

Biologically Based Management of White Grubs, Cutworms, and Mound-building Ants on Golf Courses

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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

Caterpillar samples collected monthly from greens, tees, fairways, and roughs of four Kentucky golf courses were mostly of black cutworms (BCW), with some sod webworms, fall armyworm, yellow-striped armyworm, and fiery skipper. Parasitic wasps belonging to three different families were discovered attacking BCW eggs or larvae, causing mortality as high as 27%. We are trying to rear these wasps for study, as they have not previously been reported from turf.

Callie Prater, a graduate student, made a discovery that may provide new tools for BCW control. Many BCW from all sampled golf courses showed disease symptoms including necrotic spots, milky appearance, and liquification. We isolated a BCW AgipMNPV baculovirus from the cadavers, sequenced it by PCR analysis, and found it matched a virus recently described from BCW in Iowa field corn.

Cooperators at Iowa State



The abundance of mound-building ants was monitored on and around putting greens in research done at the University of Kentucky.

University amplified the Kentucky virus and provided liquid and bait formulations that we tested against 4th-instar BCW in field plots of fairway-cut bentgrass and in lab trials. High mortality (70-80%) from virus was obtained in both trials. This residual virus has the potential to provide season-long BCW control from a single application. Studies to characterize its activity, host range, residual activity, and potential as a bio-insecticide are planned for 2004.

Graduate student Reid Maier monitored seasonal abundance of *Lasius neoniger* ant mounds, mapped their locations on three golf courses, and monitored emergence of ant queens to determine when new nests originate. Mound activity started in late winter, peaked in May, and declined steadily thereafter. Nearly all mounds on sand-based greens were located within two meters of the outer edge. Mounds also were abundant in collars and adjacent roughs.

Root-feeding aphids, tended by the ants, were absent from the interior of greens, but abundant in bordering roughs. Presence of ant mounds and aphids was negatively correlated with sand/soil ratio at the green/collar/rough interface. Sand-based greens evidently are unsuitable for root aphids and therefore the ants encroach from the edge in order to maintain access to aphid honeydew. Augmenting sand content just outside the collar (or directly controlling the aphids) therefore may discourage the ants. *Lasius* queens were active in late summer with synchronized emergence periods. Queen behavior was observed and photographed. Targeting queens may provide a means of preventive control.

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Summary Points

- Parasitic wasps belonging to three different families were discovered attacking BCW eggs or larvae, causing mortality as high as 27%.
- A baculovirus isolated from BCW cadavers has the potential to provide season-long BCW control from a single application. Studies to characterize its activity, host range, residual activity, and potential as a bio-insecticide are planned for 2004.
- Mound activity of *Lasius neoniger* ants started in late winter, peaked in May, and declined steadily thereafter. Nearly all mounds on sand-based greens were located within two meters of the outer edge.
- *Lasius* queens were active in late summer with synchronized emergence periods. Queen behavior was observed and photographed.
- Planting peonies as a nectar source for spring-active *Tiphia* wasps significantly increased parasitism rates of white grubs in nearby turf.