

# Nematode Pests Of Turf: Their Identification And Control

Plant parasitic nematodes are recognized as important pests on both warm- and cool-season turfgrasses in Alabama. The sting and lance nematodes are the most destructive nematode pests of turfgrass. Other damaging nematodes are listed in Table 1.

Although damaging nematodes are found in soils growing turf in all residential, commercial, and recreational settings, golf course greens and tees as well as sod farms suffer the heaviest damage each year.

Table 1. Nematode Pests of Turfgrasses.

Nematodes	Comments
Sting nematode <i>Belonolaimus longicaudatus</i>	Most widespread and destructive nematode pest of turfgrasses.
Lance nematode <i>Hoplolaimus</i> spp.	Damages turf at low populations. Found primarily on greens and tees.
Ring nematodes <i>Criconemoides</i> spp. <i>Macropostonia</i> spp.	Common turf damage occurs only at high populations. Most common on golf course greens.
Stubby-root nematode <i>Trichodorus</i> spp. <i>Paratrichodorus</i> spp.	Found at low levels in all soils. Rarely injures turf.
Root-knot nematode <i>Meloidogyne</i> spp.	Seen on lighter soils. May cause damage at high populations.
St. Augustinegrass cyst nematode <i>Heterodera leuceilyma</i>	Found in Florida. May move into state on infested St. Augustine-grass sod.

## Description And Life Cycle

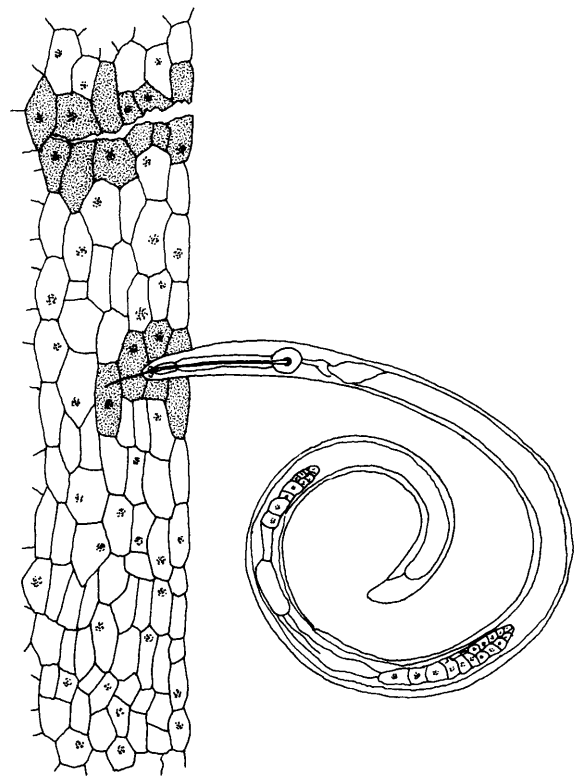
Nematodes that attack turfgrasses are tiny, transparent, unsegmented round worms varying in size from 1/300 to 1/3 inch long. They feed on turf-roots most commonly.

Nematodes feed through a needle-like stylet that they use to puncture host root cells and suck out their contents. The larvae and adults of some nematodes penetrate the root before feeding while others feed on host cells at or just below the root surface. A nematode such as the root-knot or cyst nematode may feed at one site its entire life; others, like the damaging sting and lance nematodes, migrate through the soil along roots, feeding as they move. Saliva injected into host tissues breaks down cell contents and, in some cases, causes root galls to form.

In some nematode species, the female lays eggs singly or in masses either in the roots or soil. The larvae, which are usually similar in appearance to the adults, go through a series of four molts before reaching maturity.

Nematode survival, growth, and reproduction are largely dependent on soil moisture, temperature in the soil or host tissues, and the suitability of the host plant. Under ideal conditions, some nematode species can go from eggs to reproducing adults in 3 to 4 weeks while others require 6 to 12 months. Nematodes survive adverse soil conditions as eggs or larvae.

Populations of damaging nematodes often peak in late summer or early fall. Few nematodes are found on turfgrass root systems in late winter or early spring.



