

Nematodes in Sand Root Zones— Coming to a Golf Course Near You?

Severe nematode damage on a golf course putting green.

Of all the pest problems in the world of agriculture, nematodes are possibly the least-understood pest. But based upon several recent reports from around the state of Illinois, we all might want to bone up on these little critters. Nematodes are sporadically diagnosed as problems on Illinois golf courses. However, in the past two years we have seen three cases of nematodes damaging turfgrass in sand root zones. Two of these reported cases were in the Chicago area. There may have been other cases that we are unaware of as well.

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Besides the two golf courses in the Chicago area, John Donahoe, athletic turf manager for the University of Illinois Department of Intercollegiate Athletics, had a positive test for nematodes during summer of 2002 on a Kentucky bluegrass soccer field with a 100% fine-sand root zone.

How does one determine if nematodes are a problem? This is a question that can spur tremendous debate amongst agricultural scientists and growers. The problem in determining nematode damage is twofold. First, nematodes are always present in large quantities. Many nematodes are not plant-parasitic, but there will always be some nematodes present that do feed on plants. So, the question is not “are nematodes present,” rather the question is “what level is necessary to cause significant turf damage and when will the turf really benefit from an application to control nematodes?” Second, nematodes are quite tiny and can't be observed with the naked eye. So diagnosis generally involves a significant effort, expense and requires expertise. At the University of Illinois, nematodes are extracted from 100 cc of soil. The extract is then sent to a nematologist to quantify the numbers and species of nematodes present in the sample.

Recently retired University of Illinois extension nematologist Dale Edwards has established threshold guidelines for nematode infestations in

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turf grown in Illinois (Table 1). However, since nematodes are always present in turf, it can be difficult to decide what levels are necessary to cause damage. Nematode diagnoses are often the result of the elimination of all other possible sources of plant injury. Typically, superintendents try increasing water, fertility and then may try fungicides, all without any reduction in symptoms. In fact, symptoms often increase during these periods. It is only after all other possible causes are eliminated that nematodes are suspected.

What kinds of plant injury do nematodes cause? Nematode injury is often first observed on plants under the most stress. Nematode feeding is a stress that will exacerbate existing stresses. Thus, on a putting green, turf may begin to wilt where stress is most severe, the mower cleanup lap on the edge of the green or the area that is under shade. Damage is usually first observed as a yellowing of the leaf tissue. In the case of the Kentucky bluegrass, injury was observed as a light yellowing of the turf and the affected turf was growing more rapidly than the surrounding healthy turf, a type of growth termed etiolation. Damage on creeping bentgrass also starts out as a yellowing of affected leaf tissue. It is difficult to tell on putting-green turf whether affected turf is growing more rapidly than non-nematode-stressed turf due to the low cutting heights and frequent mowing. Because nematode feeding injury is mostly a plant stress, damage is generally observed in the hot summer months when turf is under heat and drought stress. On sand root zones, drought stress can be a problem because of the limited water-holding capacity of sand. Nematode predation on roots can increase the occurrence of drought stress even on well-watered turfs growing on sand root zones. This further increases the stress the turf must endure.

When is nematode injury most likely to be observed? Nematodes have a short life cycle, producing a

new generation in as little as four weeks under warm soil conditions. Nematode populations tend to rise as turf root growth increases. The most likely time to see nematode injury is in the early summer following the spring flush of root growth. Populations may also rise in the fall, but turf managers are less likely to observe damage then because the temperatures are cooler and there is less risk of drought stress. So, like many other turf problems, it is the hot summer months when the damage from nematodes will most likely be apparent.

Proper soil sampling is imperative when attempting to diagnose nematodes. Because nematodes are quite variable and always present, it is wisest to take two, paired samples. One sample from a healthy area helps to establish baseline populations. A second sample from the damaged area can be used to compare levels of plant-parasitic nematodes to those in the healthy turf. A note of caution: if the area you're sampling is very damaged, the nematodes may not be

found in large quantities at the center of the damaged area. They may have moved to more fertile areas after doing their damage. Nematodes can't move great distances—up to one foot per year is normal—but they will move after extensively feeding on a turf root system. Use a standard 1" diameter soil sampling tube to collect six to 10 subsamples from each area. Sampling depth should be equivalent to the turf root zone depth, at least 4" but not more than 6". Subsamples should be combined and placed in a plastic bag and shipped immediately to a testing facility. Remember, these are living organisms; improper handling or storage could kill them and invalidate the test.

Nematode Control

How does a turf manager manage nematodes? First, never apply a nematicide without first having a sample tested by a reputable soil-testing lab, plant clinic or nematologist. Because nematodes are always present, you must first establish the baseline levels prior to treatment. If the nematode analysis



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indicates that nematode levels are high enough to warrant an application (Table 1), consider leaving a small check area untreated. This will help in determining the effectiveness of any nematicide treatments. Currently, there is only one product labeled for nematode control in turf, fenamiphos (trade name NemaCur). NemaCur is a highly toxic product, LD₅₀ of 2 to 19 mg/kg in rats, which also has a propensity to leach to groundwater. This pesticide is a restricted-use product that must be applied with great caution. NemaCur will not eliminate nematodes but will reduce their numbers, and should result in a reduction of the symptoms. A second nematode count about two-three weeks after application will provide additional evidence of the efficacy of the application.

Unless damage is severe, a reduction in environmental stress will cause a reduction in the plant injury caused by nematodes. Sometimes just waiting can be a cure; however, other times a nematicide

application will be required to provide a reduction in symptoms.

Nematodes in turf have been well studied, and we don't know what cultural factors, outside of sand root zones, contribute to nematode problems. Since nematodes are always present, what causes their populations to get to the point where turf damage is observed? This would be a fruitful area for future research. Meanwhile, be on the lookout for signs of nematode injury this summer.

The University of Illinois Plant Clinic accepts samples for nematode determination. The address for the plant clinic is 1401 W. St. Marys Road, Urbana, IL 61802 (217-333-0519). Charges are \$40 per sample and payment should be included with the samples.

Table 1.
Damage thresholds for plant-parasitic nematodes in Illinois turfgrasses^a.

NEMATODE	NEMATODES PER 100 CC OF SOIL ^b
Lance	>75
Lesion	>50
Stunt	>100
Dagger	>50
Spirals	>300
Ring	>300
Pin	>500

^a From University of Illinois Extension report RPD 1108. D.I. Edwards, author.

^b Lance, lesion and stunt nematodes in combination can cause symptoms at lower population levels.



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