

BY HARRY NIEMCZYK, PH.D AND DAVID SHETLAR, PH.D

## Head them off

A look at preventive approaches to destructive turf insects

Preventive insecticide programs are implemented based on the theory that one pest or group of pests often is the primary, but not necessarily the only, focus of treatments. This is called the primary target. However, a treatment's impact on other pests causing damage at application time also should be considered.

An insecticide or other form of insect control generally should be applied only when its use is justified. The major justification for implementing a preventive program is a past history of infestation and/or damage and confidence damage will reoccur. Such history is based on previous years' experiences, observations, monitoring and knowledge of the seasonal spectrum of pests.

### WHITE GRUBS

In the North, if grubs (black turfgrass *Ataenius*, *Aphodius*, Japanese beetle, masked chafer, European chafer, Asiatic garden beetle, Oriental beetle) are the primary target and a preventive program is selected, early May is the optimal time to apply imidacloprid (Merit) or clothianidin (Arena). In addition to providing season-long

control of these grubs, other secondary pests in the spectrum (billbug larvae, first generation cutworm larvae, and probably greenbug aphids and frit fly) will be prevented. Turfgrass ants (*Lasius neoniger*) also will be suppressed.

However, in June, it's too late to prevent the first generation of cutworms and probably billbug larvae by applying imidacloprid or clothianidin. Billbugs are a significant pest on tee and bunker banks and in roughs. Applications from July to mid-August will prevent annual grubs, including green June beetle, but it's too late to control most other secondary pests in the spectrum during that time.

An application of thianicotinyl, thiamethoxam (Meridian) in May or June or July will preventively control Japanese beetles, masked chafers and BTA grubs. Larvae of billbugs, cutworms, sod webworms and chinch bugs existing during and after the time of application can be controlled, too.

June applications of halofenozide (Mach 2) provide season-long preventive control of BTA and *Aphodius*, Japanese beetle and masked chafer grubs. Control of European chafer and

Asiatic garden beetle is limited. Infestations of billbugs, cutworm and sod webworm larvae existing at the time of application also might be controlled with treatment at this time.

Application of halofenozide from July thru early August may also prevent infestation of grubs, and controls existing infestations of cutworm and sod webworm. Treatments applied from mid-August to mid-September control Japanese beetle and masked chafer and might provide a degree of control of sod webworm larvae that normally overwinter.

### ANNUAL BLUEGRASS WEEVIL

Where grubs and annual bluegrass weevil are major targets, a combination of imidacloprid and a pyrethroid insecticide or clothianidin applied from mid- to late April prevents damage from first and second generation annual bluegrass weevil larvae. This treatment also should prevent larval infestations of billbug, BTA, Japanese beetle, masked chafer, European chafer and first generation cutworms.

Where the grub species aren't major targets, an application of the labeled pyrethroid insecticides during the third week of April has prevented damage from annual bluegrass weevil larvae. The principle of this approach is to target overwintered adults as they return to annual bluegrass to begin laying eggs. Timing is critical. However, recent studies have confirmed the existence of annual bluegrass weevil resistance to the pyrethroid bifenthrin on some East Coast courses.

The impact of a preventive program on the spectrum of secondary target pests occurring at



First, second and third instar grubs. The first and second instar larvae are most susceptible to curative controls. Photo: Dr. David Shetlar, The Ohio State University.



Prevention of grub damage can be accomplished with application of an insecticide from early May through mid-July. Photo: Dr. David Shettlar, The Ohio State University.

the time of application hasn't been studied well. However, because these insecticides are labeled for and known to be residually toxic to BTA and billbug adults, larval infestations of these pests also should be prevented.

