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The cyst nematodes *Heterodera* and *Globodera* species in Egypt

I. K.A. Ibrahim[1], Z.A. Handoo[2†] and A. B. A. Basyony[1]

[1]*Department of Plant Pathology, Faculty of Agriculture, Alexandria University, Alexandria, Egypt*
[2]*Mycology and Nematology Genetic Diversity and Biology Laboratory, ARS, USDA, Beltsville, MD 20705, U.S.A.*

[†]Corresponding author: zafar.handoo@ars.usda.gov

Abstract

A survey was conducted in three governorates Alexandria, El Behera and Sohag of Egypt during 2012-2016 and one hundred seventy-eight soil and root samples were collected for the detection of cyst nematodes. The results showed the prevalence of nine cyst nematode species associated with different crop plants: *Heterodera avenae* on wheat, *H. daverti* and *H. trifolii* on Egyptian clover, *H. leuceilyma* on Bermuda grass, *H. lespedezae* on lentil, *H. goldeni* on qasabagrass, *H. schachtii* on cabbage and sugar beet, *H. zeae* on corn and wheat and *Globodera rostochiensis* on potato. The cyst nematodes *H. leuceilyma* and *G. rostochiensis* are new records of the country and *H. lespedezae* on lentil is a new host plant record in Egypt.

Keywords: Cyst nematodes, *Heterodera*, *Globodera*, Egypt

The genera *Heterodera* Schmidt, 1871 and *Globodera* Skarbilovich, 1959 represent one of the largest groups of economically important plant-parasitic nematodes. These nematodes are known by the common name "cyst nematodes". In Egypt, cyst nematodes are one of the most important pest groups of economically important crop plants (Ibrahim & Handoo, 2016; Ibrahim *et al*., 2000, 2010). Earlier researchers reported that cyst nematodes (*Heterodera* spp.) have a widespread occurrence in Egypt and may affect the production of many crop plants (Aboul-Eid & Ghorab, 1974; Elmiligy, 1968; Ibrahim & Handoo, 2007; Ibrahim *et al*., 1986, 2010, 2012). The objective of this research was to study the occurrence of cyst nematodes (*Heterodera* spp. and *Globodera* spp.) on certain host plants in Egypt.

Materials and Methods

Nematode surveys were undertaken in Alexandria, El-Behera and Sohag Governorates of Egypt during 2012 to 2016 for the detection of cyst nematodes and their associated host plants. In this regard one hundred seventy-eight (178) soil and root samples with approximate 1 kg soil were collected from the root zone area at 15-40 cm depth. Roots were examined for female and cyst nematodes after washing. Nematodes from a composite sample of 250 cm^3 soil were extracted by Cobb's wet-sieving and centrifugal sugar floatation techniques (Ayoub, 1980); fixed in 2% formaldehyde solution and then counted under a stereomicroscope.

Females were removed from the roots and cysts were sieved from soil, after which juveniles were hatched from cysts kept in water in a watch glass in the laboratory. The method given by Golden & Birchfield (1972) was followed for preparing and measuring specimens. The identification of nematodes was performed on the morphology of second-stage juveniles (J_2), adult females, and cysts, and their identities were confirmed with taxonomic keys (Subbotin *et al*., 2010; Golden, 1986; Mulvey &

Golden, 1983). Identification of cysts was made by cyst shape, cyst terminal cone including nature of fenestration, vulval-slit length, shape and presence/absence of bullae, underbridge length, and cyst wall pattern. The second-stage juvenile morphologies useful for identifications were: body and stylet length, shape of stylet knobs, shape and length of tail and hyaline tail terminus. The frequency of occurrence and nematode population density (nematodes per 250 cm^3 soil) were evaluated for each nematode species.

Results and Discussion

The frequency of occurrence and population densities of cyst nematode species (*Heterodera* spp. and *Globodera* spp.) and associated host plants in Alexandra, El-Behera and Sohag governorates are given in Table 1. The results showed the occurrence of *Heterodera avenae* Wollenweber, 1924 on wheat (*Triticum aestivum* L.), *H. daverti* Wouts & Sturham, 1979 and *H. trifolii* Goffart, 1932 on Egyptian clover (*Triloium alexandrinum* L.), *H. lespedezae* Golden & Cobb, 1963 on Egyptian clover and lentil (*Lens esculenta* Moench), *H. schachtii* Schmidt, 1871 on cabbage (*Brassica oleracea* L. *var*. *capitata*) and sugar beet (*Beta vulgaris* L.), *H. goldeni* Handoo & Ibrahim 2002 on qasabagrass (*Panicum coloratum* L.), *H. zeae* Koshy *et al*., 1971 on wheat, corn (*Zea mays* L.), *H. leuceilyma* Di Edwardo & Perry, 1964 on Bermuda grass (*Cynodon dactylon* (L.) Pers.), and *Globodera rostochiensis* Wollenweber, 1923 on potato (*Solanum tuberosum* L.).

To our knowledge, this represents new country records for *H. leucilyma* and *G. rostochiensis* in Egypt and new host plant records for *H. lespedezae* on lentil in Egypt.

Earlier studies related to cyst nematodes in Egypt showed the occurrence of *H. cajani* on cowpea and *H. zeae* on maize (Aboul-Eid & Ghorab, 1974, 1981); *H. glycines* on Egyptian clover and cowpea (Elmiligy, 1968); *H. rosii* on annual yellow sweet clover, *H. goldeni* on qasabagrass and *H. schachtii* on cauliflower and cabbage (Handoo & Ibrahim, 2002; Ibrahim *et al*., 1986, 2010).

The cyst nematodes *Heterodera* spp. and *Globodera* spp. are well known plant pathogens on various crop plants in several areas of the world (Golden, 1986). The detection of the golden cyst nematode *G. rostochiensis* on potato in El-Nobarria, El-Behera governorate in northern Egypt is very important as this nematode species has been considered as a serious and a potential pest on potato and other solanaceous vegetable crops. In general more research is needed to identify other cyst nematode species that might occur in Egypt.

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Table 1. Frequency of occurrence (FO%) and population density (PD) of cyst nematode species (*Heterodera* spp. and *Globodera* sp.) and associated host plants in some Egyptian governorates.

Governorate & Location	Host plant	No. of soil samples	Nematode species	FO%*	PD**
Alexandria:					
Abees	Clover***	12	*H. trifolii*	42	248
Abees	Corn	10	*H. zeae*	60	340
Borg Elarab	Cabbage	20	*H. schachtii*	40	286
El-Amria	Sugar beet	20	*H. schachtii*	55	280
El-Maamora	Qasabagrass	12	*H. goldeni*	58	324
El-Sabaheya	Clover	10	*H. lespedezae*	42	232
El-Sabaheya	Wheat	12	*H. zeae*	50	310
Khorshed	Clover	10	*H. daverti*	40	248
El-Behera:					
El-Nobarria	Bermuda	10	*H. leuceilyma*	40	210
El-Nobarria	Corn	12	*H. zeae*	42	362
El-Nobarria	Potato	16	*G. rostochiensis*	44	284
El-Nobarria	Sugar beet	12	*H. schachtii*	25	272
Rashed	Wheat	12	*H. avenae*	50	248
Sohag:					
Sohag	Lentil	10	*H. lespedezae*	40	260

*FO%: No. of positive samples/No. of total samples x 100.
**PD: No. of cyst nematode 2nd stage juveniles/250cm^3 soil.
***Clover: Egyptian clover (*Trifolium alexandrinum* L.)

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