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CURRENT STATUS OF GENERA AND SPECIES OF PHYTOPARASITIC NEMATODES IN EGYPT

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ABSTRACT

Ibrahim, I. K. A, M. Kantor, and Z. A. Handoo. 2023. Current status of genera and species of phytoparasitic nematodes in Egypt. Nematropica 53:16-29.

In Egypt, phytoparasitic nematodes have been recognized as important plant pests and major constraints to agricultural production especially in sandy and coarse soils. A review of the historical nematode records indicate the occurrence of about 60 genera and 170 species of phytoparasitic nematodes found on crop plants, grasses, and weeds. Some of these nematode species such as *Heterodera goldeni* were described from Egypt, while others such as *H. rosii*, *Globodera rostochiensis*, and *Xiphinema rivesi* were recorded for the first time in Egypt and other African countries. Important phytoparasitic nematodes found in Egypt include species of *Tylenchulus*, *Globodera*, *Heterodera*, *Xiphinema*, *Hoplolaimus*, *Criconemella*, *Mesocriconema*, *Pratylenchus*, *Meloidogyne*, *Helicotylenchus*, and *Tylenchorhynchus*. Among these, *Tylenchulus*, *Heteroderidae*, *Pratylenchus*, *Meloidogyne*, and *Helicotylenchus* were the most frequently encountered nematode genera in Egypt.

Key words: Egypt, genera, phytoparasitic nematodes, species, survey

RESUMEN

Ibrahim, I. K. A., M. Kantor y Z. A. Handoo. 2023. Estado actual de géneros y especies de nematodos fitoparásitos en Egipto. Nematropica 53:16-29.

En Egipto, los nematodos fitoparásitos han sido reconocidos como plagas importantes de plantas y representan grandes limitaciones para la producción agrícola, especialmente en suelos arenosos y gruesos. Una revisión de los registros históricos de nematodos indica la ocurrencia de cerca de 60 géneros y 170 especies de nematodos fitoparásitos encontrados en plantas de cultivos, pastos y malezas. Algunas de estas especies de nematodos como *Heterodera goldeni* fueron descritas de Egipto, mientras otras como *H. rosii*, *Globodera rostochiensis* y *Xiphinema rivesi* fueron registradas por primera vez en Egipto y otros países africanos. Nematodos fitoparásitos importantes encontrados en Egipto incluyen especies de *Tylenchulus*, *Globodera*, *Heterodera*, *Xiphinema*, *Hoplolaimus*, *Criconemella*, *Mesocriconema*, *Pratylenchus*, *Meloidogyne*, *Helicotylenchus* y *Tylenchorhynchus*. Entre estos, *Tylenchulus*, *Heteroderidae*, *Pratylenchus*, *Meloidogyne* y *Helicotylenchus* fueron la familia/género de nematodos que se encontraron con mayor frecuencia en Egipto.

Palabras clave: Egipto, géneros, nematodos fitoparásitos, especies, estudio

INTRODUCTION

Phytoparasitic nematodes have been considered as important plant pests since 1901 when Preyer (1901) reported a nematode disease of banana in Alexandria, Egypt. In 1955, Oteifa (1955) reported the occurrence of citrus nematode (*Tylenchulus semipenetrans* Cobb, 1913). Early nematode studies were mainly concerned with the occurrence and identification of phytoparasitic nematodes in Egypt especially *Tylenchulus semipenetrans*, *Pratylenchus* spp., and *Meloidogyne arenaria*, *M. incognita* and *M. javanica* (Oteifa, 1955, 1962; Tarjan, 1964; Oteifa and Tarjan, 1965; Ibrahim *et al.*, 1972, 1976). Extensive surveys on phytoparasitic nematodes in Egypt were conducted by Abou-Elnaga (1979), Ibrahim (1990), Oteifa *et al.* (1997) and Ibrahim *et al.* (2010). These surveys showed the occurrence of large numbers of genera and species of phytoparasitic nematodes associated with many plant crops, grasses, and weeds. Many of these nematodes are considered a limiting factor in plant crop production in Egypt. Information concerning the occurrence and identification of phytoparasitic nematodes in Egypt is very important since nematodes such as citrus (*Tylenchulus* spp.), cyst (*Globodera* spp., *Heterodera* spp.), dagger (*Xiphinema* spp.), lance (*Hoplolaimus* spp.), ring (*Criconemella* spp., *Mesocriconema* spp.) root-knot (*Meloidogyne* spp.), spiral (*Helicotylenchus* spp.) and stunt (*Tylenchorhynchus* spp.) may occur in large numbers and cause economic damage to many plant crops (Abbou-Elnaga, 1979; Oteifa *et al.*, 1997, Ibrahim *et al.*, 2000, 2010; Ibrahim *et al.*, 2000, 2010).