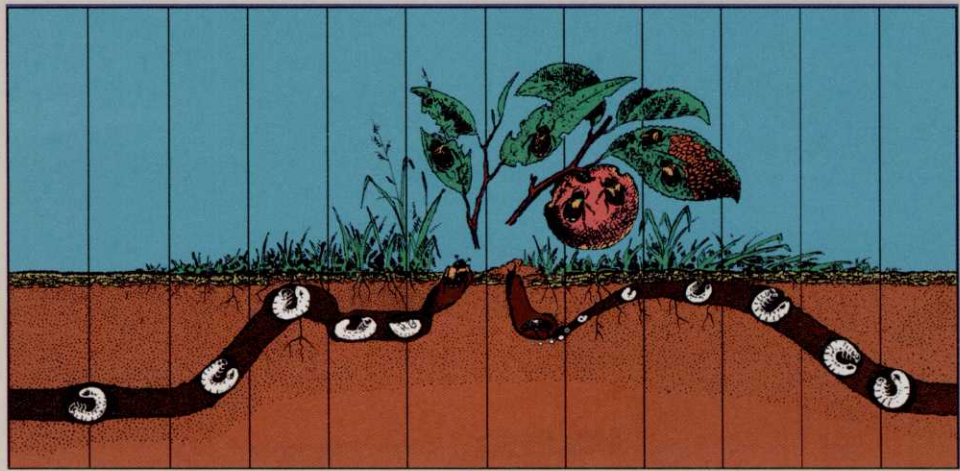
**BLACK TURFGRASS ATAENIUS**

Where BTA is the only grub of concern, another preventive option has been used successfully. Principle control involves application of chlorpyrifos (Dursban) or a labeled pyrethroid to target overwintering adults just as egg laying begins. In the Northern states, this event coincides with the onset of full bloom of Vanhoutte spirea (*Spirea vanhouttei*), usually early to mid-May. The treatment's objective is to deposit the insecticide into the first 1/4-inch of thatch so residues kills adults as they land on the turf to hide, feed on organic matter and/or burrow to lay eggs. Treatments should be syringed immediately after application to wash the insecticide off the grass blades into the thatch.

A preventive application of imidacloprid, clothianidin or thiamethoxam during the first week of May or halofenozide in early June to control other major grub targets also controls BTA, *Aphodius* and a spectrum of other pests. These insecticides also can be used successfully when BTA is the primary target.

**BLUEGRASS BILLBUG**

The bluegrass billbug causes significant damage to Kentucky bluegrass and nonendophytic perennial ryegrass around greens and sand bunkers, on tee and green banks, in roughs and turf around the clubhouse. Damage can be as subtle as a chronic thinning of the stand. Symptoms often are misdiagnosed as irrigation not reaching the turf, drought or disease such as dollar spot. If uncontrolled for extended periods, the Kentucky bluegrass portion of a sward continues to diminish. Kentucky bluegrass varieties vary in their susceptibility to this pest.



Applying imidacloprid, clothianidin or thiamethoxam during the first week of May for prevention of major target pests also prevents bluegrass billbug damage.

**OTHER PEST INSECTS/CUTWORMS**

When cutworms (mainly the black cutworm) are the primary concern, a preventive approach isn't recommended. We discourage adding an insecticide to a treatment of which the objective is fertilization and/or growth regulation and/or disease control just in case there might be cutworms. Instead, we recommend a curative approach and application of a control when evidence of damage first appears.

A program of regularly scheduled applications, beginning when the first eggs begin to hatch and continuing at a 14- to 21-day interval, thereafter, has been shown to prevent damage. Affected larvae die in their burrows, not on the turf surface.

**SOD WEBWORM**

Generally, sod webworms haven't been considered a pest worthy of concern on golf courses. But based on observations and communication with golf course superintendents from Ohio to Nevada to Florida, they are.

Sod webworm larvae commonly overwinter in greens, practice greens and tees. The overwintered larvae resume feeding in early spring by constructing a C-shaped cover of webbed-together topdressing over its burrow. The sand

cover is just below the turf's mowing level. The larva feeds on the turf under the cover, which is made larger as more food is required. During the summer, more irregular tunnels with covers can be constructed in the turf.

