The mole cricket plague

Tests at 200 courses show positive results with nematodes

By HAL PHILLIPS

TAMPA, Fla. — The use of nematodes to fight mole crickets is gaining acceptance in Florida, where more than 120 superintendents have experimented with this cutting-edge technology.

"We've observed more than 200 golf course applications at approximately 125 different sites," said Cameron McCaskill, president of BioControl, Inc., a Tampa-based firm specializing in cricket-combating nematodes.

"We began the commercial distribution of the nematode in late 1992, and from the feedback we've received in our first full year of business, I'd say 80 to 90 percent of our customers are satisfied with the results. "

About 10 years ago, the federal Environmental Protection Agency banned persistent chlorinated hydrocarbons, the superintendent's best weapon against mole crickets. Since then, golf course managers from Houston to Raleigh, Knoxville to Key West have fought a protracted, largely unsuccessfully battle against this burrowing pest.

While McCaskill hastened to point out that nothing will ever completely kill off the mole cricket, nematodes are most effective when used in concert with applications of two existing chemicals, Orthine and Ofthanol.

Nematodes are most effective against the adult mole cricket, while the chemicals are better suited to elimination

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Mole crickets thrive in S'east, not bothered by natural enemies

In the Southeastern United States, the mole cricket has become "Public Pest No. 1" because it has no natural enemies.

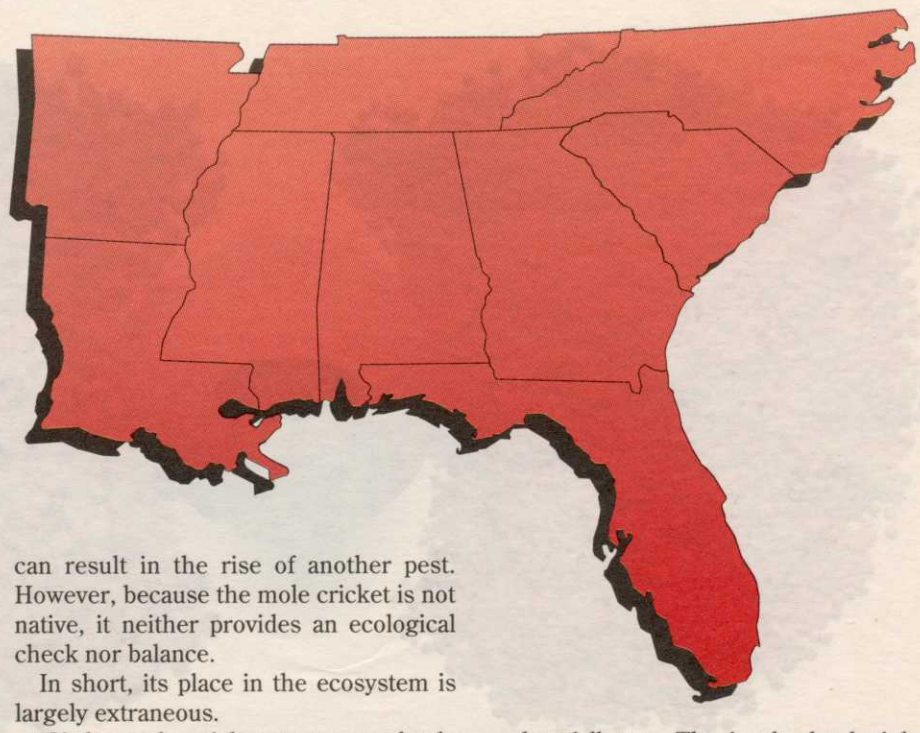
This burrowing pain in the drain has no native environmental foes because the species was introduced to the North American continent from Uruguay. They were first spotted in the Sea Island, Ga., area at the turn of the century.

"They came over in the ballast of ships, but none of their natural enemies were brought with them," explained Cameron McCaskill, president of Tampa-based BioControl, Inc., a firm that specializes in the biological combat of mole crickets.

"Mole crickets have no natural enemies on this continent. Armadillos like to eat them, but it wouldn't be very practical to let armadillos run wild on a golf course.

"Some birds will eat mole crickets, but only as a last resort."

In some cases, elimination — or attempted elimination — of a certain species



can result in the rise of another pest. However, because the mole cricket is not native, it neither provides an ecological check nor balance.

In short, its place in the ecosystem is largely extraneous.

"If the mole cricket were completely eliminated tomorrow, no one would miss it," said McCaskill.

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Some superintendents cautiously admit they believe mole crickets are more active under a full moon. They're absolutely right, according to McCaskill.

"Mole crickets are nocturnal feeders," he said, "but they're attracted to light. The more natural light — as exists under a full moon — the more surface activity."

Research promising, but nothing yet said 'revolutionary'

By DR. MIKE KENNA

The quest for alternative control methods of Tawny and Southern mole crickets has turned up several promising methods, but nothing that has revolutionized the way golf course superintendents deal with these devastating pests.

Dr. Howard Frank, University of Florida, has tried to fight mole crickets with naturally occurring enemies, such as nematodes, flies, and beetles. Dr. Frank's first attempts resulted in the introduction of the South American nematode, Steinernema scapterisci, which was inoculated on to six golf courses in south Florida.

