal feregrina</i>	156	364	520	-	-	-	-	-
<i>Sabal palmetto</i>	-	-	320	64	64	-	-	-
<i>Thrinax barbadensis</i>	-	-	624	-	-	-	72	52
<i>Trachycarpus fortunei</i>	180	-	180	-	-	-	-	60
<i>Walichia spp.</i>	40	-	-	200	160	280	-	40

<sup>3</sup> Each value is a mean of four replicates.

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