UF UNIVERSITY of FLORIDA
IFAS Extension

EENY-544

Spiral Nematode, *Helicotylenchus pseudorobustus* (Steiner, 1941) Golden, 1956 (Nematoda: Tylenchida: Hoplolaimidae)[1]

William T. Crow[2]

Introduction

The common name spiral nematode is most often applied to nematodes in the genus *Helicotylenchus*, but it is also sometimes applied to other genera in the family Hoplolaimidae including *Rotylenchus, Aorolaimus*, *Scutellonema*, and *Peltamigratus*. These are called spiral nematodes because their bodies tend to curl into a spiral when the nematodes are relaxed or dead (Figure 1). Spiral nematodes of the genus *Helicotylenchus* are among the most ubiquitous plant-parasitic nematodes worldwide.

Figure 1a. The body of *Helicotylenchus* and other spiral nematodes curve into a spiral when the nematode is dead or relaxed. This moving nematode is outstretched.
Credits: William T. Crow, University of Florida.

Helicotylenchus pseudorobustus is a species common in Florida and the southeastern United States and is frequently found associated with turfgrasses and other grass hosts in the region. On most plants, *Helicotylenchus pseudorobustus* is not considered particularly damaging, but recent research has shown that this species suppresses growth of certain turfgrass hosts.

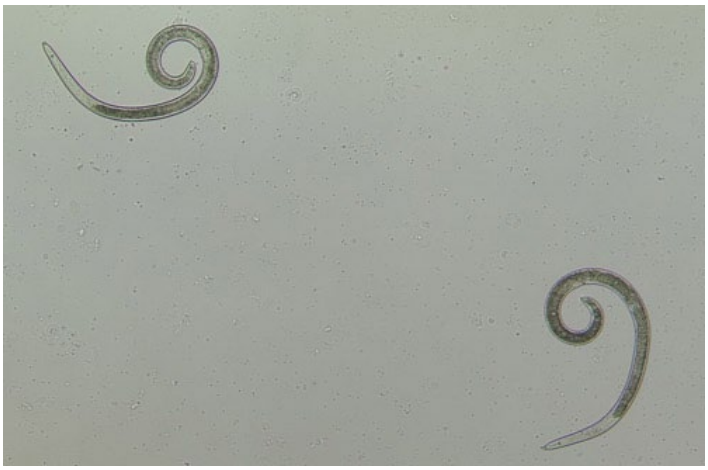

Figure 1b. The body of *Helicotylenchus* and other spiral nematodes curve into a spiral when the nematode is dead or relaxed. These relaxed nematodes are curled into a spiral.
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Distribution

Helicotylenchus pseudorobustus is found in temperate and tropical regions on all continents (except Antarctica), on many islands, and throughout the United States (Figure 2). It is the second most commonly reported species of *Helicotylenchus* worldwide. Statewide in Florida, *Helicotylenchus pseudorobustus* is one of the most common plant-parasitic nematode species found in agriculture fields, nurseries,

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landscapes, pastures, and natural habitats. *Helicotylenchus pseudorobustus* is less affected by soil type than many other nematodes and can be found in heavy, sandy, and organic soils.

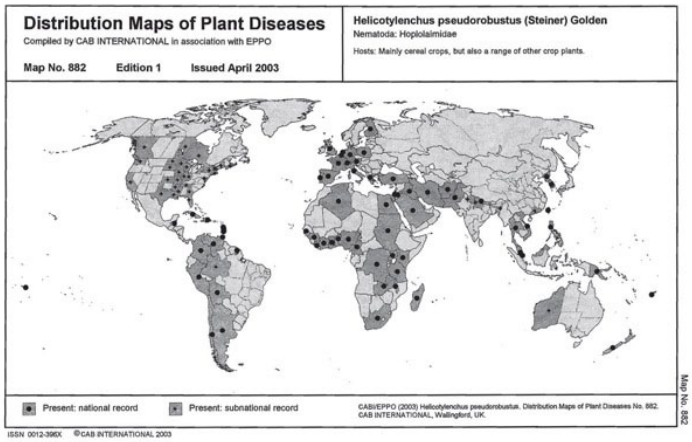

Figure 2. Worldwide distribution of *Helicotylenchus pseudorobustus*. *Credits:* Used with permission from: 2003 Distribution Maps of Plant Diseases, Map 882. Wallingford, UK. CAB International.