Cumulative records of phytoparasitic nematodes in Egypt have been maintained in the Nematology Research Laboratory, Faculty of Agriculture, Alexandria University, Alexandria, Egypt and Nematology Laboratory, now Mycology and Nematology Genetic Diversity and Biology Laboratory (), USDA, ARS, Beltsville, MD, USA for the last 40 years. Previous nematode records and survey studies showed the occurrence of about 60 genera and 170 species of phytoparasitic nematodes in Egypt (Ibrahim,1990; Ibrahim *et al.*, 2000, 2010, 2016; Oteifa *et al.*, 1997). The scientific cooperation between the faculty of Agriculture, Alexandria University and the MNGDBL has resulted in the identification and recording of many species of phytoparasitic nematodes in Egypt. Most of the identified nematode species were first records in Egypt and Africa (Handoo and Ibrahim, 2002; Handoo *et al.*, 2015; Ibrahim and Handoo, 2016; Ibrahim *et al.*, 2000, 2010, 2016, 2017). The most important achievements of this cooperation included the identification of 14 new species records in Egypt (Ibrahim *et al.*, 2000), and the description of *Heterodera goldeni* Handoo and Ibrahim 2002, as a new cyst nematode species. Other important first reports include *Xiphinema rivesi* Dalmaso, 1969 (Handoo *et al.*, 2015), *Globodera rostochiensis* Wollenweber, 1923 and *Heterodera* spp. (Ibrahim *et al.*, 2017, Haroon *et al.*, 2021), as well as *Aglenchus geraerti* Mizukubo, 1989, *Bitylenchus ventrosignatus* Tobar Jiménez, 1969, *Coslenchus capsica* Khurma 1988, *Helicotylenchus indicus* Siddiqi, 1963 and *Malenchus bryanti* Knobloch 1976 (Ibrahim and Handoo, 2016). The objective of the present work was to compile a list of nematode genera and species and associated host plants from previously published research in Egypt.

RESULTS AND DISCUSSION

Genera and species of phytoparasitic nematodes identified and previously reported in Egypt with corresponding host plants and references are presented in Tables 1 and 2. Table 1 provides the numbers of species and frequency of occurrence (FO) of phytoparasitic nematode genera found in soil samples collected from crop plants in Egypt. Table 2 provides the species of phytoparasitic nematodes reported and identified in Egypt, the associated host plants, and the corresponding references based on previous nematode surveys and reports published (Abou Elnaga, 1979; Oteifa *et al.*, 1997; Ibrahim and Handoo, 2016; Ibrahim *et al.*, 2000, 2010, 2017; Basyony *et al.*, 2020). A total of 180 species are listed in Table 2. *Helicotylenchus*, *Tylenchorhynchus,* and *Xiphinema* are represented by the highest numbers of species, 15-17 species,

Table 1. Numbers of species and frequency of occurrence (FO) of phytoparasitic nematode genera found in soil samples collected from crop plants in Egypt.

Genus	No. of species	FO index[y]	Genus	No. of species	FO index[y]
Aglenchus	1	1	*Malenchus*	1	1
Anguina	1	1	*Meloidogyne*	4	5
Aphelenchoides	2	3	*Merlinius*	3	2
Aphelenchus[z]	1	3	*Mesocriconema*	1	2
Aporcelaimus[z]	1	1			
Basiria	1	1	*Nacobbus*	1	1
Belonolaimus	1	1	*Neotylenchus*	1	1
Bitylenchus	1	1	*Nygolaimus*[z]	1	1
Boleodorus	1	1	*Paralongidorus*	2	1
Cephalenchus	1	1	*Paratrichodorus*	1	1
Coslenchus	1	1	*Paratylenchus*	1	1
Criconema	2	1	*Pratylenchoides*	2	2
Criconemella	1	2			
Diphtherophora	1	1	*Pratylenchus*	12	4
Discocriconemella	1	1	*Pseudhalenchus*	1	1
Ditylenchus	3	3	*Psilenchus*	5	5
Dolichodorus	1	1	*Radopholus*	1	1
Dorylaimellus[z]					
Dorylaimus[z]					
Eutylenchus	1	1	*Rotylenchoides*	1	1
Filenchus	1	1	*Rotylenchulus*	1	3
Globodera	1	1			
Helicotylenchus	15	5	*Rotylenchus*	2	2
Hemicriconemoides	3	2	*Scutellonema*	2	2
Hemicycliophora	3	2	*Telotylenchus*	1	1
Heterodera	12	3	*Trichodorus*	1	1
Hirschmanniella	2	3	*Tylenchorhynchus*	15	4
Hoplolaimus	7	4	*Tylenchulus*	1	3
Irantylenchus	1	1	*Tylenchus*	2	4
Lelenchus	1	1	*Xiphinema*	17	3
Longidorus	6	1	*Zygotylenchus*	1	1

[y]FO index: 1=1-10%, 2=11-20%, 3=21-30%, 4=31-50% and 50% frequency of occurrence
[z]Suspected plant-parasitic forms

followed by *Pratylenchus* and *Heterodera* with 12 species each. *Hoplolaimus* and *Longidorus* have 6-7 species, while other listed genera have only 1-5 species each. Some of the nematodes reported herein, especially of the genera *Aphelenchoides* and *Ditylenchus* may be feeding on fungi, algae, or other soil microorganisms present in the rhizosphere of the plants that were surveyed. Also, some of the nematodes may parasitize the roots of the previous crop in the rotation rather than the one present at the time of sampling.

More research is needed to further identify other genera and species of phytoparasitic nematodes that might occur in Egypt, especially on grasses, weeds, and wild plants in desert areas and on the Sinai Peninsula. Results reported herein form a valuable database that should be consulted in designing crop rotations and nematode control programs to deal with phytoparasitic nematode problems in Egypt.

Table 2. Species of phytoparasitic nematodes reported and identified in Egypt, the associated host plants and pertinent references.

