

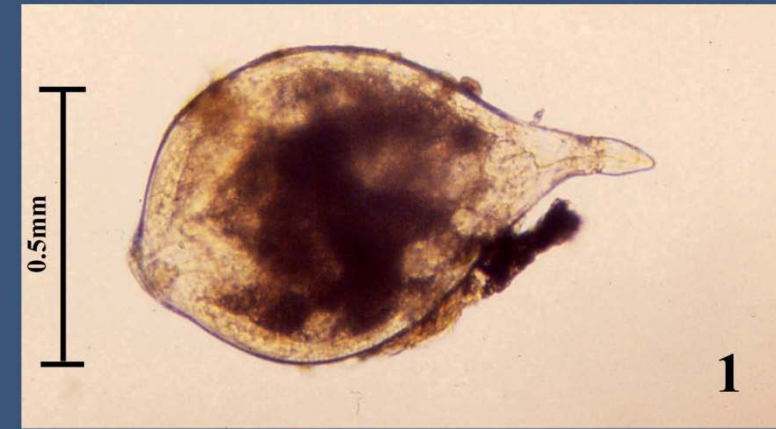
# Plant Parasitic Nematodes of Turfgrasses

Robert L. Wick and Stephanie L. Slinski, Department of Microbiology, University of Massachusetts

## INTRODUCTION

Plant parasitic nematodes are small invertebrate animals that belong to the phylum Nematoda. Most are relatively small, 0.5 to 2 mm (0.02 to 0.1 inch) in length, and more slender than a human hair. The head region has a protractible hollow or grooved stylet which is used to puncture plant cells and withdraw the contents. Nematodes that remain outside the plant and puncture root cells with their stylets are called ectoparasites. Those that enter into the plant tissue are called endoparasites. Endoparasites generally do more damage than ectoparasites.

Surveys and nematode assays of turfgrasses, carried out by the University of Massachusetts Diagnostic Lab throughout the New England Region demonstrate that at least 10 different genera of plant parasitic nematodes occur, as many as six or seven on any particular site. In many cases high populations of nematodes have resulted in wilting and thinning of the turf. The threshold levels presented here are for the New England region. The numbers are not absolute, but only serve as a guide.



1. Adult female 2. Swollen roots caused by root-knot nematodes 3. juvenile

**Root-knot** nematodes (*Meloidogyne*) are endoparasitic and one of the most important nematodes world-wide with respect to crop losses in agriculture. They are named after the galls they produce when roots are infected. Turfgrasses become infected with a unique root-knot species sometimes referred to as the “false root-knot” nematode. This nematode produces swollen roots rather than distinctive galls. The juvenile nematode is worm-like and enters into the root. Once inside, it becomes sedentary and causes the root to produce “giant cells” which provide the nematode with nutrients. The female becomes swollen. Threshold level: 500 juveniles/100 cc soil.

**Ring** nematodes (*Criconebella*) are very common, relatively small (0.5 to 1 mm) but stout ectoparasitic nematodes that are named for the distinct ring-like ornamentation of their cuticle. Ring nematodes are important on a wide range of crop plants such as peanuts, peach trees, grapes, walnuts and several ornamentals. Ring nematodes are common in turfgrasses but their pathogenicity to grasses is not well known. Ring nematodes are not very mobile and they tend to have a very clumped distribution in soils. A composite soil sample that results in an average of 2000/100 cc means that there are hot spots of much higher populations. Threshold level: 1,500/100 cc of soil.