Nematodes puncture root cells and suck out their contents. Some feed as they migrate over the root surface (above).

Plant parasitic nematodes are found usually at very low levels in all soils. The heaviest nematode injury is found most often on turf grown in well-drained sandy or sandy loam soils. Few nematode problems are seen on turf grown on heavy clay soils. Soil moisture levels at or near field capacity favor nematode activity. Nematode movement through the soil is slow. In most cases, nematodes are spread in soil clinging to turfgrass roots, on tillage equipment, by flowing water, or in the turfgrass roots.

## Symptoms

Common symptoms of nematode injury to turf are slight to severe yellowing of the foliage, thinning of the turf canopy, reduced growth, wilting under light moisture stress, and premature death. The foliar symptoms of nematode injury on turf are similar to those caused by low fertility, root-feeding insects, soil compaction, drought stress, and other sources of stress to turfgrass root systems.

Because nematodes are unevenly distributed in the soil, patches of injured turf vary greatly in size and shape. The margin between the healthy and nematode-damaged turf is gradual, not sharp. Poor response to irrigation, fertilizers, or fungicide applications is often an indication of a nematode problem. Damaged turf is generally unable to withstand severe heat or even mild drought stress.

Symptoms of nematode damage usually do not appear until injury to the turf root system is well advanced. Nematode damaged roots are often discolored, short, and stubby with few feeder roots. Visible galls or swellings are found on the feeder roots of root-knot-damaged turf.

## Diagnosis

The diagnosis of nematode injury based solely on the non-specific foliar symptoms is usually quite difficult, if not impossible. The affected turf must be carefully examined to eliminate other possible causes of turf decline. An accurate diagnosis of a nematode problem, however, can only be made on the basis of an analysis of soil from the damaged area to determine the kinds and numbers of plant parasitic nematodes.

Ideally, samples for nematode analysis should be taken anytime from mid-summer through the first hard frost when nematode populations are at their highest levels although samples can be collected at anytime of the year. See ANR-114, "Collecting Soil And Root Samples For Nematode Analysis," for directions on collecting and handling soil samples for nematode analysis.



Common symptoms of nematode injury to turf are yellowing foliage, thinned turf canopy, and premature death.

## Control

A well-managed turf often can withstand the feeding injury of low to moderate levels of many nematode pests. Management practices that favor vigorous root growth such as deep, infrequent watering and a balanced fertilization program often will offset damage to the turf's root system. Stress factors that increase turf sensitivity to nematode injury, such as low soil fertility or pH, compacted soils, light shallow watering, and low mowing heights, should be corrected or avoided to prevent further turf damage.

The spread of damaging nematodes to new turf planting often can be prevented by establishing nematode-free sod. Tillage and aerification equipment should be cleaned when moving from a nematode-infested area to nematode-free turf.

Damaging nematode populations may be reduced and turf quality improved with *nematicides*. First, confirm the presence of nematode pests with a nematode soil analysis; then apply a nematicide. Available pre- and post-plant nematicides are listed in Table 2.

When seeding or sodding areas with a known nematode infestation, use a *pre-plant fumigant nematicide* to speed turf establishment and temporarily suppress nematode populations. All fumigant nematicides are **restricted use pesticides** and may only be purchased and applied by a certified pesticide applicator. Directions for soil preparation are discussed in ANR-30, "Nematode Control In The Home Garden." Moisture levels should be sufficiently high for the soil to be worked to seedbed condition.

Fumigation results will be poor in wet or dry soils. Soil temperature at a depth of 6 inches

Table 2. Nematicides Cleared For Turf Use.