Nematode species	Host plants	References
Aglenchus geraerti	*Lantana camara*	Ibrahim and Handoo, 2016
Anguina tritici	*Triticum aestivum*	Abou-Elnaga,1979; Oteifa *et al*., 1997
Aphelenchoides sp.	*Brassica rapa, Cucumus sativus, Musa sapientum, Oryza sativa, Solanum tuberosum* and many other host plants	Abou-Elnaga, 1979; Ibrahim *et al*., 2010; Oteifa *et al*., 1997; Tarjan, 1964
Aphelechoides besseyi	*Oryza sativa*	Amin, 2001; Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Aphelechoides parietinus	*Gossypium barbadense, Lycopersicon esculentum, Solanum tuberosum, Solanum melongena*	Abou-Elnaga,1979; Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Aphelenchus avenae	*Beta vulgaruis, Oryza sativa* and many other host plants	Abou-Elnaga, 1979; Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Aporcelaimus capitatus	*Citrus sp., Musa sapientum, Vitis finifera*	Abou-Elnaga, 1985; Oteifa *et al*., 1997
Basiria graminophila	*Solanum melongena*	Abou-Elnaga, 1979; Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Belonolaimus sp.	*Gossypium barbadense*	Abou-Elnaga, 1979; Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Boleodorus pakistansis	*Polypogon monspeliensis, Solanum nigrum*	Ibrahim *et al*., 2010
Boleodorus thylactus	*Brassica oleracea, Capsium frutescens*	Abou-Elnaga, 1979; Elmiligy and Geraert, 1971; Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Bitylenchus ventrosignatus	*Lantana camara*	Ibrahim and Handoo, 2016
Coslenchus capsici	*Lantana camara*	Ibrahim and Handoo, 2016
Criconema sp.	*Cynodon dactylon, Washingtonia filifera*	Ibrahim *et al*., 2000; Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Criconema mutabile (=Nothocriconema mutabile)	*Allium cepa, Cucumis sativus, Cynodon dactylon, Phoenix canariensis, Solanum tuberosum* and many other host plants	Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Criconema sphaerocephala	*Amaranthus caudatus, Carex festivella, Cynodon dactylon, Phoenix dactylifera*, *Setaria virdis* and many other host plants	Ibrahim *et al*., 2000; Ibrahim *et al*., 2010
Diphtherophora sp.	*Washingtonia filifera*	Ibrahim *et al*., 2010; Ismail and Eissa, 1993
Discocriconemella sphaerocephaloides	*Cynodon dactylon*	Ibrahim *et al*., 2000; Ibrahim *et al*., 2010
Ditylenchus sp.	*Allium cepa* and many other host plants	Abou-Elnaga,1979; Ibrahim *et al*., 2000; Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Ditylenchus angustus	*Oryza sativa*	Abou-Elnaga,1979; Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Ditylenchus intermedius	*Cynara scolymus, Triticum sativum*	Ibrahim *et al*., 2010; Oteifa *et al*., 1997

Table 2. Continued

Nematode species	Host plants	References
Ditylenchus myceliophagus	*Beta vulgaris*	Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Dolichodorus sp.	*Cynara scolymus*	Ibrahim *et al*., 2010
Eutylenchus sp.	*Plantago major*	Ibrahim *et al*., 2000; Ibrahim *et al*., 2010
Filenchus filiformis	*Colocasia esculenta, Cucurbita pepo, Solanum tuberosum, Vicia faba*	Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Globodera rostochiensis	*Solanum tuberosum*	Ibrahim *et al*., 2017; Haroon *et al*., 2021
Helicotylenchus sp.	Many host plants	Abou-Elnaga, 1979; Ibrahim *et al*., 2000; Ibrahim *et al*., 2010; Oteifa *et al*., 1997; Tarjan, 1964
Helicotylenchus agricola	*Psidium guajava*	Abou-Elnaga, 1979; Elmiligy, 1970b; Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Helicotylenchus cavenessi	*Zea mays*	Abou-Elnaga, 1979; Elmiligy, 1970a; Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Helicotylenchus digonicus	*Gossypium barbadense, Washingtonia filifera*	Ibrahim *et al*., 2000; Ibrahim *et al*., 2010, Oteifa *et al*., 1997
Helicotylenchus dihystera	*Beta vulgaris, Brassica oleracea, Citrus aurantium, Colocasia esculenta, Mangifera indica, Prunus amygdalus, Saccharum officiinarum* and many other host plants	Abou-Elnaga, 1979; Elmiligy, 1970a; Ibrahim *et al*., 2000; Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Helicotylenchus dihysteroides	*Musa saptientum*	Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Helicotylenchus egyptiensis	*Saccharum officinarum, Washingtonia filifera*	Abou-Elnaga, 1979; Ibrahim *et al*., 2010; Oteifa *et al*., 1997; Tarjan,1964
Helicotylenchus erythrinae	*Zea mays*	Abou-Elnaga, 1979; Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Helicotylenchus exallus	*Musa sapientum*	Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Helicotylenchus hydrophilus	*Citrus aurantium, Musa sapientum*	Abou-Elnaga, 1989; Oteifa *et al*., 1997
Helicotylenchus indicus	*Lantana camara*	Ibrahim and Handoo, 2016
Helicotylenchus mangiferensis	*Mangifera indica*	Abou-Elnaga, 1979; Elmiligy, 1970b; Oteifa *et al*., 1997
Helicotylenchus microcephalus	*Citrus aurantium, Cynodon dactylon, Musa sapientum, Vitis vinifera*	Abou- Elnaga, 1989; Elmiligy, 1970b; Ibrahim *et al*., 2000; Ibrahim *et al*., 2010
Helicotylenchus microlobus	*Gossypium barbadense*	Abou-Elnaga, 1979; Oteifa *et al*., 1997; Tarjan, 1964
Helicotylenchus multicinctus	*Citrus aurantium, Cynodon dactylon, Vitis vinifera*	Abou-Elnaga,1979; Elmiligy, 1970a; Ibrahim *et al*., 2010; Oteifa *et al*., 1997; Tarjan, 1964

