

TURFGRASS NEMATODE CONTROL

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Plant parasitic nematodes are small roundworms that feed on or in the root tissues of higher plants. Their feeding can result in diseases expressed through symptoms such as yellowing, stunting, wilting, poor root growth and spots of non-healthy turfgrass. Nematode problems can exist on both greens and fairways. Plant parasitic nematodes feed as ectoparasites, migratory endoparasites, or sedentary endoparasites. There are a number of cultural, biological, physical and chemical procedures that can be used to prevent or alleviate nematode problems related to turfgrass. Proper diagnosis of the problem, however, is an essential prerequisite for the design of an appropriate nematode control program.

Because nematodes are microscopic and the damage they cause is very similar to that resulting from other factors, a laboratory analysis of soil and root tissue is usually necessary for diagnosis of plant-parasitic nematode problems. In Michigan, this service is provided by the Michigan State University Nematode Diagnostic Service Laboratory, which is operated as part of the Cooperative Extension Service Diagnostic Clinic. Soil and root samples can be taken, submitted and reliably processed whenever the soil is not frozen. For the best possible results, however, samples should not be taken until 60 days after the initiation of annual root growth and not after the first frost.

Take turf samples with a soil sampling tube, trowel, or narrow bladed shovel. The soil should be taken at a 1 to 5 inch depth, and contain as many feeder roots as possible. Each sample should consist of a pint to a quart of soil taken from a larger sample composed of 10 or more subsamples. The number of subsamples (soil cores or borings) needed depends on the size of the area being investigated.

1. Small area (less than 5,000 sq ft), take at least 10 subsamples.
2. Medium area (5000 sq ft to 1 acre), take at least 25 subsamples.
3. Large area (1 to 5 acres), take at least 50 subsamples. No one sample should represent more than 5 acres, and each sample should be from an area of a uniform sample type. Mix the subsamples in a clean pail or a plastic bag and submit one pint to a quart for nematode analysis. Plant parasitic nematodes feed only on living tissues and are rarely found in dead roots. Soil and root samples, therefore, should be taken from the margin of the problem area where the turfgrass is still living.

Use either the special nematode sample container provided by the Extension Service or a plastic bag. Place all samples in plastic bag as soon as possible. Nematodes will be killed if the sample is allowed to dry, and it is important that the nematodes are living when the sample arrives at the laboratory.

Soil and root samples are perishable. Handle accordingly, and process as quickly as possible. Ideally, they should be stored at 10-15°C (50-58°F).

Samples should not be exposed to direct sunlight or stored in trunks of automobiles. Temperatures greater than 40°C (100°F) will kill nematodes.

Submit all samples through the local extension office, accompanied by a completed form. The information requested on the form is essential for diagnosis of nematode problems and proper recommendations for nematode population management. It generally takes two weeks from the time a sample is taken until the results are returned to the grower by the local extension agent. The rapid root and soil assays that are used for mineral soils, however, are not always satisfactory for analysis of organic soils. In a few cases, a bioassay that requires a 45 day incubation period is used for analysis of organic soils. When this is recommended, you will be notified immediately of the delay and will receive the results within two months after the sample was taken.

All results and recommendations will be forwarded to you directly or returned to you by the local extension agent. The types and numbers of nematodes will be recorded on the assay form, along with an indication of whether or not nematodes are a problem. If nematodes appear to be a problem, a recommendation will be made which can be discussed in detail with the local extension agent. The best way to analyze the success of nematode population management is to submit a post-treatment sample for nematode analysis. These samples should be taken four to six weeks after treatment. There is a \$10.00 charge for nematode samples (\$9.00 per sample for 25-49 samples and \$8.00 per sample for >50 samples.)

Additional information about diagnosis and control of nematode problems of turfgrass can be obtained by requesting MSU Cooperative Extension Service Bulletin E-800, "Nematode Detection," E-701 and "The Hidden Enemy: Nematodes and Their Control," E-903.

Nematode Control

Sites to be used for the establishment of high quality commercial turfs should be sampled for nematodes before seeding or sodding. If sod is to be used, obtain a high quality product grown in nematode free, nematicide-treated or fumigated soil. This precaution, however, will be of little value unless the soil where the sod is to be used is nematode-free, nematicide-treated or fumigated.

Pre-plant Treatment--If a site is infested with a detrimental plant-parasitic nematode, treat pre-plant with an appropriate soil fumigant or nematicide. This type of control is generally more satisfactory than treatment at or after seeding or sodding.

The pre-plant soil fumigant 1,3-D (Vorlex, Telone II or Telone C-17) (1,3-D) is suitable for nematode control in future commercial turf sites (Table 1). Inject to a soil depth of 6-8 inches, and apply at least 21 days before seeding or sodding. The soil temperature should be between 50 and 80°F. Prior to seeding or sodding, work the soil to release the fumigant.

Treatment of established commercial turfs with granular nematicides such as fensulfothion (Dasanit) or phenamophos (Nemacur) can be used to control nematodes in many established commercial turfs (Table 2). They are for

professional application only, and may not be suitable for use in certain situations such as football fields and playgrounds. These materials must be uniformly distributed over the turf and drenched immediately after application using 1/2 to 1 inch of water.

Table 1. Fumigant nematicides.

Telone II	12-36 gal/A broadcast	21 days pre-plant
Telone C-17	12-36 gal/A broadcast	21 days pre-plant
Vorlex	15-40 gal/A broadcast	21 days pre-plant
Brom-O-Gas	1-2 lbs/100 sq ft	72 hrs pre-plant

Table 2. Non-fumigant nematicides.

Dasanit 15G	1.5-3.0 lbs/ 1000 sq. ft.	plus 1/2 inch water drench
Nemacur 10G	2.5-4.5 lbs/ 1000 sq. ft.	plus 1/2 inch water drench