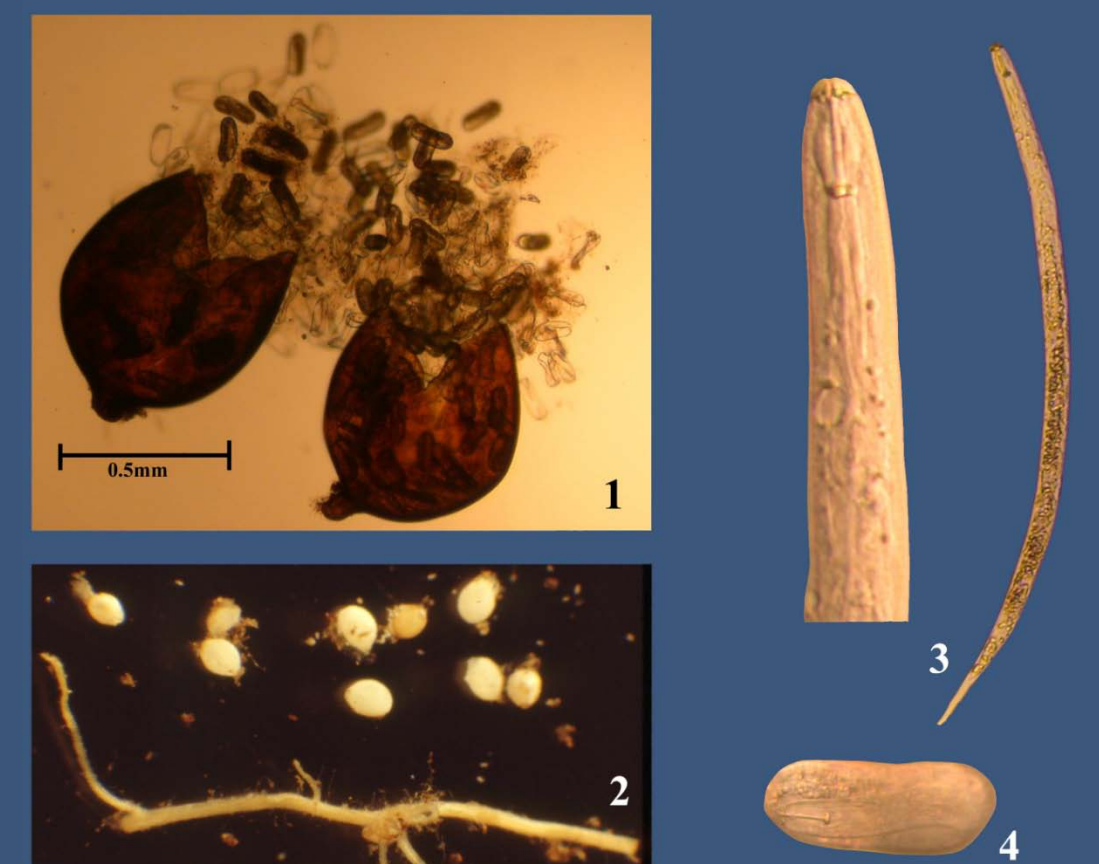
**Sting** nematodes (*Belonolaimus*) do not occur in the northeastern United States but their pathogenicity to turf and other plants is considerable. Declining turf from the southern U.S. often contains sting nematodes. Sting nematodes are large, 2 to 3 mm in length and have long stylets. They only occur in very sandy soils, and cannot survive northern winters. They have the lowest of all threshold levels for nematodes in turf; 20/100 cc of soil.



**Needle** nematodes (*Longidorus*) are very long nematodes, up to 5 mm in length. This ectoparasite has a very long stylet and tends to feed on root meristems resulting in death or swelling of the root tip. As few as 20/100 cc of soil can severely affect or kill seedling grass; established turf is more tolerant. Threshold level: 100/100 cc of soil.