Life Cycle and Biology

Reproduction is highly variable among species of *Helicotylenchus*. Some species reproduce sexually and have males and females that mate, some species are hermaphrodites that self-fertilize their own eggs without mating, and other species reproduce asexually by parthenogenesis, do not mate, and have only females. *Helicotylenchus pseudorobustus* reproduces by parthenogenesis (without mating) and all are females. Females lay eggs individually in soil. Inside each egg a first-stage juvenile develops and then molts into a second-stage juvenile before hatching. After hatching, the second-stage juvenile must locate a host plant and begin feeding for further development. *Helicotylenchus pseudorobustus* typically feeds on cortical cells of host roots. The nematode inserts its mouth-spear (stylet) into the epidermis and cortical cells and ingests the cellular content. In some cases, *Helicotylenchus pseudorobustus* induces development of a specialized "food cell" on which it feeds. This food cell in not larger than a typical cortical cell, but has denser cytoplasm and larger nucleus than a normal cell. *Helicotylenchus pseudorobustus* will generally stay in one location feeding on a single food cell, but can also move to a different location on the same or different root and induce a new food cell there. Upon feeding, the nematode undergoes three more molts into a third and fourth stage juvenile, and then into an adult.

The various juvenile life stages of *Helicotylenchus pseudorobustus* look very similar to adults, differing only in body size and lack of a developed reproductive system. While generally considered an ectoparasite whose body remains outside of host tissue during feeding, occasionally *Helicotylenchus pseudorobustus* behaves as a semi-endoparasite and penetrates into the host root with its anterior body portion (head region).

Hosts

Helicotylenchus pseudorobustus has a wide host range including fruit crops, vegetables, agronomic crops, ornamental plants, forages, turfgrasses, weeds, and plants in natural habitats. On most of these hosts it is either considered a non pest or the amount of damage cause by *Helicotylenchus pseudorobustus* has not been explored. Plants that research has shown to be damaged by *Helicotylenchus pseudorobustus* include soybean, cotton, corn, bermudagrass, seashore paspalum, and creeping bentgrass.

Symptoms

The symptoms of *Helicotylenchus pseudorobustus* are more subtle than those of certain other nematodes such as root-knot or sting nematodes. Heavy infection by *Helicotylenchus pseudorobustus* causes a reduction in the root system, leading to unthrifty plants. On turfgrasses, *Helicotylenchus pseudorobustus* has been shown to reduce root length and cause thinning of turf. Generally the turf decline will occur in patches (Figure 3) and is often accompanied by proliferation of weeds in the affected areas (Figure 4). However, these symptoms could be induced by other causes, and a laboratory assay conducted by a qualified diagnostic lab such as the Florida Nematode Assay Lab is required for a positive diagnosis.

Figure 3. Seashore paspalum on a golf course fairway infested by *Helicotylenchus pseudorobustus*. Nematode damage is visible as patches of declining turf.
Credits: William T. Crow, University of Florida.

Figure 4. A seashore paspalum golf tee box infested with *Helicotylenchus pseudorobustus*. Nematode damage results in thinning turf and proliferation of weeds.
Credits: William T. Crow, University of Florida.

