

# DuPont Technical Solutions

## 2011 Annual Bluegrass Weevil Optimum Control Program

### Annual Bluegrass Weevil Behavior and Biology

The annual bluegrass weevil (ABW): One of the most troublesome insect pests of golf courses in the northeastern United States. Originally recognized as a pest of highly maintained annual bluegrass in the metropolitan New York region, including eastern Connecticut and northern New Jersey, the ABW is now damaging turf throughout all of the New England states, as far south as areas of Virginia and as far west as eastern Ohio. Adult weevils move onto golf courses from adjacent overwintering sites in mid-spring and feed on annual bluegrass.

Females lay eggs of the first generation larvae in the leaf sheaths of that host plant during late April through May. Larvae cause extensive turf damage from late May through mid-June. First generation adults emerge in June and July, and the cycle is repeated. As the summer progresses, all life stages of the weevil may be present at any time, making control more difficult.

### Early Control Is Key

Designed for golf course professionals, the 2011 Optimum Control Program features two insecticides from DuPont that provide modes of action with proven activity against annual bluegrass weevils. This program will provide excellent control of first generation annual bluegrass weevil larvae. It's critical to control annual bluegrass weevils early in the season to preclude the challenge of controlling multiple stages of weevils later in the summer.

### The Value of New Solutions

Incorporating products with different modes of action in a programmed approach is an important component of weevil management. The different modes of action of Acelepryn® insecticide and Provaunt® insecticide make them welcome additions to the ABW arsenal. For years superintendents have relied primarily on one class of chemistry for adulticide applications to control ABW. Now superintendents have more choices to combat this troublesome pest.

### The ABW Challenge

One of the reasons that ABW is so difficult to manage is the variability associated with the timing, intensity and duration of its attack on annual bluegrass. This variation is a function of the widely different environmental conditions that occur during the spring. And no two springs are exactly alike, so ABW behavior one year may differ greatly from the next. In ideal circumstances, winter transitions to summer with gradually warming spring weather and intermittent rain events. This causes overwintered

adult ABW to move from overwintering sites during a relatively short period of time, and results in a narrow period of intense egg laying activity. When this occurs, one or two insecticide applications can successfully maintain ABW populations below damaging levels for most or all of the summer.

It is rare that spring provides a gradual transition from winter to summer. April and May are usually marked by alternate periods of unseasonably warm and cool weather, and some years experience prolonged periods of rainy weather. These varying conditions greatly impact the behavior of overwintered adult ABW and result in wide extremes in the intensity and duration of egg laying and subsequent larval development. So instead of a narrow peak of egg laying, there may be a prolonged period when eggs are deposited and larvae subsequently damage turf.

This prolonged egg laying period makes ABW management most difficult because adult activity may be rather cryptic, and the need for multiple insecticide applications often goes unnoticed until the annual bluegrass begins to quickly fade during the first hot or dry spell in June. ABW management is further complicated by the fact that differing microclimates on an individual course can result in up to a 10-day difference in ABW development. For example, an open fairway with a southern exposure will experience earlier egg hatch than a nearby fairway that has a northern exposure and is lined with evergreen trees. It is unusual that a single insecticide application could be made at the proper timing for both of these locations.

Successful spring management of ABW does not always mean that turf will be free of damage through the summer months. Even the most successful spring control programs don't totally eliminate the ABW population, and in years when high populations are present, sufficient numbers of ABW survive into the summer months, causing damage from second or third generation larvae. This is especially true considering that summer weather conditions place annual bluegrass under tremendous stress so that a minimal amount of ABW feeding (that wouldn't even be noticed when the plants are vigorously growing in the spring) causes unacceptable damage in the heat of July and August.

### WeevilTrak: An Excellent Guide for the DuPont Optimum Control Program

The DuPont WeevilTrak Web site was launched with great success during 2009. The cornerstone of this Web site is a network of university turf entomologists and key turf consultants in the northeast who track ABW development throughout the region. The researcher network monitors degree day accumulation and the first appearance of ABW adults and



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larvae. This information is used to recommend the proper application timing of each component of the 2011 Optimum Control Program and is available on the DuPont WeevilTrak Web site ([www.weeviltrak.com](http://www.weeviltrak.com)).

It cannot be overemphasized that the key to a successful ABW control program is to make proper decisions regarding treatment timing early in the season. If you miss an opportunity to control ABW early in the spring, then you will likely be dealing with them all summer long. The two key components utilized by WeevilTrak to ensure early season success are degree day monitoring and ABW adult sampling. The WeevilTrak database contains multiple years of degree day information that has been thoroughly reviewed with an aim toward refining the times at which the various treatments of the DuPont Optimum Control Program should be applied. For many years, superintendents have successfully utilized forsythia bloom stage as their primary phenological indicator for initiating an ABW control program. Degree days offer a marked improvement over phenological indicators due to the precise manner in which heat accumulation in the spring is recorded and easily translated to a decision-making process.

Degree days are used by WeevilTrak to identify the latest date that the various treatments of the Optimum Control Program should be applied. Due to the cryptic nature of this pest, the first treatment is often recommended regardless of whether ABW adults have been observed.

