# *Biological-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 root-feeding aphids, and whether managing the aphids will discourage ant encroachment into putting greens and tees.

**Start Date:** 2003
**Project Duration:** four years
**Total Funding**: $102,292

Research on the black cutworm (BCW) virus showed that it quickly controls young larvae, but larger ones require higher dosages and continue to feed for several days before being killed. Virus-infected BCW rupture in death and spread millions of virus particles onto foliage and thatch that persist and infect subsequent larvae. Sprayed viral suspensions gave 90-94% control of implanted BCW in field trials in creeping bentgrass, including one on a putting green collar. Virus spray residues continued to suppress mid-sized BCW for at least four weeks in the field. This study suggests that establishing virus in putting green surrounds or other areas can suppress successive generations of BCW on golf courses.

*Copidosoma bakeri*, a tiny parasitic wasp that reportedly is widespread throughout temperate North America, was found attacking BCW on golf courses. It lays its egg inside a BCW egg and then, after the victim hatches, the wasp egg subdivides giving rise to about 1,500 larvae that kill the cutworm and emerge as adults from the cadaver. We found, however, that parasitism causes BCW to feed longer, eat about 33% more food, and to grow about 50% larger size before they die, so *C. bakeri* does not seem a good candidate for augmentative or conservation biological control.

Masked chafer and Japanese beetle grubs were sampled from three irrigated roughs on each of six Kentucky golf courses in 2006 to prospect for bacteria, fungi, nematodes, and other microbes that might be developed as biological insecticides. More than 1,800 grubs were frozen for autopsy. Once key pathogens are identified, their potential use as bioinsecticides will be evaluated.

*Since the turfgrass ant builds nests that extend inward from the green perimeter, control measures should focus on the perimeter of greens, about 6 feet on either side of, and including, the collar, whether baits or conventional insecticides are used.*

High silica content, which has been shown to increase resistance of some grasses to fungal diseases, may also make grasses harder for herbivores to chew and digest. We tested if augmenting silica enhances creeping bentgrass resistance to BCW or white grubs. Although prilled calcium silicate fertilizer applied to fairway-height turf on silt loam did significantly increase leaf silica content, we saw little or no effect on suitability of the grass for BCW, and no reduction in grub populations in the field. Our results suggest that silicon fertilization is unlikely to enhance creeping bentgrass resistance to key insect pests.

The turfgrass ant, *Lasius neoniger* (Emery), builds mounds that are a nuisance on golf courses. We studied the ants' distribution and seasonal biology, and evaluated new management approaches. Insecticides to suppress mounding are best applied in early spring when the first mounds appear. Controlling root aphids, from which the ants obtain honeydew, does not seem to reduce or eliminate the ants. Main ant nests are located outside of sand-based greens in natural soil, explaining the typical pattern of encroachment of mounds inward from the collar.

Control measures should focus on the perimeter of greens, about 6 feet (2 meters) on either side of, and including, the collar, whether baits or conventional insecticides are used. Timing an insecticide (e.g., pyrethroid) application to coincide with queen emergence, which typically occurs around Labor Day, will kill some young queens and prevent some future nests.

## Summary Points

- Research on a naturally-occurring insect virus showed it has excellent potential as a bio-insecticide for black cutworms on golf courses.
- Studies of a tiny parasitic wasp suggested it is not a good candidate for bio-control of cutworms because parasitized larvae grow larger and eat more before they are killed.
- Silicon fertilization, which enhances resistance of some grasses to diseases, did not increase resistance of creeping bentgrass to insect pests.
- Field studies on life history of mound-building ants suggests control actions should start in early spring as soon as mounds appear and focus on the perimeter of sand-based greens.