Identification

As with other species of *Helicotylenchus*, the body of *Helicotylenchus pseudorobustus* forms a complete spiral when the nematode is dead or relaxed. The absence of males is a useful biological character to separate *Helicotylenchus pseudorobustus* from species that have males. The vulva of the adult is located 59 to 62% of the nematodes body length from the anterior terminus (Figure 5). The

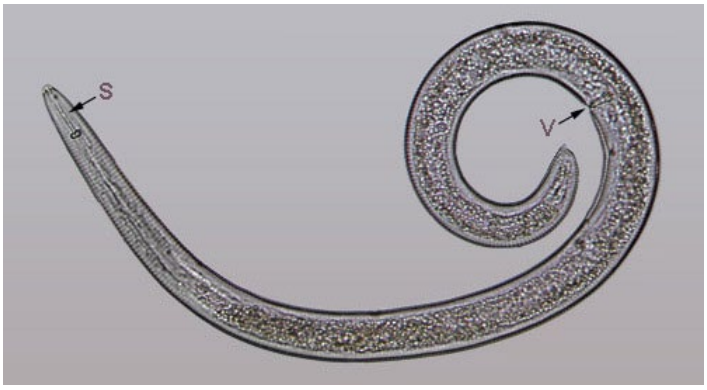

Figure 5. An adult *Helicotylenchus pseudorobustus*. S = stylet (mouth spear) used for feeding. V = vulva, located around 60% of the body length from the anterior terminus.
Credits: William T. Crow, University of Florida.

tail is asymmetrical, being curved dorsally with a rounded projection (Figure 6). The adult body length is 600 to 820 µm and the stylet length is 25.5 to 30 µm. The phasmids (sensory organs) are visible under high magnification with oil emersion and are located anterior to the anus. Under high magnification a trained nematologist will be able to see that the inner lines of the lateral field join on the tail in variable patterns (Figure 6).

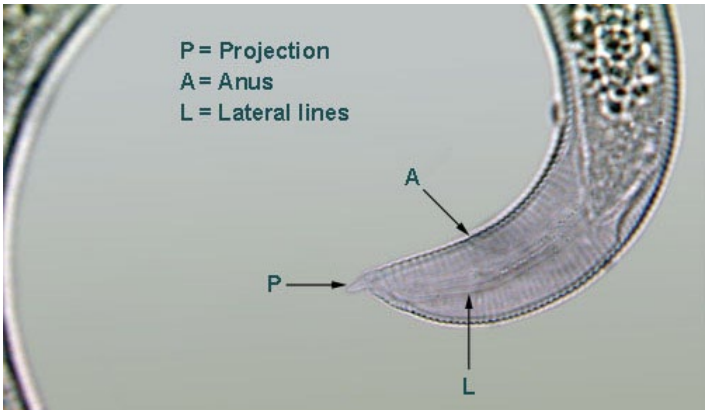

Figure 6. The tail of *Helicotylenchus pseudorobustus* is asymmetrical and has a projection on the ventral terminus.
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Populations of *Helicotylenchus pseudorobustus* collected from different localities worldwide found four distinct lineages designated types A, B, C, and D based on analysis of the D2-D3 expansion segments of the 28S rRNA gene sequences. While these are all classified as *Helicotylenchus pseudorobustus* based on morphology, they could represent multiple species. Recently, *Helicotylenchus pseudorobustus* collected from turfgrasses in Florida was assigned as type E because it is distinct from the other populations.

Economic Importance

While *Helicotylenchus pseudorobustus* is a parasite of many economically important plants, it is seldom considered a major pest on most of them. The exception is seashore paspalum, a turfgrass used in tropical and subtropical regions that is particularly susceptible to infestation by *Helicotylenchus pseudorobustus*. On this grass, *Helicotylenchus pseudorobustus* is among the most common nematodes requiring nematicide application. *Helicotylenchus pseudorobustus* also has been associated with unthrifty corn, soybean, and other crops, and with declining bermudagrass, and bentgrass on golf courses.

Management

The extensive host range of *Helicotylenchus pseudorobustus* makes management by use of crop rotation or cover crops very difficult. Because the body of *Helicotylenchus pseudorobustus* remains exposed in soil, it responds well to nematicides and bionematicides that are effective for management of other nematodes. However, other than for golf and sports turfgrasses, the amount of damage caused by *Helicotylenchus pseudorobustus* seldom justifies the expense of nematicide application. Refer to the Nematode Management for Golf Courses in Florida for current management recommendations on golf course turf.

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