Table 2. Continued

Nematode species	Host plants	References
Helicotylenchus pseudorobustus	*Cynodon dactylon, Lantana camar Vitus vinifer* and many other host plants.	Ibrahim *et al*. 2010; Ibrahim and Handoo, 2016; Ibrahim *et al*., 1994; Ibrahim *et al*., 2000 Oteifa *et al*., 1997
Hemicriconemoides sp.	*Allium cepa, Cucurbita pepo, Mangifera indica, Phoenix dactylifera, Solanum tuberosum, Zea mays*	Elmiligy and Geraert, 1971; Ibrahim *et al*., 2000; Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Hemicriconemoides affinis	*Allium cepa, Cucumus sativus, Solanum tuberosum*	Ibrahim *et al.,* 2010*;* Oteifa *et al*., 1997
Hemicriconemoides cocophilus	*Phoenix canariensis, Phoenix dactylifera*	Ibrahim *et al*., 2000; Ibrahim *et al*., 2010
Hemicriconemoides mangiferae	*Agava sisalana, Angifera indica, Roystonia elata*	Abou-Elnaga, 1979; Elmiligy and Geraert, 1971; Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Hemicycliophora sp.	*Arachis hypogaea, Cynodon dactylon, Pyrus communis, Rosa sp., Zae mays*	Abou-Elnaga, 1979; Ibrahim et al., 2000; Ibrahim *et al*., 2010; Tarjan, 1964
Hemicycliophora oostenbrinki	*Cynodon dactylon, Vitis vinifera*	Abou-Elnaga, 1979; Ibrahim *et al*., 2010; Oteifa, 1964; Oteifa *et al*., 1997; Tarjan, 1964
Hemicycliophora similes	*Citrus aurantium*	Abou-Elnaga,1979; Oteifa, 1964; Oteifa *et al*., 1997; Tarjan,1964
Hemicycliophora thienemanni	*Phoenix dactylifera*	Ibrahim *et al*., 2000; Ibrahim *et al*., 2010
Heterodera sp.	Many host plants	Ibrahim *et al*., 2010; Ibrahim *et al*., 2017; Oteifa *et al*., 1997
Heterodera avenae	*Hordeum vulgaris, Triticum aestivum*	Ibrahim *et al*., 2010; Ibrahim *et al*., 2017
Heterodera cajani	*Vigna cylindrical*	Aboul-Eid and Ghorab, 1974; Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Heterodera daverti	*Oryza sativa, Trifolium alexandrinum, Triticum aestivum*	Ibrahim *et al*., 2010; Ibrahim *et al*., 2017
Heterodera glycines	*Trifolium alexandrinum, Vigna cylindrical*	Elmiligy, 1968; Ibrahim *et al*., 2017
Heterodera goldeni	*Oryza sativa, Panicum coloratum, Zea mays*	Handoo and Ibrahim, 2002; Ibrahim *et al*., 2010; Ibrahim *et al*., 2017
Heterodera latipons	*Hordeum vulgars, Triticum aestivum*	Ibrahim *et al*., 2010; Oteifa *et al*., 1997.
Heterodera lespedezae	*Trifolium alexandrinum*	Ibrahim *et al*., 2017
Heterodera leuceilyma	*Cynodon dactylon*	Ibrahim *et al*., 2017
Heterodera rosii	*Melilotus officinalis, Trifolium alexandrinum*	Ibrahim *et al*., 2010; Ibrahim *et al*., 2017

