

# FOUNDATION NEWS

A PUBLICATION OF THE TRI-STATE TURF RESEARCH FOUNDATION SPRING 2009 VOL. 11 NO. 1

## PRESIDENT'S MESSAGE

# Research Is the Answer

Research has long been essential to the turfgrass management industry. If you consider the great strides made in our industry over the past 40 to 50 years, you'll see that research has played a critical role. It's through research that turfgrass managers have learned to overcome a variety of debilitating turfgrass pests and challenges and discovered the most effective products and approaches to producing quality turf. Now, in the face of a shrinking economy—and shrinking golf course



Scott Niven,  
CGCS  
Tri-State Turf  
Research  
Foundation  
President

budgets—research plays an even more vital role.

With fewer dollars to spend, turfgrass managers can't afford a trial-and-error approach to *any* aspect of their

maintenance operations. When a new turf disease or pest problem arises, they need a concrete, definitive plan of action . . . the kind that only well-funded research can provide.

## A LITTLE SUPPORT GOES A LONG WAY

Since 1992, the Tri-State Turf Research Foundation has supported research pertinent to turf issues in the tri-state area. These studies have yielded turf-saving insights and information on such devastating turf pathogens and insects as summer patch, anthracnose, white grubs, and the annual bluegrass weevil. They've taken the guesswork out of selecting appropriate putting green root zone mixes, microbial and organic-based nutritional products, moss and earthworm controls, and fairway renovation programs.

Looking at this history of research projects, it's clear our work will never be done. There will always be a turf pest or agronomic practice that requires the study and counsel of a turfgrass scientist. Fortunately, we have no shortage of talent at Rutgers, Cornell, University of Connecticut, and University of Rhode Island—the universities we rely on to conduct our research.

## INSIDE THIS ISSUE

- 2 **URI and Rutgers Offer Promising New Insight Into ABW Monitoring and Control**  
URI Researchers Seek New Plan of Attack on Pyrethroid-Resistant Weevils  
Getting the Bugs Out of New ABW Monitoring Program
- 6 **UConn Researchers Still Wrestling With Algae Cure and Control**
- 8 **Special Thanks to Our 2008 Contributors**
- 10 **Rutgers Researchers Dig Deeper for Solution to Earthworm Casting Activity**
- 12 **UConn Researchers Gain Ground on Viable Fairway Topdressing Program**
- 14 **Is Nitrogen the Key to Anthracnose Control?**
- 15 **Putting Uniformity Back Into Mixed-Species Fairways**



(continued on page 16)

## URI and Rutgers Offer Promising New Insight Into ABW Monitoring and Control

Golf course superintendents can rest a bit easier knowing that two teams of researchers—one from Rutgers, the other from University of Rhode Island—have been hard at work, investigating more efficient and effective monitoring methods and controls for the highly destructive annual bluegrass weevil (ABW).

Technically known as *Listronotus maculicollis*, this pest is particularly troublesome on close-cut annual bluegrass (*Poa annua*) in the

northeastern United States. ABW trouble begins when young larvae tunnel the grass plant's stems, causing the central leaf blades to yellow and die, while the older larvae feed externally on crowns and roots, sometimes completely severing the stems from the roots.

The most severe ABW damage normally is caused by first generation older larvae around late May/early June in the New York metropolitan area. Damage from the second generation

larvae, in early to mid-July, is usually less severe and more localized.

With funding from the Tri-State Turf Research Foundation, both the URI and Rutgers research teams have come infinitely closer to providing golf course superintendents with a concrete plan for reigning in this seemingly unstoppable pest.

In the pages that follow, you'll find the researchers' most up-to-date findings and recommendations for taking the edge off the ABW threat.

## URI Researchers Seek New Plan of Attack on Pyrethroid-Resistant Weevils

For years, preventive applications of pyrethroids allowed superintendents to protect their turf from ABW damage. By 2005, that all began to change. With some courses making up to six preventive pyrethroid applications per year, the annual bluegrass weevil began to show signs of resistance to this once highly effective insecticide class.

With \$30,000 in funding from the Tri-State Turf Research Foundation, University of Rhode Island researchers Dr. Steven Alm and Darryl Ramoutar have been hard at work evaluating the efficacy of commonly used controls for the annual bluegrass weevil, while pursuing more effective alternatives.

In 2007, their trials took them to golf courses in Connecticut, Rhode Island, and Massachusetts where they were able to confirm their suspicions: ABW populations on the high-pyrethroid-use golf courses did, in fact, develop

resistance to both bifenthrin and  $\lambda$ -cyhalothrin.