### Adult Monitoring in the Spring

Adult monitoring is most essential in the one- to two-week period before the WeevilTrak Stage One “flag” has been raised, indicating that the first adulticide treatment should be applied. During this period, direct observations of ABW activity on an individual golf course may override the information that is being provided by WeevilTrak. For example, if a substantial number of ABW adults are observed before Stage One has been declared by WeevilTrak, then the first treatment should be applied as soon as weather and course conditions allow.

Adult monitoring can be accomplished by a number of techniques, including soapy water flushes, vacuum sampling, checking mower baskets, visual examination of the turf and pitfall traps. Soapy water flushes and vacuum sampling are the preferred methods because they are easy, they can rapidly be used on many areas of the golf course and they disclose adults that may be present lower in the turf profile—these adults might not be observed using the other sampling methods. The major drawbacks of pitfall traps are the time-consuming nature and spatially limited area of their deployment.

### 2011 DuPont Optimum Control Program—For Control of ABW Plus Grubs and Caterpillars

A total program approach is being recommended for ABW control. Given the recent documentation of pyrethroid resistance by certain ABW populations—primarily in Connecticut—this program incorporates a range of insecticides with different modes of action. Each insecticide will be utilized to target the most vulnerable life stage for that particular product. The program anticipates the worst-case scenario of a prolonged period of egg laying by overwintered ABW adults and also recognizes that, under some circumstances, even high levels of control of first generation larvae will not completely prevent damage by summer generations of ABW.

#### First Generation Control

Three products featuring three different modes of action will be incorporated in the program designed to prevent damage from first generation larvae in May and June.

*FIRST APPLICATION:* The first application will call for an adulticide—usually a pyrethroid, but chlorpyrifos is also an option. This application will be based on degree days; however, be sure to carefully monitor for adults and check the WeevilTrak Web site for proper timing in your area.

The adulticide application accomplishes three important tasks:

1. Based on the contact activity of these active ingredients, it reduces overall ABW pressure by killing overwintered adults as they walk from overwintering sites onto areas of highly managed annual bluegrass.
2. It prevents early egg laying by gravid overwintered female ABW.
3. In keeping with the concept of trying to provide insecticide protection over a roughly two-month period, it allows Acelepryn® to be applied slightly later in the season as was recommended during 2010.

*SECOND APPLICATION:* DuPont™ Acelepryn® insecticide is a remarkably forgiving product when applied for white grub or caterpillar control. For white grubs, excellent control will be achieved from applications made any time between early April and late July. For caterpillars, a single application of 8 fluid ounces per acre will provide season-long control of cutworms, armyworms and sod webworms. Although Acelepryn® is highly active against ABW larvae (see Table 1), timing is critical because effective control is thought to depend on the systemic uptake of Acelepryn® by the annual bluegrass plant. This suggests that it is important to have Acelepryn® moving in the transpiration stream of the annual bluegrass plant when the young (and extremely vulnerable) ABW larvae hatch and begin to chew their way into the stem. Empirical evidence suggests that Acelepryn® will provide high levels of control of ABW larvae that hatch about three weeks after application.

The timing of this application will be made roughly two to three weeks after the first application and will be based on degree day monitoring (check the WeevilTrak Web site for proper timing in your area).

Acelepryn® applied at 12 fluid ounces per acre accomplishes three important tasks:

1. It provides about three weeks of ABW larval control.
2. It provides season-long white grub control.
3. It provides season-long cutworm control.

*THIRD APPLICATION:* The third component of the program targeting first generation ABW larvae is an application of DuPont™ Provaunt® insecticide during late May or June to control late hatching larvae. This application is critical because June is often when the first period of really hot weather occurs in the northeast, which makes annual bluegrass exceptionally vulnerable to damage. University turfgrass researchers and private consultants from throughout the region will be monitoring ABW larval development, and this information will be available on the WeevilTrak Web site.

Provaunt® applied at 12 ounces per acre will:

1. Target the early third instar larvae as they emerge from the annual bluegrass stem and move to feed on the crown of the plant.
2. Provide two to three weeks of residual control, which will complete the control program for first generation ABW larvae.

### Control of Summer Generations

First generation ABW populations may reach more than 300 larvae per square foot of turfgrass. Under such high population pressure, even programs that provide exceptionally high levels of control will allow a certain number of individuals to survive and produce subsequent generations throughout the summer. Early in the summer, there is still some predictability of the dominant ABW life stages present in turfgrass. First generation adults generally appear in late June and early July, making them obvious targets for another adulticide application featuring a pyrethroid or chlorpyrifos product. By the middle of July, ABW populations have usually become asynchronous—meaning that all life stages are present at the same time and there often is not a single dominant stage. Late July through early August is prime time for a final ABW insecticide application. Provaunt® should be considered the product of choice for this application because, in addition to excellent activity toward ABW larvae, Provaunt® provides good control of ABW adults. An application of Provaunt® at 12 ounces per acre in this time period should carry most courses through to the end of the year.