Table 2. Continued

Nematode species	Host plants	References
Heterodera schachtii	*Beta vulgaris, Brassica oleracea var. capitata, Brassica oleracea var. botrytis*	Ibrahim *et al*., 2010; Ibrahim *et al*., 2017
Heterodera trifolii	*Trifolium alexandrinum*	Ibrahim *et al*., 2010; Ibrahim *et al*., 2017; Oteifa *et al*., 1997
Heterodera zeae	*Hordeum vulgare, Oryza sativa, Triticum aestivum, Zea mays*	Aboul-Eid and Ghorab, 1981; Ibrahim *et al*. 2010; Ibrahim *et al*. 2017; Oteifa *et al*., 1997
Hirschmanniella sp.	*Gossypium barbadense, Oryza sativa, Zea mays*	Abou-Elnaga, 1979; Ibrahim *et al*., 2010; Oteifa *et al*., 1997; Tarjan, 1964
Hirschmanniella gracilis	*Oryza sativa*	Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Hirschmanniella oryzae	*Amaranthus caudatus, Chenopodium album, Oryza sativa*	Abou-Elnaga, 1979; Ibrahim *et al*., 2010; Oteifa *et al*., 1997; Tarjan, 1964
Hoplolaimus sp.	Many host plants	Abou-Elnaga, 1979; Ibrahim *et al*., 2000; Ibrahim *et al*., 2010; Oteifa *et al*., 1997; Tarjan, 1964
Hoplolaimus aegypti	*Agava sisalana, Ipomoea batatas, Phoenix dactylifera, Roystonea regia, Zea mays*	Ibrahim *et al*., 2000; Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Hoplolaimus clarissimus	*Conyza aegyptiaca, Cynodon dactylon, Cyperus rotundus, Erigeron annuus*	Ibrahim *et al*., 2000; Ibrahim *et al*., 2010
Hoplolaimus columbus	*Citrus aurantium, Gossypium barbadense, Musa sapientum, Sofficinarum, Zea mays*	Ibrahim *et al*., 2000; Ibrahim *et al*., 2010; Oteifa *et al*., 1997; Oteifa and Tarjan,1965; Tarjan,1964
Hoplolaimus galeatus	*Citrus aurantium, Gossypium babadense, Vitis vinifera*	Abou-Elnaga, 1989; Ibrahim *et al*., 2010; Oteifa *et al*., 1997; Tarjan, 1965
Hoplolaimus pararobustus	*Musa sapientum, Psidium guajava*	Elmiligy, 1970a; Ibrahim *et al*., 2010
Hoplolaimus seshadrii	*Citrus aurantium, Musa sapientum*	Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Hoplolaimus tylenchiformis	*Arachis hypogaea, Glycine max*	Ibrahim *et al.,* 2010; Oteifa *et al*., 1997
Irantylenchus clavidorus	*Amaranthus caudatus, Cynodon dactylon, Poa annuua, Portulaca oleracea, Setaria viridis, Urtica urens*	Ibrahim *et al*., 2000; Ibrahim *et al*., 2010
Longidorus sp.	Many host plants	Abou-Elnaga, 1979; Ibrahim *et al*., 2010; Oteifa *et al*., 1997; Tarjan, 1964

Table 2. Continued

Nematode species	Host plants	References
Longidorus africanus	*Citrus aurantium, Musa sapientum, Prunus amygdalus, Saccharum officinarum, Vitis vinifera*	Abou-Elnaga, 1979; Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Longidorus brevicaudatum (= L. siddiqii)	*Gossybium barbadense*	Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Longidorus elongatus	*Citrus aurantium, Cynodon dactylon, Mangifera indica, Olea europaea, Saccharum officinarum, Vitis vinifera, Zea mays*	Abou-Elnaga, 1979; Ibrahim *et al*., 2000; Ibrahim *et al*., 2010; Oteifa *et al*., 1997; Oteifa and Tarjan, 1965; Tarjan, 1964
Longidorus laevicapitalus	*Citrus aurantium, Glycine max, Musa sapientum, Vitis vinifera*	Abou-Elnaga, 1979; Ibrahim *et al*., 2010; Lamberti *et al*., 1996; Oteifa *et al*., 1997; Tarjan, 1964
Longidorus pisi (= L. latocephalus)	*Glycine max, Vitis vinifera*	Ibrahim *et al.,* 2010*;* Lamberti *et al*., 1996
Longidorus taniwha	*Citrus aurantium, Ficus carica, Musa sapientum*	Abou-Elnaga, 1979; Ibrahim *et al*., 2010; Oteifa *et al*., 1997; Tarjan, 1964
Malenchus bryanti	*Lantana camara*	Ibrahim and Handoo, 2016
Meloidogyne sp.	Many host plants	Abou-Elnaga, 1979; Ibrahim *et al*., 2010; Oteifa *et al*., 1997; Tarjan, 1964
Meloidogyne arenaria	Many host plants	Abou-Elnaga, 1979; Ibrahim *et al*., 2010; Oteifa *et al*., 1997; Tarjan, 1964
Meloidogyne hapla	*Lycopersicum esculentum*	Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Meloidogyne incognita	Many host plants	Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Meloidogyne javanica	Many host plants	Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Merlinius brevidens	*Lantana camara*	Elmiligy and Geraert, 1971; Ibrahim and Handoo, 2016; Ibrahim *et al*., 2000; Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Merlinus nanus	*Cynodon dactylon*	Ibrahim *et al*., 2010, Ibrahim *et al*., 1994; Ibrahim *et al*., 2000
Merlinius nothus (=Tylenchorhynchus nothus)	*Citrus aurantium, Morus alba, Solanum melongena*	Abou-Elnaga, 1979; Elmiligy and Geraert, 1971; Ibrahim, 1990; Ibrahim *et al*., 2010; Oteifa *et al*., 1997; Tarjan, 1964
Mesocriconema sp. (=*Criconella* sp. *Criconemoides* sp.)	Many host plants	Ibrahim *et al*., 2000; Ibrahim *et al*., 2010; Oteifa *et al*., 1997; Tarjan, 1964
Nacobbus sp.	*Lycopersicum esculentum*	Ibrahim *et al*., 2010; Oteifa et al., 1997
Neotylenchus sp.	*Prunus amygdalus*	Ibrahim, 1990; Oteifa *et al*., 1997; Tarjan, 1964
Nygolaimus sp.	*Citrus aurantium, Musa sapientum, Vitis vinifera*	Abou-Elnaga, 1989; Oteifa *et al*., 1997
Nygolaimus parasquaticus	*Allium sativum, Citrullus vulgaris*	Abou-Elnaga, 1985; Oteifa *et al*., 1997
Paralongidorus erriae	*Vitis vinifera*	Ibrahim *et al*., 2010; Lamberti *et al.,* 1996

