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First report of *Xiphinema rivesi* Dalmasso, 1969 on citrus in northern Egypt

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Abstract

In a survey, specimens of dagger nematode (*Xiphinema* sp.) were collected from soil around the rhizosphere of citrus trees (*Citrus sinensis* (L.) Osbeck) with poor growth appearance and low yield from EL-Nobarria, EL-Behera governorate, northern Egypt, during 2012-13. Dagger nematode (*Xiphinema rivesi* Dalmasso, 1969) was identified on morphology of females that included female body and total stylet (odontostyle and odontophore) length, location of guiding ring and excretory pore from oral aperture, shape of head and tail including various tail measurements and vulva percentage in relation to body length. This is the first report of this nematode from Egypt, Africa. The values of the morphological parameters completely fall within the previously reported ranges for *X. rivesi*.

Keywords: First report, dagger nematode, *Xiphinema rivesi*, citrus, Egypt.

In Egypt, plant-parasitic nematodes have been recognized as important plant pests since 1901, when Preyer reported a nematode disease of banana in Alexandria. Information concerning the occurrence of plant-parasitic nematodes on citrus in Egypt is very important, since many nematode pathogens such as *Tylenchulus*, *Xiphinema*, *Hoplolaimus*, *Pratylenchus*, *Longidorus*, *Mesocriconema*, *Helicotylenchus* and *Tylenchorhynchus* may occur in large numbers and cause economic damage to citrus crops (Oteifa, 1955; Tarjan 1964; Oteifa & Tarjan, 1965).

Some of the most important nematodes in Egypt are the dagger nematodes (*Xiphinema* spp.); 16 species have been associated with various host plants (Ibrahim *et al*., 2010; Lamberti *et al*., 1996; Tarjan, 1964). Tarjan (1964) conducted a nematode survey of broad areas of Egypt, where every surveyed location contained *Xiphinema* spp., mostly associated with fruit crops and citrus trees. Surveys of citrus trees in Egypt have revealed the occurrence of six species of *Xiphinema*: *X. americanum*, *X. arenarium* (= *X. italiae*), *X. elongatum*, *X. imitator*, *X. insigne* and *X. lambertii* (Ibrahim *et al*., 2010; Lamberti *et al*., 1996; Tarjan, 1964). Although the dagger nematode, *Xiphinema rivesi* Dalmasso, 1969 transmits several viruses in North America, Europe and other countries (Urek *et al*., 2003), it has not been reported from Egypt, Africa.

Materials & Methods

During 2012-13 poor growth and low yield of citrus trees growing in calcareous sandy soil in EL-Nobarria, EL-Behera governorate, northern Egypt was investigated for nematodes. A total of 68 soil samples, each containing 500 g of soil was collected from the rhizosphere of citrus trees from approximately 45 acres. Nematodes from a composite sample of 250 g soil taken from each sample were extracted by means of Cobb's wet sieving and centrifugal sugar-flotation techniques (Ayoub, 1980). Nematodes were examined under the compound microscope. Identification of isolated nematodes to the generic level was based on the morphological characters of adult forms as described by Mai & Lyon (1975) and Wojtowicz *et al*., (1982). After fixation in 2% formaldehyde,

specimens were processed to glycerin with a rapid method (Seinhorst, 1959) and mounted in anhydrous glycerin on microscope slides (Hooper, 1970; Golden, 1990). Photomicrographs of females were made with an automatic 35 mm camera attached to a Leitz DMRB compound microscope and measurements were made with an ocular micrometer on the same microscope. All measurements are in micrometers unless otherwise stated.

Xiphinema rivesi was morphologically identified from the citrus soil samples according to taxonomic keys and other literature (Wojtowicz *et al*., 1982; Loof & Luc, 1990; Lamberti & Carone, 1991). This species was found in 68% of the collected soil samples and averaged 340 nematodes/250 g soil, with some soil samples having populations as high as 1300 nematodes/250 g soil.

Xiphinema rivesi Dalmasso, 1969
(Fig. 1 A-F)

Measurements: Table 1.

Table 1. Measurements of *Xiphinema rivesi* on citrus from northern Egypt. All measurements in µm except body length).

Character, n = 10	Mean ± SD (Range)
Body length (mm)	1600.6±75.5 (1480-1660)
Odontostyle length	87.5±2 (85-90)
Odontophore length	52.8±2.9 (50-57)
Total stylet length	140.3±3.8 (135-145)
Distance from ant. to nerve ring	72.2±4 (65-75)
Max. body width	45.7±3.3 (40-50)
Distance from anterior to EIV	247.5±20.4 (220-270)
a	35.1±1.3 (32.7-37)
b	6.6±0.7 (5.5-7.4)
c	56.0±3.4 (50.2-59.5)
c'	1.0±0.1 (1.0-1.1)
Tail length	28.6±1.9 (25-30)
Vulva (%)	52.1±1.4 (50.4-54)
Body width at anus	27.7±1.6 (25-30)
J length	9.1±1.5 (8-12)
J width at beginning	12.6±1.2 (11.5-15)
J width 5µm from tail terminus	9.6±0.7 (8.5-10)

The Egyptian population of *Xiphinema rivesi* collected from soil around the rhizosphere of citrus trees (*Citrus sinensis* (L.) Osbeck) in EL-Nobarria, EL-Behera governorate, northern Egypt were characterized by having a gradually tappering body forming a close to open "C" shape, rounded lip region continuous with the rest of the body, stirrup-shaped amphids and a conoid tail usually with a small terminal bulge. The morphology and morphometrics of the adult females was identified as dagger nematode *Xiphinema rivesi* Dalmasso, 1969 that is coincident with previous species descriptions (Dalmasso, 1969; Wojtowicz *et al*., 1982). The present results represent a new record of *X. rivesi* on citrus in Egypt, Africa. Other detections of this species include those of Maqbool (1986) and Fadaei *et al*., (2003) on citrus in Pakistan and Iran, respectively and those of Dalmasso (1969), Arias & Navacerrada (1973), Lamberti & Bleve-Zacheo (1979) and Lamberti *et al*., (1994) in vineyards in France, Spain and Portugal. *Xiphinema rivesi* was observed on several fruit crops (apple, peach, raspberry and walnut), oak, hackberry, alfalfa, corn, cottonwood and potato in the United States (Wojtowicz *et al*., 1982; Hafez *et al*., 1992). In Canada, this nematode occurs on grape (Ebsary *et al*., 1984). This nematode is a virus-transmitting plant-parasitic nematode and reported from France, Germany, Portugal, Spain, Solvenia, widespread in North America and present in Peru and Pakistan (Urek *et al*., 2003). The presence of this nematode in several citrus samples calls for concern.

Fig. 1 (A-F). Photomicrographs of *Xiphinema rivesi*. A. Whole body with arrows indicating flanges of odontophere and vulva; B. Head with protruding odontostyle; C. Anterior region with arrows indicating guiding ring and flanges of odontophore; D. Vulval region; E, F. Tail with arrows indicating anus.

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