Are Alternatives to Traditional Nematicides a Real Possibility?

Although many of the traditional products may no longer be used, new ones may be available soon.

BY WILLIAM T. CROW

Nematode management on golf course turf has not gotten easier in recent years. Many of the effective nematicides formerly labeled for golf course use are no longer available. Fenamiphos, the active ingredient in the Nemacur® products, has been the most widely used nematicide on golf courses over the last 30 years. This product is currently being phased out of production.

At the same time, nematode problems are becoming more widespread. The sting nematode, the most devastating nematode to turfgrasses, is being spread to putting greens and sandy fairways outside of its natural geographical range through infested planting material. What does the future hold for nematode management on golf course turf? Will golf course superintendents be able to treat for these invisible invaders?

During the past two decades most of the major players in pesticide development and manufacturing have not put much effort into nematicide discovery. This trend has changed to some extent in recent years due to opportunities presented by the phase-out of methyl-bromide and organophosphates. At the University of Florida and other institutions, nematologists are working with chemical companies to evaluate new chemistries and uses for existing nematicides. However, the road to registration is fraught with delays and difficulties. Even if a new nematicide works, it can be years before it gets on the market, if it does at all.

The lack of effective new nematicides has opened up opportunities for smaller companies to get alternative products for nematode management on the market. These products include soil amendments, biological organisms (bacteria, fungi, nematodes), or biologically derived compounds (plant extracts, vat fermentation products, etc.). Because most of these are exempt from EPA scrutiny, they are relatively cheap and quick to get on the market. Unfortunately, rigorous and objective evaluation of their efficacy is lacking for many of these products.

Dr. Brian Unruh at the University of Florida is investigating various nematode treatments under golf course conditions at Walton Beach Golf Club.

In 2002 and 2003 the University of Florida evaluated the effectiveness of numerous alternative nematicide control products on golf course turf. This project was funded with grants from the Florida Golf Course Superintendents Association, the Golf Course Superintendents Association of America, and with grant-in-aid from the USGA. In these studies the effects of these products on nematode populations, turf visual performance, and root development were evaluated. Various rates, timing, and application protocols approved by the respective companies were used for each product. Treatments were applied monthly, biweekly, or weekly for six months. The products tested included root stimulants, nematode biological controls, plant extracts, induced resistance products, and biological nematicides with comparisons to untreated controls and Nemacur-treated turf.

In 2002 the experiment was conducted on an experimental putting green at the University of Florida G. C.

Nematodes frequently attack the root system, resulting in stunted root growth (right). The shoots may become stunted in irregular patches and appear yellowish or chlorotic.

Horne Turfgrass Research Facility. This green had Floradwarf bermudagrass infested with damaging numbers of lance nematodes (*Hoplolaimus galeatus*) and stubby-root nematodes (*Trichodorus proximus*). During 2002 the products evaluated included:

1. Nemastop (Soil Technology Corp., Ames, Iowa)
2. Safe-T Green (Safe Materials Inc., Valdosta, Ga.)
3. Nematac S (Becker Underwood, Ames, Iowa)
4. Avermectin (Syngenta Professional Products, Basil, Switzerland)
5. Neo-Tec (Parkway Research Corp., Houston, Tex.)
6. Floradox (Floratine Products Group, Collierville, Tenn.)
7. Keyplex 350 DP (Morse Enterprises, Miami, Fla.)
8. Turf Vigor LN (Novozymes Biologicals Inc., Salem, Va.)
9. Superbio Microbial Blend (Advanced Microbial Solutions, Pilot Point, Tex.)
10. Synzyme (Howard Fertilizer Co., Orlando, Fla.)
11. Quillaja 35 (Desert King International, San Diego, Calif.)
12. A mustard-based material (Nematrol Inc., Guelph, Canada)

In 2003 the experiment was conducted on a Tifway 419 athletic field with damaging populations of sting nematodes (*Belonolaimus longicaudatus*). Product evaluations included:

1. NeoTec (Parkway Research Corp., Houston, Tex.)
2. Safe-T Green (Safe Materials Inc., Valdosta, Ga.)
3. Keyplex 350 DP (Morse Enterprises, Miami, Fla.)
4. Turf Vigor LN (Novozymes Biologicals Inc., Salem, Va.)
5. Synzyme (Howard Fertilizer Co., Orlando, Fla.)
6. Quillaja 35 (Desert King International, San Diego, Calif.)
7. Neo-Tec S.O. (Parkway Research Corp., Houston, Tex.)
8. Dragonfire CPP (Poulanger U.S.A., Lakeland, Fla.)
9. Cyclewise Nema (Hoodridge International, Parkland, Fla.)
10. AgroNem (Agro Logistic Systems Inc., Diamond Bar, Calif.)
11. Superbio Soil Builder (Advanced Microbial Solutions, Pilot Point, Tex.)
12. Ditera (Valent BioSciences Corp., Libertyville, Ill.)
13. A mustard-based material (Nematrol Inc., Guelph, Canada)

In 2002 none of the experimental treatments reduced nematode populations compared to the untreated controls. However, the mustard product enhanced turf color and density throughout the six-month test period. The data being collected for 2003 have not yet been analyzed. In 2003, we worked with an improved formulation of the mustard product and used new application methods. With the changes in 2003, significant reductions in nematode population densities, in addition to beneficial turf responses, were observed.

The mustard product may benefit the turf in several ways. Nematode effects can be largely attributed to biofumigation. As the mustard bran breaks down, it releases a nematicidal gas called allyl-isothiocyanate. This gas is similar to that released by certain synthetic soil fumigants sometimes used in turf renovation. The gas dissolves in water and is moved into the soil profile by irrigation. The material also has some fertility effects, and the rates used in the study delivered about 0.5 to 1.0 lb. of N per 1,000 sq. ft. We are still learning about this product and how it works. Data thus far indicate that it may be more effective against some nematode species than others.

So, will there be any effective nematode management products on the market by 2010? I feel confident that there will be. Several of the products evaluated in this study and in other research show promise. The chemical companies are restarting their nematicide screening programs, and we are learning more about nematode biological control. At the same time, superintendents need to be warned that many of the options on the market are not all they are cracked up to be, and they should first be carefully evaluated on a small scale.

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