Table 2. Continued

Nematode species	Host plants	References
Paralongidorus georgiensis (=*Longidorus georgiensis*)	*Citrus aurantium*	Ibrahim, 1990; Oteifa *et al*., 1997; Oteifa and Tarjan, 1965; Tarjan, 1964
Paratrichodorus minor (= *Trichodorus christiei, Trichodorus minor*	*Alopecurus geniclatus, Alopecurus partensis, Amaranhus caudatus*	Abou-Elnaga, 1979; Ibrahim *et al*., 2000; Ibrahim *et al*., 2010; Oteifa *et al*., 1994; Oteifa *et al*., 1997; Oteifa and Tarjan, 1965, Tarjan, 1964
Paratylenchus sp.	*Cyperus rotundus*, many other host plants	Ibrahim, 1990; Ibrahim *et al*., 2000; Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Paratylenchus minor	*Cyperus rotundus, Phoenix dactylifera, Setaria verticillata*	Ibrahim *et al*., 2000; Ibrahim *et al*., 2010
Paratylenchus projectus	*Phoenix canariensis, Washingtonia filifera*	Ibrahim *et al*., 2000; Ibrahim *et al*., 2010
Pratylenchoides sp.	*Citrus aurantium, Pyrus communis*	Ibrahim *et al*., 2010; Tarjan, 1964
Pratylenchoides crenicauda	*Citrus aurantium, Gossypium barbadense, Pyrus communis, Vitis vinifera*	Abou-Elnaga, 1989; Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Pratylenchus sp.	Many host plants	Abou-Elnaga, 1979; Ibrahim *et al*., 2000; Ibrahim *et al*., 2010; Oteifa *et al*., 1997; Tarjan, 1964
Pratylenchus brachyurus	*Arachis hypogaea, Citrus aurantium, Fragaria* sp., *Gossypium barbadense, Musa sapientum, Oryza sativa, Solanum tuberosum, Zea mays* and many other host plants.	Abou-Elnaga, 1979; Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Pratylenchus coffeae	*Arachis hypogaea, Citrus aurantium, Lycopersicon esculentum, Musa sapientum, Pisum sativum, Solanum tuberosum, Vicia faba*	Abou-Elnaga, 1979; Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Pratylenchus crenatus	*Saccharum officinarum*	Ibrahim *et al*., 2010; Oteifa *et al*., 1997; Tarjan, 1964
Pratylenchus goodeyi	*Citrullus vulgaris, Musa sapientum, Oryza sativa, Vicia faba, Vigna cylindrical*	Ibrahim *et al.*, 2010; Oteifa *et al*., 1997
Pratylenchus minyus	*Arachis hypogaea, Gossypium barbadense, Lycopersicon esculentum, Musa sapientum, Vicia faba* and many other host plants	Ibrahim *et al*. 2010; Oteifa *et al*., 1997
Pratylenchus musicola	*Musa sapientum*	Ibrahim et al., 2010; Oteifa, 1962; Oteifa *et al*., 1997
Pratylenchus neglectus	*Citrus aurantium, Mangifera indica, Vitis vinifera, Zea mays*	Ibrahim *et al*., 2010; Oteifa *et al*., 1997; Oteifa and Tarjan, 1965
Pratylenchus penetrans	*Arachis hypogaea, Citrus aurantium, Cucumis sativus, Musa sapientum, Solanum tuberosum, Vitis vinifera* and many other host plants	Ibrahim *et al*., 2010; Oteifa, 1962; Oteifa *et al*., 1997; Oteifa and Tarjan, 1965

Table 2. Continued.