In 2008, the researchers determined that several insect enzyme systems are involved in pyrethroid resistance: cytochrome P450s, glutathione s-transferases, and carboxylesterases. Each ABW population tested had low, moderate, or high resistance to pyrethroids, suggesting that the use of synergists may assist in overcoming resistance. This information will also prove useful in tracking whether the pyrethroid-resistant populations are resistant to other classes of insecticides as well.

In 2009, the researchers will use their third, and final, year of Tri-State funding to:

- » Explore the use of synergists like piperonyl butoxide (PBO) to overcome pyrethroid resistance
- » Conduct field trials on new chemistries—e.g. Provaunt<sup>®</sup>, Conserve<sup>®</sup>,

Acelepryn<sup>®</sup>—to evaluate their ability to combat the annual bluegrass weevil

- » Track ABW populations with degree-day monitors

What follows are the researchers' latest conclusions and recommendations for breaking through the pyrethroid resistance barrier.

### OVERCOMING PYRETHROID RESISTANCE IN THE ADULT ABW

To combat pyrethroid resistance and ensure significant mortality of overwintered adults, the researchers emphasize the importance of well-timed applications. Their recommendations:

- » Ensure applications coincide with peak adult abundance by carefully monitoring adult activity. The best method: a soapy flush in which 2 ounces of lemon-scented dish liquid is combined with 2 gallons of water and then poured over an 8-square-foot

## URI Researchers Seek New Plan of Attack on Pyrethroid-Resistant Weevils

area. The soap irritates the adult weevils lying deep within the turf thatch layer, causing them to rise to the surface within 5 minutes.

» Apply pyrethroids late in the afternoon since weevils prefer to feed in the dark, and some pyrethroids are less effective at high temperatures and break down in sunlight.

The researchers' trials also linked pyrethroid resistance to enzymatic insecticide metabolic detoxification. Translation: The ABW produces a group of enzymes—the cytochrome P450s—that essentially inactivate pyrethroids before they can do their job.

Further investigation revealed:

» The cytochrome P450 enzymes can be blocked by using an insecticidal synergist called piperonyl butoxide (PBO).

» Kicker®, a Bayer Environmental Science product that contains both PBO and pyrethrins may have potential as a P450 blocker when used in combination with a pyrethroid. Alone, pyrethrins—natural chemicals from which synthetic pyrethroids were modeled—are excellent for knock-down, but they do not provide a high level of mortality. The researchers plan to put the Kicker®/pyrethroid combination to the test next season. One caution: PBO breaks down rapidly in sunlight and may not stay around long enough to exert the synergistic effect.

» Dursban® may also be used for adult control. Unfortunately, it's no longer being sold for use on turf, and Dow AgroSciences will maintain only

current state registrations through 2009.

» Applications of these products should be made during peak adult activity.

### IF ADULT CONTROLS FAIL TRY, TRY AGAIN

If insecticide applications fail to curb adult populations, then larval control is crucial. While adult weevils chew notches on grass blades and at the juncture of leaves and stems, their feeding has little effect on plant vitality. Larval feeding, which is concentrated inside the plant's stem and roots, is more damaging and can lead to extensive turf loss. The progression:

» The first three larval stages feed inside plant stems, while the 4<sup>th</sup> and 5<sup>th</sup> stages attack plant crowns.

» Because they feed outside the stem, larvae in the last two stages are most vulnerable to contact insecticides. The time to target these late-stage larvae is from mid-May through early June for the first generation; late July and early August for the second generation; and again, in late September to early October for the third generation.

The researchers are quick to point out, however, that populations vary considerably depending on location. Monitoring, therefore, is essential to determine precisely when and where to apply insecticides for optimal control.

Larvae can be monitored by cutting a wedge of turf with a knife or by using cup cutters to remove plugs and then searching the turf crowns, thatch, and soil for the creamy white, legless late-stage larvae. (See Tri-State-supported research on new ABW sampling technique on page 4.)

### PRODUCTS THAT SHOW PROMISE

The researchers looked at several options for larval control, including Conserve® SC, Dylox® 80 S, Provaunt® 30 WDG, and Aloft® SC. Here's what they found:

» All the products tested offered 80 to 96 percent control at labeled rates.

» Conserve® performed well, but it was not as consistent as the other chemicals tested.

