

Nematode progress reviewed by company, turf research experts

SCOTTSDALE, Ariz.—Representatives of the Biosys Co. and Ciba-Geigy met here in March with leading university turfgrass entomologists to discuss the future of the Exhibit nematode product for use in professional turf care.

The 14 university and USDA researchers included Drs. Harry Niemczyk, David Shetlar and Michael Klein from Ohio State University; Dr. Patricia Cobb, Auburn University; Dr. Patricia Vittum, University of Massachusetts; and Dr. Lee Hellman, of the University of Maryland.

The Palo Alto, Calif.-based Biosys has established itself as a leader in nematode research and breeding. It recently entered into a joint marketing agreement with Ciba-Geigy Corp. and at least two other major chemical firms.

Currently, Exhibit controls cutworms, armyworms, sod webworms and billbugs.

The two-day meeting, meant to help drum up support for the product and to keep track of field research progress, contained a summary by Dr. Ramon Georgis of the current nematode research on soil insects in turf, including:

- ✓ black cutworms;
- ✓ sod webworms;
- ✓ billbugs;
- ✓ armyworms;
- ✓ chinch bugs;



Houseworth: new packaging designed for easier measure.

- ✓ mole crickets;
- ✓ white grubs;
- ✓ crane flies.

The only significant surface-feeding turf pest not yet included on the Exhibit label is the chinch bug, and it was suggested that various research strategies be used to tackle the problem of chinch bug control.

One of the recognized drawbacks with nematode control is its delayed action following application. To overcome this problem on golf courses, Niemczyk, Shetlar and Stan Swier of New Hampshire are going to develop a research program to judge the efficacy of season long applications on golf course turf.

The group approved the introduction of a bulk LCO product based on *S.*

glaseri and/or *H. bacteriophora* for control of white grubs, and another, based on *S. scapterisci*, for control of mole crickets.

Nematode formulations currently under development by Biosys include:

- a filled-flowable nematode formulation in a paper pouch supported by cardboard;
- a gel formulation in a bag, in which an insert is broken and the nematodes become flowable;
- a moist granular flowable that dissolves in the mixing tank;
- a granular formulation that absorbs water, and then breaks open to disperse the nematodes.

Exhibit will soon be available in a new flowable formulation, consisting of plastic polymer pouches attached to a plastic frame.

Rick Miller of Biosys says new Exhibit use recommendations have been established, primarily a significant relaxation of product use barriers, including time of day and pre-irrigation requirement, a reduced screen size requirement and adoption of turf spray volume standards.

Future nematode application research will cover the following:

- investigation of the effects of thatch and soil moisture;
- control evaluation/insect monitoring techniques;

- further work on irrigation requirements and automated delivery systems;
- sub-surface application systems.

continued on next page



Klein: Questions nematode efficacy in white grub control.



Georgis: Exhibit available in bulk for LCOs.



Miller: Exhibit 'The consumer white grub product of the future.'

NEMATODE Q & A

■ Here are the answers to green industry professionals' most common questions about nematodes.

What are nematodes?—They're a large class of worm-like organisms that live in soil and occupy many different biological niches. Some are destructive parasites of plants. Others—called beneficial nematodes—prey exclusively on grubs and larvae of harmful insects.

What are the practical uses of nematodes?—Nematodes are an ideal biopesticide (or, a living organism that controls pests).

How do nematodes control insect pests?—Harmless to humans, animals and plants, beneficial nematodes aggressively pursue insects. When they sense the temperature and carbon dioxide emissions of soil-borne insects, beneficial nematodes move toward their prey and enter the pest through its body openings.

Are nematodes safe?—Beneficial nematodes are harmless to humans, pests and livestock, as well as honey bees, earthworms, ladybugs and other useful organisms. Nematodes represent a "closed system." This means that neither the nematodes nor their accompanying bacteria can live at the warm body temperature of mammals.

Are there any environmental side effects?—No. Beneficial nematodes do not have any negative impact on groundwater, soil, livestock, crops or farm workers. Nor do they become a permanent part of an agricultural or garden ecosystem. Even under ideal conditions, they persist in the soil only for a few months until they run out of prey.

How do nematodes compare to other biological pesticides?—Nematodes do not rely on passive ingestion or contact with the insect pest. They are mobile predators that actively seek out pests. They target a broad range of soil-living insects, at several stages of their life cycles.

What application rates are most effective?—User rates vary, according to the target pest, soil conditions and other factors. Generally, nematode-based pesticides are comparable in applied quantity to chemical sprays. For example, to treat an acre of turf, a grower would apply Exhibit (manufactured by Biosys, marketed by Ciba-Geigy) at the rate of four gallons per 50 to 100-gallons of water.

Suitable targets for steinernema nematodes

Insect group	Market segments
White grubs	turf, ornamentals, vegetables
Root weevils	turf, ornamentals, flowers, cranberries, citrus, banana, mint
Moths/caterpillars	turf, ornamentals, cranberries, artichokes, corn, peanut, vegetables
Root beetles	corn, vegetables, peanuts
Maggots, flies	mushrooms, pasture
Leaf miners	chrysanthemums, vegetables
Stem-borers	trees and shrubs
Cockroaches, yellowjackets	urban environments

courtesy Biosys

Nematodes, continued

A major stumbling block in nematode research is its control of white grubs in commercial turf applications. The product is currently marketed to consumer markets, but its control is not at the 80-85 percent control expected in professional applications.

According to Klein, the nematode was successful against white grubs in research conducted in the mid-1980's. Research conducted later research was not as positive, likely due to inferior quality nematodes, says Klein.

Pat Vittum, entomologist from the University of Massachusetts reports good results from her 1992 research. Her turf plots did not include a buffer zones, and nematode contamination was detected in the check plots.

Other conference participants indi-



Robert Crocker of Texas A & M suggests multiple applications for chinch bugs.

cated similar problems with nematode contamination.

If nematodes are moving actively or passively into other treatment plots, is the population being reduced in treatments in comparison to nematode-contaminated controls.

Suggestions to solve the problem of poor grub control results include larger plot; and increased variance due to uneven population distributions within plots.

Fred Baxendale, in research conducted at the University of Nebraska in 1992, found an 80 percent grub reduction with *S. glaseri*, 36 percent with Exhibit and 79 percent with Dursban.

Dr. Stan Swier of New Hampshire observed a 50 percent reduction with *S. glaseri*. The site contained heavy thatch, and rain occurred during application. No irrigation was applied during the study period.

A similar conference was scheduled for April, in Chicago. The topic: nematode use on ornamentals.