Nematode species	Host plants	References
Pratylenchus pratensi	*Citrullus vulgaris, Citrus aurantium, Cucumis sativus, Gossypium barbadense, Trifolium alexandrinum, Vitis vinifera, Zea mays*	Ibrahim *et al*., 2010; Oteifa, 1962; Oteifa *et al*., 1997
Pratylenchus scribneri	*Citrullus vulgaris, Fragaria sp., Ipomoae batatas, Solanum tuberosom, Vigna cylindrical*	Ibrahim *et al*., 2010; Oteifa, 1962; Oteifa *et al*., 1997
Pratylenchus thornei	*Arachis hypogaea, Ficus carica, Gossypium barbadense, Lycopersicon esculentum, Oeyza sativa, Lantana camaram, Zea mays*	Ibrahim and Handoo, 2016; Ibrahim *et al*., 2010; Oteifa *et al*., 1997; Tarjan, 1964
Pratylenchus vulnus	*Citrus aurantium, Citrullus vulgaris, Cucumis sativus, Mangifera indica, Musa sapientum, Vitis vinifera*	Ibrahim *et al*., 2010; Oteifa, 1962; Oteifa *et al*., 1997
Pratylenchus zeae	*Arachis hypogaea, Citrus aurantium, Prunus persica, Vicia faba, Zea mays*	Ibrahim *et al*., 2010; Oteifa, 1962; Oteifa *et al*., 1997; Oteifa and Tarjan, 1965
Pseudhalenchus sp.	*Cynodon dactylon*	Ibrahim, 2010; Tarjan, 1964
Pseudhalenchus anchilisposomus	*Pyrus communis*	Ibrahim *et al*., 2010; Oteifa *et al*., 1997; Tarjan, 1964
Psilenchus sp.	*Cucurbita pepo, Gossypium barbadense, Solanum tuberosum, Washingtonia filifera*	Abou-Elnaga, 1979; Ibrahim *et al*., 2010; Oteifa *et al*., 1997; Tarjan, 1964
Psilenchus aestuarius	*Gossypium barbadense*	Abou-Elnaga, 1979; Ibrahim *et al*., 2010; Tarjan, 1964
Psilenchus hilarulus	*Gossypium barbadense, Oryza sativa*	Elmiligy and Geraert, 1971; Ibrahim *et al*., 2010; Tarjan, 1964
Psilenchus iranicus	*Cucurbita pepo, Lycopersicon esculentum, Solanum tuberosum*	Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Psilenchus magnidens	*Ficus carica, Gossypium barbadense*	Ibrahim *et al*., 2010; Tarjan, 1964.
Psilenchus striatus	*Ipomoea batatas, Solanum tuberosum, Vicia faba*	Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Radopholus similis	*Musa sapientum, Pyrus communis*	Ibrahim *et al*., 2010; Oteifa, 1964; Tarjan, 1964
Rotylenchoides variocaudatus	*Gossypium barbadense*	Abou-Elnaga, 1979; Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Rotylenchulus sp.	*Citrus aurantium, Cycas revolute, Gossypium barbadense, Musa sapientum, Vitis vinifera*, many other host plants	Ibrahim *et al*., 2000; Ibrahim *et al*., 2010; Oteifa, 1964; Oteifa *et al*., 1997; Tarjan, 1964
Rotylenchulus reniformis	*Gossypium barbadense,* many other host plants	Ibrahim and Handoo, 2016; Ibrahim *et al*., 2000; Ibrahim *et al*., 2010; Oteifa, 1964; Oteifa *et al*., 1997; Oteifa and Tarjan, 1965; Tarjan, 1964
Rotylenchus sp.	*Citrullus vulgaris, Citrus aurantium, Gossypium barbadense, Prunus amygdalus, Prunus persica, Vitis vinifera*, many other host plants	Ibrahim *et al*., 2010; Oteifa *et al*., 1997; Oteifa and Tarjan, 1965

Table 2. Continued

Nematode species	Host plants	References
Rotylenchus robustus	*Citrus aurantium, Mangifera indica*	Ibrahim *et al*., 2010; Oteifa and Tarjan, 1965; Oteifa *et al*., 1997
Rotylenchus uniformis	*Citrus aurantium*	Ibrahim *et al*., 2010; Oteifa, 1964; Oteifa *et al*., 1997
Scutellonema sp.	*Mangifera indica, Musa sapientum Vitis vinifera*	Abou-Elnaga, 1979; Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Scutellonema blaberum	*Cynodon dactylon*	Abou-Elnaga, 1979; Ibrahim, 1990; Oteifa *et al*., 1997
Scutellonema brachyurum	*Cynodon dactylon, Nerium oleander, Vitis vinifera*	Ibrahim, 1990; Ibrahim et al., 2000; Oteifa et al., 1997; Tarjan, 1964
Telotylenchus ventralis	*Cynodon dactylon, Digitana sanguinalis*	Oteifa *et al*., 1997; Tarjan, 1964
Trichodorus sp.	Many host plants	Ibrahim *et al*., 2000; Ibrahim *et al*., 2010; Oteifa, 1964; Oteifa *et al*., 1997; Oteifa and Tarjan, 1965; Tarjan, 1964.
Trichodorus teres	*Citrus aurantium, Vitis vinifera, Zea mays*	Ibrahim, 1990; Oteifa and Tarjan, 1965; Tarjan, 1964
Tylencholaimu sp.	*Brassica rapa, Brassica oleracea var. capitata*	Abou-Elnaga *et al.*, 1985; Oteifa *et al*., 1997
Tylencholaimu teres	*Citrus aurantium*	Abou-Elnaga, 1989; Oteifa *et al*., 1997
Tylenchorhynchus sp.	Many host plants	Ibrahim *et al*., 2000; Ibrahim *et al*., 2010; Oteifa, 1964; Oteifa *et al*., 1997; Oteifa and Tarjan, 1965; Tarjan, 1964.
Tylenchorhynchus annulatus	*Myporum pictum*	Ibrahim *et al*., 2000; Ibrahim *et al*., 2010
Tylenchorhynchus besselatus	*Citrus aurantium, Musa sapientum*	Abou-Elnaga, 1989; Oteifa *et al*., 1997
Tylenchorhynchus brassicae	*Citrus aurantium, Cynodon dactylon, Pyrus communis*	Ibrahim *et al*., 2010; Oteifa *et al*., 1997; Tarjan, 1964
Tylenchorhynchus capitatus	*Alium cepa, Saccharum officinarum*	Abou-Elnaga, 1979; Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Tylenchorhynchus clarus	*Brassica rapa, Cucurbita pepo, Oryza sativa, Zea mays*	Elmiligy and Geraert, 1971; Ibrahim *et al*., 2000; Ibrahim *et al*., 2010; Oteifa and Tarjan, 1965; Tarjan, 1964
Tylenchorhynchus clavicaudatus	*Citrus aurantium*	Ibrahim *et al*., 1990; Oteifa and Tarjan, 1965; Tarjan, 1964
Tylenchorhynchus cylindricus	*Vitis vinifera*	Ibrahim *et al*., 1990; Oteifa *et al*., 1997; Oteifa and Tarjan, 1965
Tylenchorhynchus dubius	*Gossypium barbadense*	Abou-Elnaga, 1979; Ibrahim, 1990; Oteifa *et al*., 1997
Tylenchorhynchus ebriensis	*Washingtonia filifera*	Ibrahim *et al* 2000; Ibrahim *et al*., 2010
Tylenchorhynchus goffarti	*Acalypha wilkesiana, Anabsis articulate, Capsicum frutescens Cucrbita pepo, Gossypium barbadens, Solanum tuberosum, Solanum melongena, Zea mays*	Elmiligy and Geraert, 1971; Ibrahim *et al*., 2000; Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Tylenchorhynchus kegenicus	*Gossypium barbadense*	Ibrahim *et al*., 2010; Oteifa *et al*., 1997; Tarjan, 1965
Tylenchorhynchus latus	*Citrus aurantium*, *Ficus carica, Vitis vinifera,* and many other host plants	Ibrahim *et al*., 2010; Oteifa *et al*., 1997; Oteifa and Tarjan, 1965; Tarjan, 1964
Tylenchorhynchus martini	*Oryza sativa*	Ibrahim *et al*., 2010; Oteifa, 1964; Oteifa *et al*., 1997