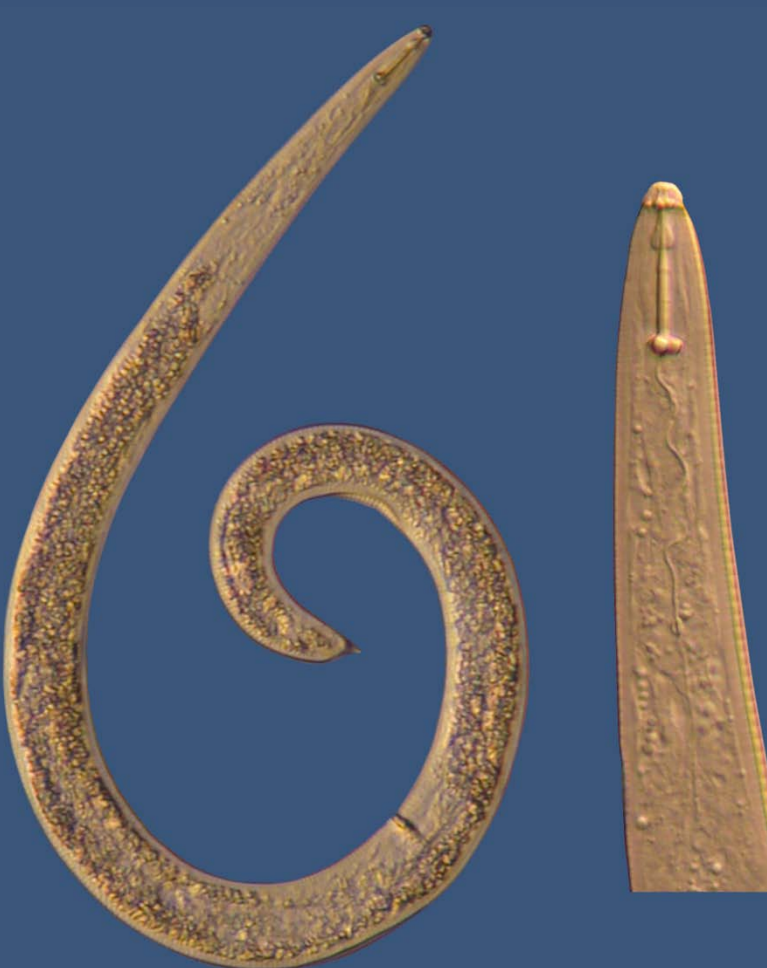
**Stubby root** nematodes (*Trichodorus*) are not common in turf but occasionally occur in high numbers. They are ectoparasitic and about 1 mm in length. They get their common name from the fact that parasitized roots usually become shortened and may develop short lateral roots behind the point of injury. They are capable of transmitting viruses to plants but are not known to do so to turfgrasses. Threshold level: 100/100 cc soil.

**Lesion** nematodes (*Pratylenchus*) are very important parasites of agricultural and ornamental crops. They are relatively small (less than 1 mm) but their migratory endoparasitic behavior can result in extensive damage to the root system. Their common name reflects the fact that their feeding activity results in lesions on roots. They are not common in turfgrasses but occasionally develop high populations. Threshold level: 100/100 cc of soil.



1. Mature cysts with eggs 2. Bent grass root with detached cysts 3. Juvenile nematode 4. Egg with 2nd stage juvenile inside

**Cyst** nematodes (*Heterodera*) are related to root-knot nematodes and are similar in several ways. They are extremely important parasites of crops world wide. Like root-knot, cyst nematodes are endoparasites. The cyst nematode develops into a swollen female as the root-knot does but most of the body of the nematode develops outside the root with the head region imbedded. After the female matures and dies, the cuticle hardens into a protective sack containing 40 to 60 eggs. In the picture above, the cysts have been squashed slightly to extrude some of the eggs. Threshold level: 500 juveniles/100 cc soil or 40 cysts/100 cc soil.



**Spiral** nematodes (*Helicotylenchus*) are named for their propensity to coil into a spiral shape. They are slightly more robust than stunt nematodes and up to 1.2 mm in length. Spiral nematodes feed on a wide range of hosts besides grasses but do not appear to be very damaging to turf. Threshold level: 1,500/100 cc of soil.

**Stunt** nematodes (*Tylenchorhynchus*) are common, small (1 mm long) slender ectoparasites of grasses and other plants. They feed primarily on epidermal cells and root hairs. High populations of stunt and lance nematodes are commonly associated with decline of turf in golf greens. Threshold level: 800/100 cc of soil.

**Lance** nematodes (*Hoplolaimus*) are common, robust, moderately large nematodes (1-2 mm) that feed ectoparasitically and endoparasitically on turfgrass roots. High populations of lance and stunt are commonly associated with decline of turf in golf greens. Because lance nematodes can move into the roots and cause considerable damage, the threshold level is lower than for stunt nematodes. Threshold level: 400/100 cc of soil.

**Sheath** nematodes (*Hemicycliophora*) are related to ring nematodes and also have a highly annulated cuticle. They are much less common than ring nematodes but apparently more pathogenic. They are about 1mm in length. In Massachusetts they can be found in cranberry bog soils where other plant parasitic nematodes are scarce. Threshold level: 200/100 cc soil.