New biological nematicide 'disappointing'

Quite a few new product announcements cross our desks each month, usually accompanied by fairly extensive marketing literature. One such packet arrived recently, touting a new biological nematicide: DiTera, from Abbott Laboratories. Upon first glance, DiTera has all the qualities turfgrass managers are looking for as an alternative to the 1960s chemistry of Nemacur and Mocap:

- Biological origin — DiTera is a product of the fermentation of a naturally-occurring fungus (Myrothecium s p.), which was originally isolated from a cyst nematode
- U.S. EPA registered — with the signal word "Caution" and a 4-hour reentry interval (compared to "Danger" and 48 hours for both Nemacur 3 and Mocap 20G)
- Broad-spectrum control — of root knot, cyst, lesion, stubby root, sting and several other nematode species
- Low toxicity— acute oral, dermal and inhalation LD50 rated in Category IV (practically non-toxic)
- No toxicity toward non-target organisms — including beneficial nematodes (free-living, saprophytic and insect-pathogenic species), birds and aquatic wildlife
- Flexible application timing and methodology
- No restrictions on the number of annual applications.

All this sounds great. So what is the problem? Apparently, DiTera doesn't work terribly well controlling nematodes in turfgrass. The first "red flag" we noticed was a very limited list of turf-related references included in the promotional package: one golf course superintendent and a spray applicator in Florida, and an Abbott Labs field technical specialist. No university references at all — highly unusual. Perhaps this might be one of those "snake oils" that don't work.

Coincidentally, we received the May issue of *The Newsletter,* published by the Golf Course Superintendents Association of New England, which cited the 1997 Turfgrass Nematode Studies performed by Dr. Robert Wick at the University of Massachusetts, Amherst. The research, funded by Abbott Labs and GCSANE, basically compared DiTera to Nemacur and a control, over two years, on two different putting greens, on ring, lance, stunt and root-knot nematodes.

Dr. Robert Dunn explains the progress of his research into biological controls for turf damaging nematodes at the July 1998 IFAS Field Days in Gainesville. Photo by Joel Jackson.

Some excerpts from the results:

- "Ring populations were not significantly reduced by either DiTera or Nemacur..."1996
- "DiTera did not reduce lance populations..."—1996
- "Stunt was not reduced by either the DiTera or Nemacur..."—1996
- "Ring and lance populations were not significantly reduced by either DiTera or Nemacur..."—1997
- "Nemacur significantly reduced stunt populations but DiTera did not..."—1997
- "Only Nemacur reduced root-knot juveniles compared to the control..." – 1997.

We contacted Dr. Rob Wick at UMass to confirm if we were reading the results correctly. His reply:

"I had high hopes for DiTera but it failed miserably. I am even retesting it again at 2x rates this year. I do not believe it will work for nematodes in turf, and I can't recommend it. Please call Bob Dunn, nematologist in Florida, who is also studying this product."

In the interim, we had contacted Dr. Bruce Martin at Clemson University, who concurred that results in his field trials to date have been disappointing. "It is early, however," he added, "and more data is needed before we can tell how DiTera might fit in a nematode management program."

Following Dr. Wick's suggestion, we contacted Dr. Robert Dunn, professor and extension nematologist at the University of Florida, Gainesville.

"DiTera kills nematodes in vitro very well," he said. "Unfortunately, the performance of the product in turfgrass systems, particularly in the sandy soils characteristic of golf greens, has been disappointing. I have yet to get a positive re-

sponse on a continuous basis, but I'm still looking for the secret. Frankly, I'm puzzled..."

Dr. Dunn forwarded a summary of the nematode research in progress at the University of Florida, which follows.

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1998 Nematology Studies at the University of Florida Envirogreen

Three nematology experiments are under way at the University of Florida's Envirogreen research facility for the 1998 season. Funds provided by the Florida Turfgrass Association have made it possible to hire an assistant, Mr. Paul Fox, to attend to this and related field research in turf nematology this year. Cooperation of the manufacturers of products being tested in Trial 2 (Nematicide Product Evaluation) also has been critical for establishing that study.

Biological control of turf nematodes

The nematodes' natural enemies that seem to be most promising for use as biological control agents are bacteria in the genus *Pasteuria*. Most work with these microbes has been done with root-knot nematodes as pests of annual food and feed crops. In some cases, *Pasteuria penetrans* has caused nearly complete collapse of extremely virulent root-knot nematode populations associated with peanut and some vegetable crops. I believe that I have isolated a *Pasteuria* that attacks the turfgrass root-knot nematode. Dr. Robin Giblin Davis (nematologist at UF AREC at Fort Lauderdale) has identified a related *Pasteuria* species that attacks sting nematodes in south Florida.