Table 2. Continued

Nematode species	Host plants	References
Tylenchorhynchus mexicanus	*Casuarina glauca*	El-Hamawi, 1993; Ibrahim *et al*., 2010, Oteifa *et al*., 1997
Tylenchorhynchus phaseoli	*Citrus aurantium, Musa sapientum*	Ibrahim *et al*., 2010; Oteifa *et al*., 1997
Tylenchulus semipenetrans	*Lantana camara, Citrus spp., Olea europaea*, *Vitis vinifera*	Abou-Elnaga, 1979; Ibrahim and Handoo, 2016; Ibrahim *et al*., 2010; Ibrahim *et al*., 2022; Oteifa, 1964; Oteifa *et al*., 1997; Oteifa and Tarjan, 1965; Tarjan, 1964
Tylenchus sp.	Many host plants	Ibrahim *et al*., 2010; Oteifa *et al*., 1997; Tarjan, 1964
Tylenchus afghanicus	*Amaranthus caudatus*, *Portulaca oleracea*	Ibrahim *et al*., 2000; Ibrahim *et al*., 2010
Tylenchus exiguous	*Amaranthus caudatus* and many other host plants	Ibrahim *et al*., 2000; Ibrahim *et al*., 2010
Xiphinema sp.	Many host plants	Ibrahim *et al*., 2000; Ibrahim *et al*., 2010
Xiphinema americanum	*Citrus* spp., *Citrus aurantium, Gossypium barbadense, Mangifera indica, Prunus amygdalus, Vitis vinifera*	Ibrahim *et al*., 2010, Oteifa *et al*., 1997; Tarjan, 1964
Xiphinema arenarium	*Citrus* aurantium, *Ficus carica*	Ibrahim *et al.,* 2010; Oteifa *et al.,* 1997
Xiphinema basilgoodeyi	*Acalypha wilkesiana, Rosytonia regia*	Ibrahim *et al.,* 2000; Ibrahim *et al*, 2010
Xiphinema elongatum	*Allium cepa, Citrus aurantium, Olea europaea*	Ibrahim *et al.,* 2010; Oteifa *et al.,* 1997
Xiphinema diversicaudatum	*Fragaria spp.*	Ibrahim *et al.,* 2010.
Xiphinema ensiculiferum	*Phoenix dactylifera*	Ibrahim *et al.,* 2000*;* Ibrahim *et al.,* 2010
Xiphinema hygrophilum	*Mangifera indica*	Ibrahim *et al., 2010;* Lamberti *et al.,* 1996
Xiphinema imitator	*Citrus aurantium, Musa sapientum, Vitus vinifera*	Ibrahim *et al.,* 2010; Oteifa *et al.,* 1997
Xiphinema incognitum	*Ficus carica*	Ibrahim *et al., 2010;* Lamberti *et al.,* 1996
Xiphinema index	*Vitus vinifera*	Ibrahim *et al., 2010;* Lamberti *et al.,* 1996
Xiphinema insigne	*Citrus aurantium, Musa sapientum, Vitus vinifera*	Ibrahim *et al., 2010;* Lamberti *et al.,* 1996
Xiphinema ismailiensis	*Medicago sativa*	Ibrahim *et al.,* 2010*;* Oteifa *et al.,* 1997
Xiphinema italiae	*Vitus vinifera*	Ibrahim *et al., 2010;* Lamberti *et al.,* 1996
Xiphinema lamberti	*Citrus aurantium, Musa sapientum, Vitus vinifera*	Ibrahim *et al.* 2010*;* Oteifa *et al.,* 1997
Xiphinema santos	*Vitus vinifera*	Ibrahim *et al.,* 2010*;* Lamberti *et al.,* 1996
Xiphinema simillimum	*Ficus carica*	Ibrahim *et al*., 2010; Lamberti *et al*., 1996; Oteifa *et al*, 1997
Xiphinema rivesi	*Citrus aurantium*	Handoo *et al.,* 2015
Zygotylenhus guevarai	*Zea mays*	El-Hamawi and Ali, 1992; Ibrahim *et al*., 2010; Oteifa *et al*, 1997

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