In addition to the sand covers being unsightly and interfering with ball roll, the larvae under them are a major reason for the probing of starlings and other birds in early spring. When necessary, spring damage can be prevented by treating the turf areas of concern with an insecticide from late September to mid-October to kill the larvae that would otherwise overwinter. An imidacloprid application in May for preventive control of grubs or other primary targets hasn't controlled overwintered sod webworms. Application of clothianidin or thiamethoxam has been effective.

**MOLE CRICKETS**

In the South, the most difficult time to control mole crickets is late fall and early spring when adults are flying to relocate and mate. These adults might burrow deep in the soil profile during cool or dry soil conditions, and therefore, are less prone to feed, which minimizes their exposure to control materials. Little can be done to prevent this movement and damage.

At sporadic times, usually associated with warm and rainy weather, adults move to the surface, tunnel extensively, fly in mass and mate. Research shows moist but not saturated sites with dense turf or weed growth are highly





attractive to spring-active adults. Eggs will be concentrated in such sites.

In spring, areas where mole crickets are most actively tunneling, emerging and digging back into the soil are where most of the eggs will be laid. A visual inspection of each area should allow for easy detection of mole cricket hot spots. With experience, turf managers will learn to differentiate between light, moderate and extensive mole cricket activity.

Constructing maps of each fairway, turf managers should draw rough outlines of areas with extensive mole-cricket tunneling. These high-risk areas will have significant turf loss from mole cricket nymphal populations. Such sites are candidates for preventive control.

Insecticides with moderately-long residual activity (isofenphos and isazofos) can be applied to high risk areas at the beginning of mole cricket egg hatch (usually late May to early June). Because fipronil (Chipco Choice) applied with subsurface placement equipment provides season-long control of hatching mole cricket nymphs, most other preventively used insecticides have lost favor.

However, subsurface application of fipronil appears to have little activity against other soil-inhabiting insect pests of turf. Turf managers using this tactic have experienced increased white-grub damage and damage from animals digging for grubs. Apparently, these grubs were

controlled or suppressed when the more traditional insecticides (isofenphos, isazofos) were used to control mole crickets.

Applied when mole crickets first hatch eggs, surface application of imidacloprid, clothianidin or thiamethoxam adequately prevents mole cricket nymphal damage. The application date varies considerably from South to North where mole crickets are.

For example, tawny mole cricket egg laying might begin as early as late March in South Florida, mid-April in North Florida and early May in South Georgia, with egg hatch occurring about 20 days later. Generally, each major biological event in the life history of mole crickets is delayed one week as one moves 100 miles south to north. Coastal and island areas can vary from this rule.

A single surface application of imidacloprid, clothianidin or thiamethoxam (at the highest label rate) made within the first three weeks of first egg hatch should prevent damage from tawny and southern mole crickets. One of these insecticides, applied within this time period should suppress (if not control) the first new generation of cutworms, fall and true armyworms and tropical sod webworm for 25 to 30 days after application, thereby eliminating the need for a surface insecticide treatment during this time.

Chlorpyrifos, acephate (Orthene) or a regis-

Thinning and damage spots are caused by bluegrass billbugs that prefer the sunny, dry bunker banks of golf courses.  
Photo: Dr. David Shetlar, The Ohio State Univ.

tered pyrethroid might be applied to mapped areas that were determined to have considerable adult tunneling activity in April and early May. The insecticide is applied at egg hatch and every three weeks thereafter until egg hatching stops (usually after two to three applications). These applications also will control secondary targets such as cutworm, armyworm and sod webworms but won't control grubs effectively.

Surface applications of fipronil (Chipco Choice) made after egg hatch until the mole cricket nymphs are medium sized have provided good control and also suppresses fire ant populations.