### 2011 DuPont Optimum Control Program—For Courses With Pyrethroid-Resistant Annual Bluegrass Weevil

Pyrethroid resistance by annual bluegrass weevils was first documented in Connecticut during 2005. This finding should not have been surprising considering that pyrethroids had been the primary insecticides used for ABW control since the mid- to late 1990s and that as many as six or more applications per year were made on many courses. Subsequent studies by researchers from the University of Rhode Island and the Connecticut Agricultural Experiment Station confirmed high levels of pyrethroid resistance on numerous golf courses in Connecticut and, to a limited extent, other states. This research also showed that enhanced metabolism by several enzyme systems was a major contributing factor to pyrethroid resistance by ABW. Metabolic resistance is particularly troublesome because there is potential that the resistance may be conferred to other classes of insecticide that feature different modes of action. In general, adult insects have greater metabolic capacity than immature stages. And within the immature stages (larvae or nymphs) metabolic capacity increases with age. So in order to maintain as many products as possible in an ABW management program, it is important to increase the use of ABW larvicides and to use them targeting the earliest possible larval instar. The fact that insect enzyme systems metabolize insecticides from numerous insecticide classes could provide an opportunity for synergism using tank-mixtures of appropriate pesticides. Research conducted against pyrethroid-resistant ABW populations by leading turf entomologists during 2009 showed surprising levels of ABW control when Acelepryn® was tank-mixed with bifenthrin. This suggests that there may be synergism when two active ingredients with demonstrated efficacy against ABW are used in conjunction to control resistant populations.

#### First Generation Control—Fairways

*FIRST APPLICATION:* The first application will utilize a tank-mixture\* of DuPont™ Acelepryn® insecticide at 12 fluid ounces per acre combined with a labeled rate of a pyrethroid product. The timing of this application will be based on degree day monitoring (check the WeevilTrak Web site for proper timing in your area).

*SECOND APPLICATION:* The second application will be made roughly two to three weeks after the first application and will consist of a labeled rate

of a pyrethroid product. The timing of this application will be based on degree day monitoring (check the WeevilTrak Web site for proper timing in your area).

*THIRD APPLICATION:* The third component of the program targeting first generation ABW larvae is an application of DuPont™ Provaunt® insecticide at 12 ounces per acre during late May or June to control late hatching larvae (check the WeevilTrak Web site for proper timing in your area).

#### First Generation Control—Greens, Tees and Surrounds

*FIRST APPLICATION:* The first application will utilize a tank-mixture\* of Acelepryn® at 12 fluid ounces per acre combined with a labeled rate of a pyrethroid product. The timing of this application will be based on degree day monitoring (check the WeevilTrak Web site for proper timing in your area).

*SECOND APPLICATION:* The second application will be made roughly two to three weeks after the first application and will consist of a tank-mixture\* of Acelepryn® at 12 fluid ounces per acre combined with a labeled rate of a pyrethroid product. The timing of this application will be based on degree day monitoring (check the WeevilTrak Web site for proper timing in your area).

*THIRD APPLICATION:* The third component of the program targeting first generation ABW larvae is an application of DuPont™ Provaunt® insecticide at 12 ounces per acre during late May or June to control late hatching larvae (check the WeevilTrak Web site for proper timing in your area).

#### Control of Summer Generations—Greens, Tees, Surrounds and Fairways

First generation adults generally appear in late June and early July, making them obvious targets for another adulticide application featuring one or two applications of a chlorpyrifos product. By the middle of July, ABW populations have usually become asynchronous—meaning that all life stages are present at the same time and there often is not a single dominant stage. Late July through early August is prime time for a final ABW insecticide application. Provaunt® should be considered the product of choice for this application because, in addition to excellent activity toward ABW larvae, Provaunt® provides surprisingly good control of ABW adults. An application of Provaunt® at 12 ounces per acre in this time period should carry most courses through to the end of the year.

### 2011 DuPont Optimum Control Program—For Courses Located in Nassau, Suffolk, Kings and Queens Counties of New York State

DuPont™ Acelepryn® insecticide is not currently registered for use in Nassau, Suffolk, Kings and Queens counties of New York state. Golf course superintendents in those counties should continue with the following program that was proven effective during 2009.

#### First Generation Control

*FIRST APPLICATION:* The first application will call for an adulticide—usually a pyrethroid, but chlorpyrifos is also an option. This application will be based on degree days; however, be sure to carefully monitor for adults and check the WeevilTrak Web site for proper timing in your area.

*SECOND APPLICATION:* The second application of the DuPont Optimum Control Program for Long Island is the application of DuPont™ Provaunt® insecticide at 12 ounces per acre. The timing of this application will be roughly two to three weeks after the first application and will be based on degree day monitoring (check the WeevilTrak Web site for proper timing in your area).

\*When tank-mixing Acelepryn® or Provaunt® insecticides with other pesticides, observe all precautions and limitations on each separate label. No label application rates may be exceeded. Acelepryn® and Provaunt® cannot be mixed with any product containing a label prohibition against such mixing.