» Of all the Dylox® options, the 80 S formulation proved most effective because it offers increased coverage.

» Colleagues at the University of New Hampshire who had researched Provaunt® noted that making two applications five to seven days apart may be the best approach when using this chemical.

» Aloft® is composed of two products: bifenthrin (pyrethroid) and clothianidin (systemic neonicotinoid). In some trials, an application of Aloft® made in April proved effective in suppressing adult (bifenthrin) and larval (clothianidin) activity for the entire season. By themselves, however, the neonicotinoids have not shown a high level of control in several studies. Therefore, before the researchers can widely recommend this product for its synergistic effect, more testing will be needed. Keep in mind, too, that Aloft® is *not* registered for use in Nassau and Suffolk counties in New York.

» Acelepryn®, a new product, also works well against larvae, providing greater than 80-percent control. Moving in the transpiration stream of

(continued on page 11)

## Getting the Bugs Out of New ABW Monitoring Program

*Rutgers Researchers Look to Perfect Method for Predicting Larval Damage*

Rutgers entomologists Dr. Albrecht Koppenhöfer and Benjamin McGraw have fulfilled their one-year agreement with the Tri-State Turf Research Foundation. With \$5,500 in support, Dr. Koppenhöfer and Benjamin McGraw have worked to perfect a nondestructive sampling method for forecasting larval damage from one of the most dreaded golf course insect pests in the Northeast, the annual bluegrass weevil (ABW).

Koppenhöfer and McGraw are among the first to seek a practical and reliable sampling protocol for assessing both the presence of ABW adults and the threat of damage by their offspring. Their objective: to help superintendents reduce unwarranted insecticide use by enabling them to pinpoint precisely when and where applications are needed.

Current sampling methods either rely on unrelated plant indicators to time applications or require soil core sampling, which is both labor-intensive and destructive to the turf. Koppenhöfer and McGraw have developed a method of vacuum sampling, using a common leaf blower (reverse-air), to detect adults on playing surfaces and correlate their numbers to future larval densities and, ultimately, the threat of turf loss.

Here's a look at their latest work in developing a more effective—and efficient—program for monitoring and managing ABW populations that threaten close-cut annual bluegrass (*Poa annua*) on golf courses.

### VACUUM SAMPLING PUT TO THE TEST

From 2007 to 2008, the researchers evaluated the viability of vacuum

sampling in detecting ABW adults on the fairways of three separate golf courses in central and northern New Jersey. Beginning late March, early April, the researchers used their vacuum sampler weekly, collecting the emerging adult weevils from fairway turf surrounding short-mown playing surfaces. They continued sampling until mid-October, through the end of the third-generation larval cycle.

#### The process:

- » The researchers fitted the vacuum sampler with a mesh basket to capture adults as they entered the nozzle.
- » After vacuuming a section of fairway for 10 seconds, they emptied the basket onto a tray and recorded the number of adults collected.
- » To gage the effectiveness of the vacuum sampling method, the researchers also employed the traditional soil core sampling process to collect adult weevils. This required using a turf plugger (5.5 cm diameter) to collect the samples and then saline extraction in the laboratory to free the adult weevils from the soil cores.

#### The outcome:

- » Both methods detected adults arriving on fairways and were effective at determining the peaks in adult abundance.
- » Vacuum sampling, however, proved superior to soil sampling because it's not destructive to the turf; it takes less time per sample (under 1 minute); and it provides an instant, in-field estimate of population density.

### ARE ADULT COUNTS PREDICTORS OF FUTURE LARVAL DENSITIES?

While putting their vacuum sampler to the test, the researchers worked to determine whether larval densities could be correlated to the number of adults captured.

Conducting trials on two golf courses in northern New Jersey, the researchers collected adult weevils between the start of adult emergence from overwintering through the egg-laying period.

#### The process:

- » The researchers drew samples from 6' x 6' plots laid across six fairways on each of the two courses.
- » After the adult weevils were no longer laying eggs, the plots were sampled for larvae.
- » The larvae collected were then compared to the number of adults captured throughout the entire sampling period.

#### The outcome:

- » The first adults were detected on fairways in the first week of April at all sites. In 2007 and 2008, two peaks in adult abundance were observed, with the first peak occurring around April 20 and the second peak around May 5.
- » Larval densities were most consistent with adult counts during the second peak of abundance but also correlated with the cumulative adult counts during the study.

These correlations suggest that, while egg laying occurs over an extended period of time, the majority of eggs