Biological-based Management of White Grubs, Cutworms, and Mound-building Ants on Golf Courses

Daniel A. Potter
University of Kentucky

Objectives:

1. Survey, identify, and assess the impact of microbial pathogens and parasitic insects attacking white grubs and cutworms on Kentucky golf courses, the first such study in the transition zone.
2. Study late-summer reproductive activity of mound-building ants, including timing and duration of swarming, number of new queens produced, distance they will disperse, and feasibility of targeting young queens to prevent initiation of new nests on golf courses.
3. Investigate co-dependence of mound-building ants with grass root-feeding aphids, and whether managing the aphids will discourage ant encroachment onto putting greens and tees.

Start Date: 2003
Project Duration: three years
Total Funding: $76,719

Callie Prater, a graduate student, discovered a naturally occurring insect pathogen, *Agrotis ipsilon* multicapsid nucleopolyhedrovirus (AgipMNPV), causing high mortality of black cutworms (BCW) on central Kentucky golf courses. Potential use of this virus as a biological insecticide was investigated in laboratory, greenhouse, and field trials. The virus is highly active against young larvae (LD_{50} = about 70 viral occlusion bodies) causing rapid stoppage of feeding and 100% mortality within 4 to 5 days.

Larger BCW required somewhat higher lethal dosages and continued to feed for several days before morbidity and death. Regardless of age or dose, however, once BCW become infected they inevitably will die. Natural transmission of the virus from diseased to healthy BCW was shown. Assays with other caterpillar species imply that AgipMNPV is specific to BCW and unlikely to harm non-target species. The virus provided 90-94% control of implanted third instars in a small-plot trial a golf course putting green collar.

In another trial, one-day-old virus residues gave 83 to 94% control of implanted 3rd instars in fairway-height creeping bentgrass, and 28-day-old residues still gave 50% control. Our research suggests that AgipMNPV has excellent potential as a preventive bio-insecticide for managing BCW on golf courses and sport fields. Once the virus becomes established on-site, it has the potential to provide season-long or even multi-year control.

Copidosoma bakeri, a tiny wasp, was discovered parasitizing BCW eggs on golf courses. After the cutworm hatches, the parasite egg subdivides (called polyembryony) giving rise to about 1,500 wasps that emerge from the mummified caterpillar cadaver. Clarifying the role of these wasps in suppressing BCW may help superintendents to conserve their benefits.

Callie Prater, a graduate student, discovered a naturally occurring insect pathogen causing high mortality of black cutworms. Once the virus becomes established on-site, it has the potential to provide season-long, or even multi-year control.

Graduate student Reid Maier studied *Lasius neoniger*, the turfgrass ant. In Kentucky, mounding starts in late February or March and peaks in May or June. Nests occur in the soil and consist of interconnected galleries and chambers. Each of the multiple nest entrances is surrounded by a mound of excavated soil. Winged pupae and adults first appeared in nests in late June. Winged adults were present until mid-September.

Eggs and larvae were present throughout the growing season, but not in winter. Workers and root aphids, from which ants obtain honeydew, were present year-round. Several pulses of queens emerged over about 4 weeks in late August and September, generally after rains. Synchronizing late-summer cutworm applications with queen emergence may help prevent new nests. Main nests (with queen and brood) were abundant in natural soil of roughs but nearly absent from sand-based greens.

During colony expansion from March to August, satellite nest chambers and mounds used by worker ants foraging for food may encroach into sand-based greens. That accounts for mounds being concentrated in a two-meter band just inside the collar. Superintendents managing ants on sand-based greens should begin scouting in March and treat with surface insecticides (e.g., pyrethroids) or baits when mounds first appear. The focus should be the perimeter and a two-meter wide band of adjacent rough. Current insecticides provide several weeks' suppression but rarely give permanent control.

Summary Points

- Three years of research on a naturally-occurring insect virus showed that it has excellent potential as a bio-insecticide for black cutworms on golf courses.
- Biological studies of an egg parasite of black cutworms were initiated that may point to ways that these beneficial natural controls can be augmented or conserved.
- Field studies on nest location and life history of mound-building ants provided new insights for managing these pests on golf courses. Control actions should be initiated in early spring as soon as mounds appear and focus on the perimeter of sand-based greens.