Use of a Baculovirus for Season-long Control of Black Cutworms on Golf Courses and Compatability with Soil Insecticides and Insect-resistant Turfgrasses

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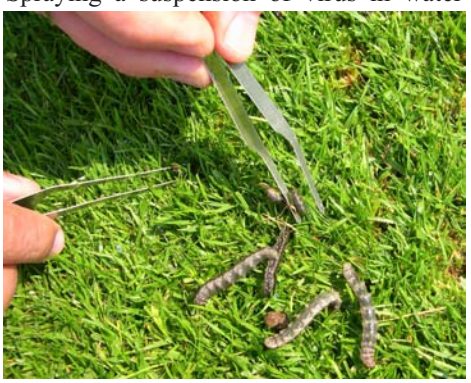
Objectives:

1. Evaluate AgipMNPV, a naturally occurring baculovirus, as a bio-insecticide for season-long and multi-year preventive control of black cutworms (BCW) on golf courses.
2. Compare infectivity and persistence of AgipMNPV to BCW in sand-based and soil-based putting green and fairway height creeping bentgrass habitats.
3. Investigate compatibility and possible synergism of AgipMNPV with soil insecticides used for grub control on golf courses.
4. Investigate compatibility of endophytic and other insect-resistant turfgrasses with biological control of black cutworms by AgipMNPV.

Start Date: 2007
Project Duration: three years
Total Funding: $60,000

In 2003, former UK graduate student, Callie Prater, discovered that numerous black cutworms (BCW) collected from golf courses in Kentucky exhibited disease symptoms including necrotic spots, milky appearance, and liquefaction of larval tissues. A virus isolated from the cadavers was identified as *Agrotis ipsilon* multiple nucleopolyhedrovirus (AgipMNPV).

Our USGA-funded research was the first to evaluate use of a baculovirus to suppress an insect pest in turfgrass. It showed that AgipMNPV 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. Spraying a suspension of virus in water gave good control of third-instar BCW in field trials in creeping bentgrass, including one on a putting green collar where 90-94% infection was achieved. Virus spray residues continued to infect third-instars for at least 4 weeks in the field. That study suggested that establishing a reservoir of virus in putting green surrounds or other areas could suppress successive generations of BCW on golf courses. This new project will evaluate that approach in realistic turfgrass settings.



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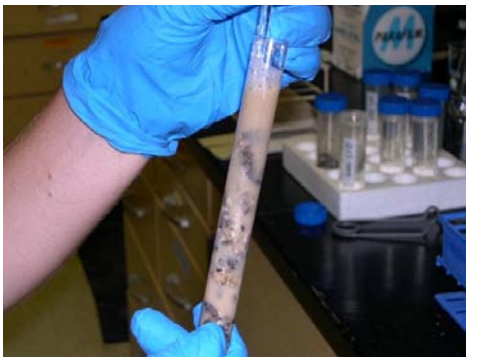
AgipMNPV was applied to replicated plots on a soil-based green, a sand-based green, and fairway-height creeping bentgrass in fall 2007 to evaluate potential for its residues to provide residual control on golf course sites. Third-instars were introduced one week after application and when those larvae were collected 4 days later, 50 to 60% had become infected with virus on all sites. Additional challenges with BCW will be done 6 weeks after application, and in spring 2008 to evaluate if the virus remains infective after the winter. Smaller larvae will be used and left in the turf for 7 days which is expected to provide higher infection rates.

A larger study will be conducted on whole tees and surrounds at two central Kentucky golf courses to evaluate the virus for season-long suppression of BCW under realistic conditions. Six tees, as well as a 2-m (6 ft) buffer of fairway height grass surrounding them, will be treated with virus on each course. BCW crawl onto tees from adjacent turf so treating a buffer zone may reduce populations significantly. Six untreated tees on each course will be used for comparison.

Virus efficacy will be determined by sampling natural densities of BCW populations and also implanting sentinel larvae into the turf. The virus suspension for this whole-tee trial requires about 7,000 virus-killed BCW which are being cultured in the lab, but we are hopeful that methods will be developed to mass produce the virus on artificial medium. We also plan to investigate the compatibility of endophytic and other insect-resistant turfgrasses with biological control of BCW by AgipMNPV.



Once infected by the virus, black cutworm larvae can be used to prepare virus suspensions and applied to the field to further infect resident larvae.

Summary Points

- AgipMNPV has the potential to provide season-long or multi-year BCW control from a single application. Studies to determine virus persistence on sand-based and soil-based putting greens, fairway-height creeping bentgrass, and whole tees are underway.
- AgipMNPV may be compatible or have a synergistic interaction with insecticides used for grub control, as well as endophytic and other insect-resistant turfgrasses. These interactions will be determined in greenhouse and field experiments planned for 2008.