

Integrating Natural Enemies, Cultural Control, and Plant Resistance for Sustainable Management of Insect Pests on Golf Courses

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Objectives:

1. Evaluate the role of ants as beneficial predators in golf turf (i.e., determine the predominant species inhabiting golf courses and develop tactics for managing mound-building pest ants on putting greens with reduced environmental risk or impact on beneficial species).
2. Investigate synergism between endophyte-enhanced, resistant turfgrasses and bio-rational insecticides for improved management of white grubs and black cutworms.
3. Examine the main and interacting effects of cultural practices (i.e., mowing height, irrigation, and N fertilization) on nutritional and defensive characteristics of creeping bentgrass and relative susceptibility to white grubs and black cutworms.

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Project Duration: 3 years

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Ants are important predators on eggs and larvae of cutworms, grubs, and other pests, but on golf courses, these positive aspects must be weighed against the fact that some ant species build mounds on putting greens and tees.

Our research showed that two commercially available baits containing either avermectin (Advance Granular Carpenter Ant Bait; WhitMire Micro-Gen, Inc.) or hydramethylnon (Maxforce granular ant bait; Clorox, Inc.) are effective for spot-treating ants in high-profile situations.

Fipronil (Chipco Choice, Rhone-Poulenc, Inc.), a novel phenyl pyrazole, was found to be effective for season-long suppression of *Lasius* nests and mounds on putting greens. In fairways and roughs, ants are beneficial in suppressing eggs and larvae of other insect pests. *Lasius* ants were found to cultivate and tend certain root-feeding aphids from which the ants obtain sugary honeydew as food.



The project at University of Kentucky has demonstrated how ants are effective predators of a wide range of turfgrass pests. Methods to control ants on putting greens and fairways were developed.

Two toxicological studies were conducted to evaluate potential hazard of turfgrass insecticides to predatory insects, and to pollinators such as bumble bees that might visit weedy turf. Halofenozide (MACH2) had no adverse effects on either predators or pollinators.

Exposure to non-irrigated spray residues of imidacloprid caused sublethal, neurotoxic effects on predatory beetles and suppressed health of bumble bee colonies foraging on white clover while confined in field cages on the treated turf. However, post-treatment irrigation greatly reduced these potential adverse effects. In contrast, bendiocarb caused high acute mortality of predators. Residues of bendiocarb and chlorpyrifos also had severe impact on bumble bees foraging on weedy turf.

These results indicate that the new generation turf insecticides, especially halofenozide, are less hazardous to beneficial insects than are the older organophosphates or carbamates. Hazard to pollinators can be further reduced by post-treatment irrigation, or by mowing flower heads of flowering weeds before treatments for surface-feeding insects are applied.

Feeding on roots of endophytic perennial ryegrass did not adversely affect survival or growth of Japanese beetle grubs, or their susceptibility to infection by milky disease bacteria, *Paenibacillus popilliae*. Use of the PGRs paclobutrazol or trinexapac-ethyl on creeping bentgrass neither increased nor decreased susceptibility of the turf to cutworms or sod webworms.



A diluted soap drench is an effective way to determine cutworm populations while they are still very small.

In another experiment, three different organic fertilizers or urea were applied to perennial ryegrass golf fairways to test whether use of the organics may encourage higher incidence of the black turfgrass ateniens (BTA).

Two of the three organic fertilizers attracted adult BTA and resulted in higher densities of BTA grubs. If validated, these results suggest that where BTA is a concern, preventive controls may be advisable on putting greens or other high-profile sites where manure-based organic fertilizers are used.

Summary Points

- Insecticides identified for controlling ants (*Lasius spp.*) in high profile areas such as tees and greens.
- Ants in fairways and rough cause little damage and provide a tremendous benefit preying on insect pest eggs and larvae.
- Insecticide screening for potential hazard to natural predators revealed the importance of post-application irrigation.
- Endophytic ryegrass did not suppress growth of Japanese beetle grubs.
- Organic fertilizers may increase incidence of black turfgrass ateniens.