Post-Plant Nematicides	Amount To Use Per 1000 sq. ft.	Comments
phenamiphos Nemacur 10G	2½ lb. (100 b./A.)	<b>All post-plant nematicides except Clandosan 618 are restricted use pesticides.</b> Do not use on residential or public recreation areas except golf courses. Do not apply near water or where run-off is likely. Irrigate immediately after treatment with all products with ½ inch water to avoid foliar burn and prevent accidental contamination of ponds or other waterways. Do not exceed 400 pounds of Mocap 10G and 200 pounds of Nemacur 10G per acre per season. Nemacur 10G may also be applied to sod fields and industrial grounds. Nemacur 3 Turf and Mocap 10G are cleared only for golf course use. One to two applications of Nemacur 10G, Nemacur 3 Turf, and Mocap 10G may be made per season.
Nemacur 3 Turf	9.7 fl. oz. (3 gal./A.)	
ethoprop Mocap 10G	4.6 lb. (200 lb./A.)	
chitin and other organic nitrogen sources Clandosan 618 25G	45 to 140 lb. (1 to 3 tn./A.)	
Pre-Plant Fumigant Nematicides	Amount To Use Per Acre	Comments
methyl bromide 68.6% + chloropicrin 1.4% Brom-O-Sol 70	350 lb.	<b>All pre-plant nematicides are restricted use pesticides.</b> For best results, apply fumigant to soil in seedbed condition, free of clods and undecomposed matter. Soil temperature at 6-inch depth should be between 50°F and 80°F. Telone II is effective only against nematodes. See product labels for specific application instructions. Fumigant nematicides will suppress nematode populations for one growing season.
methyl bromide 67% + chloropicrin 33% Terr-O-Gas 67	350 to 420 lb.	
dichloropropene + methyl isocyanate Vorlex	25 to 40 gal.	
metam-sodium Vapam	40 to 100 gal.	
dichloropropene + chloropicrin Telone C-17 Terr-O-Cide 30D	11 to 17 gal. 15 to 25 gal.	
dichloropropene Telone II	9 to 15 gal.	
dazomet Basamid 99G	222 to 350 lb. (5 to 8 lb./1000 sq. ft.)	

should be higher than 60°F. Treated areas should be covered with a plastic tarp for several days after application of a fumigant nematicide for maximum effect against nematodes.

*Post-plant contact nematicides*, available as granular or liquid formulations (except Clandosan) are **restricted use pesticides** that require a Pesticide Applicator Certification Permit for their purchase and application.

Nemacur 10G is registered for use only on golf courses, sod farms, and industrial grounds. Mocap 10G and Nemacur 3 Turf may be applied to golf course turfs *only* by a certified applicator holding a

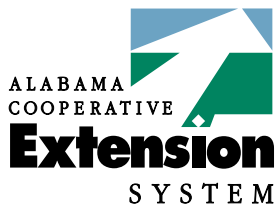
valid permit. (*Use of these nematicides on home lawns is prohibited.*)

Clandosan nematicide is composed of relatively non-toxic compounds and may be safely used in all landscape, commercial, and recreational turfs. This *bionematicide* has not been adequately tested over a wide range of situations, however, and it should be used with caution.

Application of all granular nematicides should be made only with drop-type, gravity spreaders. *Do not use rotary-type (centrifugal) spreaders to apply nematicides.* Nematicide-treated turfs should be irrigated immediately with ½ inch water after appli-

cation to reduce both pesticide exposure and the possibility of foliar burn. Keep people and pets off the treated areas until the foliage dries. Treated sod should not be cut or handled within 21 to 30 days of an application of a restricted use nematicide, depending on the product selected.

Apply nematicides in the spring to protect the newly developed root system from attack. In areas heavily infested with nematodes, a second nematicide application in late summer or early fall may be needed, especially on greens and tees to maintain turf quality.



ANR-523

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Use pesticides **only** according to the directions on the label. Follow all directions, precautions, and restrictions that are listed. Do not use pesticides on plants that are not listed on the label.

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The pesticide rates in this publication are recommended **only** if they are registered with the Environmental Protection Agency and the Alabama Department of Agriculture and Industries. If a registration is changed or cancelled, the rate listed here is no longer recommended. Before you apply any pesticide, check with your county Extension agent for the latest information.

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Trade names are used **only** to give specific information. The Alabama Cooperative Extension System does not endorse or guarantee any product and does not recommend one product instead of another that might be similar.

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**For more information**, call your county Extension office. Look in your telephone directory under your county's name to find the number.

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UPS, 7M17, **Revised Aug 1997**, ANR-523