The key to using imidacloprid, clothianidin or thiamethoxam successfully is to determine when mole crickets are ready to lay eggs. This will require weekly sampling of adult mole crickets on the course, starting when spring flights and digging is prevalent.

Turf managers can flush adult mole crickets to the surface using a soap irritant so they can be inspected carefully. They should capture three to five female mole crickets from several locations on the sites that previously were identified as hot spots. With a sharp knife, open the abdomens of the female crickets and look at the developing eggs. If the eggs are flat to slightly oval and are soft and yellow-green, the female isn't ready to lay eggs. If the eggs are rounded, hard and dark yellow, egg laying will occur within five to 10 days.

First egg hatch normally occurs 20 days after egg laying. Again, a soap irritant solution can be used to detect the first instar nymphs.

An April or May application of imidacloprid, clothianidin or thiamethoxam has enough residual efficacy to control secondary pests such as masked chafer or annual species of May/June beetle grubs that appear within 60 to 90 days after the application.

Grub adults that lay eggs in August might not be controlled. Spring applications also appear to control hunting billbug.

The insect parasitic nematodes, *Steinernema*



# Research

*scapterisci* and *S. riobraevae* have been touted as providing permanent, long-term preventive control of mole crickets. However, these nematodes, while often becoming permanently established in an area, don't produce the desired level of control expected by golf course managers, especially in high maintenance, irrigated turf. The nematodes might be useful in roughs, wetland sites and other lower-maintained turf areas.

## GRUBS

If grubs are determined to be the primary target and a preventive program is selected, the first priority is to determine which species or species complex is present.

In many Gulf States, masked chafers and annual forms of May/June beetles are the most common grub pests. In Texas, Oklahoma and the West, the Southwestern masked chafer and annual May/June beetles are the common pests. The adults of these southern grubs usually fly and lay eggs when the rainy season begins or when summer rain fronts pass through.

Flights of the Southern and Southwestern masked chafers are common in late July through August. The May/June beetles fly from May to August, depending on the species. Knowing which species is dominant and when it flies and lays eggs is essential.

May and early June applications of imidacloprid generally provide control of masked chafer

and annual May/June beetle grubs except where the adults delay flight until mid- to late August. This application also should control secondary targets such as mole crickets, cutworms, armyworms, tropical sod webworms and hunting billbugs.

Where green June beetle also is present or late flying masked chafers or annual May/June beetles occur, imidacloprid, clothianidin or thiamethoxam applications should be delayed until mid-July. This treatment will provide season-long control of the grubs and suppress secondary pests such as cutworms, armyworms, tropical sod webworms and hunting billbugs. However, it's too late to provide mole cricket control.

May and early June applications of thiamethoxam or clothianidin should provide control of masked chafer and annual May/June beetle grubs and should also control secondary targets such as mole crickets, armyworms, cutworms, tropical sod webworms and hunting billbug.

June application of halofenozide has been shown to control masked chafer and annual May/June beetle grubs in July and August. Application at this time also will control secondary pests, such as cutworms, armyworms and sod webworms.

## FIRE ANTS

Generally, fire ant control requires curative and preventive approaches. Two effective programs have been developed: the two-step and ant-elimination

methods are satisfactory approaches for golf courses.