The Envirogreen has been found to be infested with both turf root-knot nematodes and sting nematodes, so it presents us a good opportunity to study these microbial enemies of two different turf nematodes in a field situation. in this experiment, there will be 10 plots treated with each of four treatments:

- *Pasteuria* specific to the turf root-knot nematode which is present at high levels in the Envirogreen
- *Pasteuria* specific to the sting nematode, which is present at low levels in the Envirogreen
- both of the above nematode parasites
- untreated control

We will sample regularly to study what percentage of each nematode species may become affected by its specific parasite, and how fast that infection may spread from the point of application, and what effect those infections have on nematode populations and turf growth.

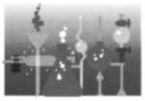
Nematicide Product Evaluation

The turf industry desperately needs objective comparisons of many products now available or being prepared for marketing for nematode control. Some are old nematicides being suggested for a relatively new use; others are entirely new biologically derived materials for which few or no data are available on their efficacy as nematicides. A single rate or sequence of applications of each of these products (list below) will be applied and nematode populations and turf quality monitored through the summer. Additional trials of some of these products will be conducted at other sites.

- Actinovate Plus® (*Streptomyces lydicus* WYEC108; Natural Industries,Inc.); University of Wyoming scientists have reported that this species can colonize the root zone of many kinds of plants and provide some protection against infection of those roots by fungal parasites. The manufacturer believes it can have a similar effect on nematodes.

- Agrimek® 0.15 EC (*avermectin* B; Novartis); the active ingredient of this well-known miticide-insecticide is very toxic to nematodes in vitro (in the lab—literally, "in glass") and in animals. However, there has been little success in getting it to behave well in soil and plant systems, at least in part because of very rapid and tight binding to soil organic matter and/or clay. We hope that the defined sands of USGA spec greens are a medium in which that binding is less of a problem, so the active ingredient can reach nematodes.

- Prosper-Nema® (Spores of nema-



tode-trapping fungi; Circle One, Brooksville, Fla.) A mixture of fungi antagonistic to nematodes formulated in a dry powder that is to be dissolved in water for spray application. Most field soils that have had any plants growing in them recently will already have large numbers of spores of such fungi in them.

• Deny®9 (0.6% *Burkholderia* (=*Pseudomonas*) *cepacia*, > 8.8 x 109 viable cells/fl. oz.: CCT Corporation): a rhizosphere bacterium that has been reported to colonize root surfaces and provide a barrier to infection by some fungal and bacterial pathogens of several kinds of crops: manufacturer believes it will do same for turf nematodes.

• DiTera (dried culture of a fungus, *Myriothecium verrucaria*, Abbott Laboratories): a fungus culture selected for toxic properties against plant-parasitic nematodes, now being marketed for control of root-knot and cyst nematodes on selected crops in California, Previous results on turf in Florida. Georgia, South Carolina, and Massachusetts have been disappointing, but we will try the most promising treatment sequence.

• MYX-473® (a pelargonic acid derivative: Mycogen Corp.): showed real promise in laboratory tests, but this is the first year of field tests on several Florida crops.

• Nemafert® (mixture of rapeseed meal and neem oilseed meal, from Atlantic Austalasia Ltd., in Australia): a top dressing or soil amendment based on two naturally nematicidal plant products that have been used successfully for centuries in some parts of the world, but this is a first test of this mixture on fine turf in the U.S.

We will sample regularly to study what percentage of each nematode species may become affected by its specific parasite . . .

• Neotrol® (composed 100% of ground-up plants of a patented variety of sesame; Parkway Research Corp.): another naturally nematicidal plant product, but there are serious questions of rates that might be most effective on turf in sandy soils, and against the range of nematodes normally found with turf.

• Safe-T Green® 18 (A proprietary blend of linear secondary alcohols reacted with ethylene oxide; SMI); researchers in Mississippi and Louisiana have had some success with this product on both turf and cotton, but results have not been consistent. This is the first test on turf nematodes that I know of in Florida.

• Telone® 11(1 ,3-dichloropropene; Dow AgroSciences); long known as an effective soil treatment for nematode control before planting many kinds of crops, but traditional rates are too phytotoxic to be applied to living turf. Application of selected lower rates by sub-surface soil injection has been very effective for reducing nematode damage to bermudagrass roots in sod farm conditions.

• Turfcure 376® (metam-sodium. AmVac); another soil fumigant well known as a preplant treatment; recent work in several Florida locations indicate that this may be safe for use at very low rates for nematode control under golf course conditions.

Population Dynamics of Turf Root-Knot Nematode

Since this area of the Envirogreen has been found to be infested with varying levels of the turf root-knot nematode *(Meloidogyne graminis)*, we are presented with an excellent opportunity to monitor its seasonal fluctuations at this site by simply sampling each plot at regular intervals.

In addition to the product comparison described above, I also have in progress four golf course evaluations of DiTera, separate rate studies with Neotrol, Nemafert, SafeT-Green, and Turfcure, a rate study with the biological agents (Actinovate, Deny, and Prosper-Nema), and commercially-applied field demonstrations/trials of Turfcure and Telone. There are large-scale trials of Agrimek being installed by Novartis this week, which I also expect to overview.

Robert A. Dunn
20 June, 1998

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