

# Bio market bubbles

*The development and promise of new biological products to solve pesky turfgrass problems is providing the green industry with more choices.*

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**G**one is much—but not all—of the hype. It left with too many unfulfilled and, perhaps, unfulfillable expectations. But the use of biological controls in professional turfgrass is accelerating.

Specifically, researchers are starting to sort and discover which biological products work, and against which pests. Equally important, they're finding out why. Promising new biological agents are being targeted against insects, diseases and, surprisingly, weeds too.

Even so, the amount of biological product used by turfgrass managers remains miniscule, particularly compared to chemical controls. But it's growing, 300 golf course superintendents learned from four researchers at the North Central Turfgrass Expo near Chicago this past December.

## **Bios and chemicals as partners**

What they learned was that most turfgrass managers will use biological agents along with, or perhaps in conjunction with, chemicals. The use of biologicals will allow managers to use chemical products less frequently or at lower use rates.

Speaking at St. Charles, Ill., were Dr. Hank Wilkinson, plant pathologist at the University of Illinois; Dr. Nick Christians, professor of horticulture at Iowa State University (see article in Feb. '97 LM); Dr. Gary Harman, plant pathologist at New York State Agriculture Experiment Station

(Cornell); and Dr. Fred Baxendale, professor and extension entomology specialist at University of Nebraska.

Wilkinson offered a working definition of a biological control as "one organism suppressing another." (His colleagues later expanded that to include by-products of organisms also.)

A severe outbreak of a turfgrass disease is "an imbalance of a turfgrass ecosystem," explained Wilkinson. The disease proliferates in the absence of other micro-organisms that, given sufficient time and the right conditions, keep disease in check. The soil contains thousands of micro-organisms. Some control harmful fungi.

However, turfgrass managers rarely have time to wait for the micro-organisms to re-establish themselves or this balance. Managers must use fungicides to reduce disease.

Meanwhile they must keep turfgrass growing and healthy to replace the damage



The grubs, top, are healthy; those on the left have been killed by nematodes and those on the right by milky spore disease.

caused by the disease.

The other researchers built on this concept which they indicated is key to understanding how biological agents work in the complex turfgrass bio system.

## **Develop a strategy**

"There is no single activity to manage or control disease," said Wilkinson. "Biological controls need to be integrated with other practices." Biologicals are most effective when used in a multi-step process involving:

- Forecasting. "If you wait till you see it (a disease), generally it's too late," said Wilkinson.

- Using disease-resistant turfgrass varieties. The composition of a stand of turf can be changed over time by slit-seeding or overseeding with disease-resistant cultivars or varieties of turfgrass.

- Cultural practices that promote grass growth and also the health, diversity and activity of micro-organisms around the turf.

Harman discussed three biological sys-

tems that turfgrass managers can already use to reduce turfgrass disease: composts, the Bioject System and Bio-Trek 22.

Composts can be made of almost any organic matter. They vary significantly in quality, said Harman who commented on research by Dr. Eric Nelson at Cornell that demonstrated that applications of some composts suppress turfgrass diseases. These composts contain high levels of the types of micro-organisms that prey on harmful fungi.

Soon, turf managers will be able to purchase composts fortified with beneficial fungi and bacteria. Harman credited Dr. Harry Hoitink at Ohio State University with developing the fortified compost which, because of its fungicidal claims will have to be registered as a pesticide. It will likely be introduced into the greenhouse market first, said Harman.

"You begin to tilt the population of the soil in favor of a healthier situation," he added, describing the use of fortified compost as an example of "a complex biological control."

#### Bio-Trek 22G

Harman briefly described one biological systems to control disease that is already available to turfgrass managers: Bio-Trek 22G.

Bio-Trek 22G is a granular formulation that has been available for two years. It uses a single fungus known as trichoderma that colonizes turfgrass roots. Trichoderma occurs naturally in the soil but not, usually, in sufficient numbers to suppress disease. Bio-Trek 22G increases the microbe's population manyfold and is superior to wild strains in its ability to colonize roots and suppress diseases.

"Here, more is indeed better. The more we apply, the more disease suppression we will have," said Harman.

The summer of 1996, Harman tested the compatibility of the product with popular fungicides. Products like Rubigan, Aliette, Chipco 26019, and Bayleton among others did not harm it. Also, tests of the product's use as a foliar spray indicated promise. Bio-Trek 22G could be applied either by itself or in combination with re-

duced rates of fungicides. Harman said he's hopeful that the product will become available as a spray by early 1998.

"These results certainly suggest that, at least with an integrated and maybe with a pure biological we can get good disease control, at least with some diseases," said Harman.

#### Insect pathogens

Nebraska's Dr. Fred Baxendale described three types of biological control agents of pest insects: predators like lady beetles and ground beetles, parasitoids including species of tiny wasps and flies, and insect pathogens.

"There is more activity going on in this area (insect pathogens) than any other aspect of biological control of turf insects," said Baxendale. Pathogens include bacteria, viruses, fungi and nematodes. "In many cases these naturally occurring organisms come in and reduce insect populations, but we often don't have time to wait," he said. "They're not going to help us before the turf has been damaged."

Turfgrass managers are already familiar with bacteria like *Bacillus thuringiensis* (Bt) that attacks caterpillars. There are many Bt products. *Bacillus popilliae* which causes milky disease in Japanese beetle grubs is also relatively well known and marketed under several trade names.

Work to improve the effectiveness on these pathogens continues at an encouraging pace.

Baxendale said he is encouraged by what he's seeing. The entomologist said researchers at Cornell and Kentucky are looking at fungi for insect control. One commercial product, Naturalist, using *Beauveria bassiana* shows promise against



**Beneficial predators like this big-eyed bug often provide unseen control of turfgrass insect pests.**

chinch bugs and billbugs.

Nematodes? "I'm still a proponent of nematodes," said Baxendale. "I think there is potential, but there is still a lot of work that needs to be done."

Conserve from DowElanco represents a class of control products derived from naturally occurring metabolites of micro-organisms. In turfgrass, it provides excellent control of armyworms, sod webworms and cutworms. It should be available soon.

Two new chemical products, while they aren't biologicals, are noteworthy also, said Baxendale. Merit from Bayer and RohMid's MACH 2 are effective against target pests, particularly grubs, but are less toxic to beneficials in the soil.

Baxendale seemed to be speaking for his colleagues too when he described how a good turfgrass manager attempts to maintain and conserve the balance of organisms in the soil and turfgrass.

"We want to preserve the existing natural enemies," he said. "We want to minimize our insecticide applications. We can use our insecticides selectively." □



**Dr. Fred Baxendale says certain strains of Bt and fungi show promise against turfgrass insect pests.**