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Golf Course Superintendents Factsheet Series

Nemacur Cancellation

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OF THE HUNDREDS of known species of nematodes, only a handful have been identified as plant pathogens. These microscopic round worms debilitate turf by feeding on the root system. Root-knot (*Meloidogyne spp.)* and Lance *(Hoplolaimus spp.)* nematodes frequently cause chronic problems in the Northeast when their populations exceed threshold levels.

Figure 1. Although not yet identified in the United States on putting greens, the grass-gall nematode (*Subanguina radicicola*) is extremely damaging on *Poa annua*. It has been found in eastern Canada and is widely distributed in Europe. A very aggressive nematode, it can kill large stands of *Poa,* usually in late fall. It has never been successfully reared on creeping bentgrass, a grass that appears to be resistant to the pathogen.

Most nematodes consume bacteria and other soil organisms. The presence of nematodes does not immediately imply the potential for damage. However, as putting green turf has experienced increased stress and more shallow rooting through dramatic reductions in cutting height over the past two decades, nematode problems have been observed more frequently.

Plant-parasitic nematodes are more destructive when their host is under stress. Many factors can increase turf stress, specifically: reduced height-of-cut, reduced fertilizer levels, increased shade, increased traffic and increased *Poa annua* invasion.

For thirty years, golf course superintendents have relied on multiple chemicals for nematode control. However, the practice of nematode control has undergone a dramatic change in the past decade. Mocap (ethoprop) and Dasanit (fensulfothion) are no longer available. In 2002, the EPA recommended cessation of the use of Nemacur (fenamiphos) due to concerns about toxicity and ground water contamination. While very effective at controlling nematodes, fenamiphos can be extremely toxic to mammals and other organisms.

On May 31st, 2007, the five-year phase-out plan for Nemacur will come to an end. Golf course superintendents will have one year beyond this date to use up their remaining stock of the chemical that has been the last line of defense against turf parasitic nematodes. If you have not prepared for this imminent change in your turf management program, now is the time to consider your alternatives.

Figure 2. The grass root-knot nematode (*Melooidogyne graminis)* has become extremely common on putting greens, fairways and roughs in the Northeast. In those places where it occurs, it is a perennial problem that was difficult to manage even with Nemacur. We have identified it from Rhode Island, Massachusetts, Connecticut and New York State. Other scientists have found it as far south as the Carolinas. It has a very wide host range, attacking everything from creeping bentgrass to wheat (as seen above) and causes large swellings or galls to form on plant roots.

Identifying Nematode Damage

Foliar symptoms of nematode damage include chlorosis, lack of vigor, thinning, and frequent wilting. These symptoms may be exacerbated by hot weather and drought, and are most likely to appear in irregular patches. Fungicides, fertilizer, irrigation, and aeration do not improve the condition of the turf. Roots may or may not show symptoms such as lesions, knots, and dieback. To be certain that nematodes are involved in turf decline, a specimen should be submitted to a turf pathology laboratory.

Low levels of turf-parasitic nematodes are expected on any putting green. When the level of turf-parasitic nematodes reaches the disease threshold, however, damage will occur. The disease threshold is different for every nematode species. The UMASS/URI thresholds for the most common nematodes are: Lance = 400 nemas/100 cc soil, Stunt = 800 nemas/100 cc soil, Spiral = 2000 nemas/cc soil, Ring = 2000 nemas/100 cc soil, Root-knot = about 100 nemas/100 cc soil.

Control

Healthy turf is far less likely to suffer from nematodes or any other form of disease. The key to nematode control is prevention, and the best way to prevent a nematode infestation is through cultural practices:

- Water deeply and infrequently. This will encourage deep, healthy root growth, which resists damage from nematode predation and helps prevent drought stress.
- Use a well-balanced fertilizer. Increased fertility stimulates root growth. Avoid excess nitrogen, which results in tender root growth that is less resistant to nematode predation.
- Increase mowing height whenever possible. The stress of frequent, low mowing makes turf more susceptible to disease. Keep mower blades sharp to minimize injury to plant tissue.
- Avoid growing *Poa annua*. It is often a preferential host of turf nematodes.
- Alleviate stress on turf wherever possible. Avoid compaction by moving the cup frequently.

Soil fumigation is another possible alternative. Telone (1,3-dichloropropene) and Basamid (dazomet) are available for pre-plant use. While fumigants will reduce nematode populations, they never entirely eliminate the pathogen. Unfortunately, they can also disrupt soil microbal populations, sometimes leading to an increase in turf-pathogenic nematodes. A number of "organic" post-plant nematicides are available. Unfortunately, many show little nematicidal activity. A few do look promising and more research into their efficacy is constantly becoming available.

Figure 3. Nematode damage can be extremely dramatic. Although damage commonly appears as dramatic wilting in large chlorotic patches, turf death can also occur, as seen above. While this type of damage is less common, it is often observed when the grass is already under drought stress and exhibiting shallow rooting.

There are no turf varieties that resist nematode infection; however, since nematode infection is a symptom of plant health, it is important to use the right variety of turf for the right place. Consider the appropriateness of the cultivar for the spot it's growing in. A species that is well adapted to its environment will be healthier than one that is not.

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