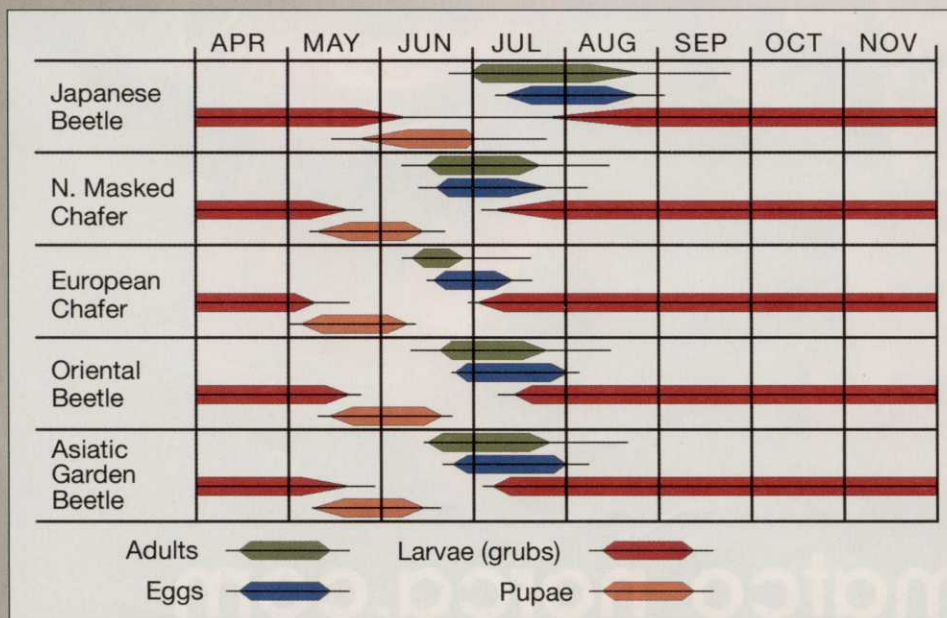
Two-step approach requires an annual or twice-a-year application of a bait-formulated insecticide first applied over the entire turf area. The principle is to allow sufficient time for the fire ant workers to pick up these baits and take them back to the colony for distribution throughout the individuals. Hydramethylnon baits provide control three to five weeks after broadcast, while fenoxycarb baits provide maximum mound control four to nine months after application.

One to three weeks after the bait is broadcast (to allow ants time to pick up the baits and take back to the colonies), the second step is to treat remaining, conspicuous or persistent mounds directly. Persistent mounds can be drenched, dusted, treated with granules, or aerosol injection with one of a range of insecticides registered for this purpose.

Once fire ants in an area have been brought under control, the two-step approach can be used every year to prevent further buildup of new colonies. This is best done by applying the baits in the fall and treating persisting mounds in the spring. If mounding becomes extensive, baits may be reapplied.

The ant-elimination approach is used where fire ants can't be tolerated and requires broadcasting a bait-formulated insecticide and/or spreading granules around individual mounds. After two to three days, a contact insecticide is applied to the entire area every four to eight weeks to kill any foraging fire ant workers. When chlorpyrifos, acephate or a pyrethroid is used, secondary pests such as cutworms, armyworms and sod webworms also will be controlled. If applications are made when mole cricket eggs are hatching, many of the young mole cricket nymphs also will be killed.

The main principle of using fire ant baits is to let the ants have time to pick up the bait and transport it to the nest for further distribution throughout the colony. If transport of the bait to the nest is disrupted by the application of other insecticides, the long-lasting effects normally obtained with baits won't be achieved.



Understanding when grubs lay eggs and early instar grubs begin feeding determines the best time to make preventive applications. Photo: Dr. David Shetlar, The Ohio State Univ.



## OTHER PESTS

Cutworms, common armyworm, fall and yellow-striped armyworm, sod webworm and tropical sod webworm rarely become the primary target of concern on Southern golf courses, therefore, a preventive approach isn't recommended.

We discourage applying an insecticide along with a fertilizer, herbicide and/or disease control as extra insurance to control any larvae that might be present. Instead, we favor a curative approach when evidence of damage first appears.

We suggest using a daily visual monitoring of greens, tees and approaches for early signs of thinning or ragged leaf margins (grass blades often appear white). These are indicators of early armyworm and tropical sod webworm activity.

Regular and persistent bird feeding in an area also is an indication that armyworms or tropical sod webworms are active. It might be advisable to

apply insecticide like chlorpyrifos or a pyrethroid every three to four weeks to prevent armyworm damage. Applications of insecticides for control of armyworms also control other insects present such as fire ants, billbug adults and young mole cricket nymphs.

