

# Nematodes in Texas Golf Courses

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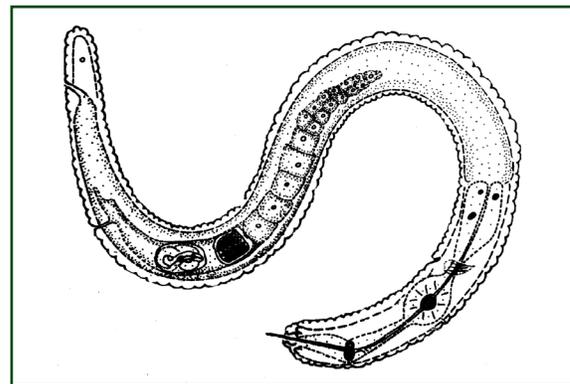
The nematode problem in Texas turfgrass is primarily on golf courses. The damage is most evident on fairways and ultra-dwarf bermudagrass putting greens. These parts of a course are under stress and especially susceptible to nematodes because the turfgrass is:

- constructed on sandy soil
- more intensively managed
- mowed at lower heights
- subject to more traffic

Nematodes are microscopic round worms that are 0.02 to 0.08 inches long and are present in all soils (Figure 1). Some nematodes are parasitic and feed on turfgrass roots and other parts of the grass that are below ground level.

The threshold levels vary for plant-parasitic nematodes to cause turfgrass damage (Table 1). Nematode concentrations in the soil can be high in one area and low just a few feet away. This is why nematode damage usually occurs in patches rather than uniformly across an area. Once established in turf, they can cause significant damage.

Nematode populations fluctuate seasonally. A recent study in Texas, revealed that plant-parasitic nematodes are more prevalent in the spring and fall than during the summer.



**FIGURE 1.** Generic nematode drawing.

Turfgrass disease symptoms are not always correlated with the number of parasitic nematodes in the area because there are fewer of them as turf health declines. High nematode populations in the spring can cause turf damage. Symptoms are evident in the summer even though populations may be lower at the time.

**Table 1.** Threshold levels at which plant parasitic nematodes damage bermudagrass in golf courses

Common name	Scientific name (genus)	Number of nematodes per 100 cc soil
Sting	<i>Belonolaimus</i>	20
Root knot	<i>Meloidogyne</i>	300
Lance	<i>Hoplolaimus</i>	50

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**FIGURE 2A and 2B.** Nematode damage on bermudagrass putting green.



It is difficult to diagnose nematodes in turfgrasses because the symptoms are similar to drought stress, nutrient deficiency and fungal root diseases (Figure 2A and 2B). During the growing season, daytime heat may wilt the grass or turn it yellow when damaged root systems cannot supply adequate nutrients and water to the plant. The turf can become thin and weeds often encroach in affected areas. Grass roots



**FIGURE 3.** Root-knot nematode galls on bermudagrass roots.

may swell, have lesions, or appear stubby, dark or undeveloped (Figure 3). In severe cases, the turfgrass turns brown and dies.

You cannot diagnose turfgrass problems based on symptoms alone. Nematodes can be identified positively only with a soil test. If you suspect that there are nematodes in the area, submit a composite soil sample to the Texas Plant Disease Diagnostic Laboratory (<http://plantclinic.tamu.edu/>).

It is best to collect multiple random soil cores— $\frac{3}{4}$  inch in diameter and 2–3 inches deep—because nematodes are often distributed unevenly in the soil.

### ***Control and management***

There are few effective ways to control nematodes in golf courses once their infestation is established. There are no turfgrass cultivars resistant to nematodes. Therefore, the most important management practice is to avoid introducing nematodes into healthy turf. Clean all equipment thoroughly before moving from infested greens/fairways to non-infested areas.

Turfgrass that has proper pH, fertility, irrigation, and is managed for insects and other diseases, will be healthier and better able to withstand nematode damage. Correct any condition that contributes to turf stress before using nematicides.

Mowing height also contributes to nematode problems. Putting greens, which are cut very short, are damaged more easily than fairways that have higher mowing heights.

### ***Nematicides***

Soil fumigation is effective for controlling nematodes before planting, but cannot be used easily once turf is established. The effectiveness of soil fumigation varies according to soil texture. It is most effective on light sandy soils and least effective in heavy clay soils.

Dichloropropene is a soil fumigant that controls nematodes in established bermuda-

**Table 2.** Nematicides labeled for turfgrass.

Brand name	Active ingredient	Manufacturer	Note
Curfew	Dichloropropene	Dow AgroSciences	Not registered in Texas
Avid	Avamectin	Syngenta	Golf course greens only
Sesamin EC	Sesame oil	Brandt Consolidated	Botanical product
Neemix 4.5	Azadirachtin	Certis USA	Neem oil
Multiguard Protect	Furfural	Agriguard Company	Derived from agricultural byproduct
Econem	Pasteuria spp.	Pasteuria Bioscience	Biological control only for sting nematodes
Nortica	Bacillus firmus	Bayer	Biological control

grass. However, it is very expensive—about \$16,000 for 35 acres of fairways in 2012—and potentially phytotoxic to turfgrass. It is a restricted pesticide and currently there are no certified applicators in Texas.

There are other less effective nematicides including biological products labeled for golf courses in Texas. Most of these products are inconsistent in the field, may require multiple applications for long-term benefit, and need to be applied preventatively. To be most effective, they should be part of a comprehensive turf management program (Table 2).

Apply nematicides only according to label restrictions. Too much organic matter, such as a heavy thatch layer, can bind to the chemical and reduce the effectiveness of nematicides.

Excessive rain and irrigations on greens with high sand content, may reduce nematicide effectiveness by washing it through the soil profile before it can act on the nematodes. Resample the turf six to eight weeks after a nematicide application to ensure that nematode populations have been reduced.

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