Small fenced in areas, with battery operated devices that mimicked the call of crickets, were inoculated with the best nematodes identified by Dr. Frank. The cricket callers attracted crickets to the inoculated area. Once in the fenced area, the crickets would have to burrow through the nematode inoculated soil to escape. The nematodes eventually kill the host cricket and leave eggs in the soil for future inoculations.

"The evulation showed that the nematode infected and killed more crickets, but did not build up large populations in turf," reported Dr. Frank. "However, immediate control within one week of application was 62 percent for adult crickets, therefore, the nematode may have considerable potential as a biopesticide for use in repeated applications."

More recently, Dr. Frank and his associates have introduced a Brazilian fly, Ormia depleta, into Florida. "Its population has grown and spread to at least 30 countries in Florida," said Dr. Frank. Trap-catches of the Tawny mole crickets indicate reductions of 36, 74, and 95 percent at three sites where fly populations have established. "These differing percentages seem to be attributable to differences in nectar (energy) availability to adult flies," suggested Dr. Frank. New research has been proposed to include specific nectar-producing plants in to the golf course landscape that would provide the necessary energy and habitat for the fly.

Yet another promising predator that Dr. Frank and his associates have identified is the South American bombarider beetle, Pheropsophus aequinoctialis, which comes from the homelands of mole crickets. A proposed research project suggested by the group

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Mike Kenna, PhD, is director of Green Section Research for the United States Golf Association. He works from the USGA office in Stillwater, Okla.

Mole crickets impossible to eradicate, but major progress made

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of juveniles and nymphs, McCaskill explained.

A single application of the nematodes costs approximately $190 per acre, according to Dr. Max Brown of Liquid Ag Systems Inc. in Pompano Beach, Fla. A single application of Orthine costs anywhere from $60 to 80 per acre, said Brown, who noted that monthly applications of Orthine are not uncommon in Florida.

"We recommend an approach that isn't primarily biological," said Brown. "Mole crickets aren't all adult at the same time. So, under any circumstances, you won't control them. We recommend biological application at two key times of the year, then chemical applications in May or June to kill the juveniles in isolated areas."

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Nematodes work this way: The tiny organisms are suspended in water and spread on the turf through a broadcast spray apparatus. Ultra-violet rays will kill the nematodes instantly, so application must come at dusk or on a very cloudy day.

Even in overcast conditions, the nematode-laden solution must be immediately "watered down into" the soil to avoid the ultra-violet rays, said Brown.

Once in the soil, the nematode can stay there for up to three months, waiting for an unsuspecting mole cricket to crawl by. When it encounters the mole cricket, the microscopic nematode immediately attaches itself and crawls inside via any number of orifices: breathing holes, mouth, eyes, anus and crevices in the exoskeleton.

The nematode then releases a bacteria that kills the mole cricket within 48 hours (the bacteria also provides sustenance to the nematode). In the meantime, the nematode lays up to 80,000 eggs in the carcass. The eggs hatch and this substantial colony of nematodes lives on the bacteria until the next victim passes by.

"The two windows of opportunity come in the winter, somewhere between January and March, and late summer — between August and October," said Brown. "Each of these should be followed by a nighttime chemical application during the full moon, because there is a lot of surface activity during a full moon."

Brown estimated that superintendents spend between $15,000 and $70,000 each year combating mole crickets with ordinary chemical applications.

"We're finding the nematode/chemical program costs less, when all is said and done," Brown said. "And if you time it right, you kill the adults before they lay their eggs."

Kenna on research

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would evaluate whether the larvae of the beetle are specific predators of mole cricket eggs. This would be a major breakthrough to eliminate mole cricket eggs before they have a chance to hatch. Research by Dr. Dan Potter at University of Kentucky has indicated that natural predators reduce 75 percent of the white grub eggs found the soil.

A different approach attempting to solve the mole cricket problem involves the identification insect pheromones, or chemicals that insects use to conduct a kind of "long-distance" communication. Dr. Leon Stacy, a private consultant in Sea Island, Georgia, made crude extracts of two sex pheromones and an alarm substance. "During the cricket flight season, acetone homogenate of sex glands from male and female crickets were biologically active and appeared to act as attractants," reported Dr. Stacy. "A concentrated alarm substance from the rectum of crickets significantly reduced fly-in crickets." However, late season tests with the alarm substance formulated in spray mixes and applied to turf had no apparent influence on crickets.

The USGA Turfgrass Research Committee recently agreed to fund a mole cricket control project at North Carolina State University under the direction of Dr. Rick Brandenburg. He will be cooperating with Dr. Mike Villani, Cornell University, to identify the active chemical pheromones in crude extracts similar to those prepared by Dr. Stacy. The two universities will also cooperate to better understand the environmental conditions that affect mole cricket behavior and compare the activity of healthy mole crickets with those that have been infected with nematodes.

"This collaboration provides the unique opportunity of combining recognized field experience and expertise on mole cricket management with similar expertise on soil insect behavior, response to nematodes, and pheromone biology," said Dr. Brandenburg.

Stay tuned as the search for alternative methods for controlling mole crickets continues.