Damage from hunting and phoenician billbugs commonly is misdiagnosed on Bermudagrass because it resembles damage caused by the disease, spring dead spot and delayed spring green-up. When careful inspection of the turf indicates signs of billbug activity (chewed stolons) or larvae are found, a curative program should be used. If damage is extensive, a preventive approach should be considered for the next season.

Preventive application of imidacloprid, clothianidin, thiamethoxam or halofenozide in May or early June normally will provide sufficient residual effect to kill billbug larvae that

begin feeding in June through August. This approach reduces the population so few larvae will remain to overwinter and cause damage the following spring. Application at this time also will control or suppress mole crickets, grubs and larvae of cutworms, armyworms and sod webworms. **GCI**

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## IMPACT ON THE BUSINESS BY CINDY CODE

### Field experience dictates application timing

Controlling insect damage on a golf course is generally not an easy proposition. Balancing when to apply insecticides preventively vs. waiting for a more targeted, curative approach is often difficult to quantify. And, a miscalculation can result in unsightly damage and an angry clientele.

Further muddying the picture is identifying which insecticide, or combination of products, to use to manage undesirable insect pests.

University research certainly goes a long way in providing superintendents with background needed to effectively keep pest outbreaks to a minimum. But trial and error is oftentimes the most comfortable fit for a superintendent once he has lived through a number of seasons and pest cycles.

David Webner, superintendent for Westwood Country Club, Rocky River, OH, says his insect treatment program varies from year to year.

"Right now I'm debating a wholesale treatment for grubs and masked chafers or whether I should spot treat where I've had problems.

I'm still deciding what I'm going to do this year," Webner says. "There's such a cost difference."

Timewise, if Webner's crews spot treat, he says they can finish the job in about five hours. But if he treats greens, tees, fairways – as well as around the fairways – it amounts to about 16 man hours.

"It's more to do with budgets. We're trying to keep it tight," he says. "It may cost us more on the back end. It's a balancing act."

After seven years at Westwood, Webner says he knows the areas of his course that will definitely experience a pest problem. Those spots are always treated preventively.

In Palm Beach Gardens, FL, superintendent Kevin Downing says he is planning three to four applications this year predominantly for grub and mole cricket management. His plan is to increase the number of areas on the course that are treated.

"We'll act more preventively on the fairways and tees for grubs, primarily, and for some increase in

mole crickets," he says of his course, Ballensles Country Club. "It's a switch from last year. We continue to evaluate conditions and hot strike areas. Obviously, this program represents more expenditure of finances than last year, but last year we played two months catch-up for areas we didn't pre-treat."

Downing observes that the contingent of year-round residents living in Florida can be more sensitive to the conditions of the course in the off-season. Thirty to 40 percent of Ballensles stay year-round.

Financially, preventive treatments will cost about \$50,000, but improved conditions are the end-result.

"We're making these changes based on experience," he says. "It's more involved to pre-treat, but if we have to replace it with sod or treat poor playing conditions, it'll cost money there too."

Both Webner and Downing plan to use two to three different products to manage grubs this year.

Webner says he tries to mix up his product selection from year to year to

vary the mode of action. Sometimes a predominantly grub control product will also provide some first generation control of surface-feeding insects, but generally that's considered a bonus.

Surface-feeders present additional problems. When cutworms, armyworms or sod webworms appear on a handful of greens they're treated right away. "We're not going to wait. At the first sign of damage we treat and repeat as necessary," Webner says.

Product choice is a continual process that's always under evaluation, according to Downing. He advises assessing new single or combination products on a test area first before widespread use.

Downing says he generally treats for grubs once a year unless he's working in a curative situation. Surface-feeders, on the other hand, are tackled two to three times a year.

Both superintendents say they review university research for timing recommendations and product efficacy results, but there's nothing better than on-the-job experience to keep one step ahead of the pest.