

Soil compaction is another factor in disease development that is caused by heavy play. Compacted soil does not allow the turf to become as well-rooted, causing it to suffer a stress level similar to dry turf. The foot and golf car traffic associated with heavy play may also increase the turf's susceptibility to dollar spot.

### Biological factors

In recent years, we have also seen changes in biological factors in turf that influence dollar spot. Penncross creeping bentgrass is a popular variety that I used to consider rather susceptible to dollar spot. However, a number of new varieties have been introduced in the past decade or so that are hypersusceptible, even more so than Penncross. Some of these include Backspin, Century, Crenshaw, SR 1020 and 18th Hole.

Naturally, these newer varieties brought benefits. Crenshaw, for example, with its high tolerance to hot, arid climates, helps superintendents maintain creeping bentgrass on greens and fairways under harsh conditions where other varieties of creeping bentgrass would perform poorly. Unfortunately, when planted in sites where dollar spot pressure is moderate to severe, these varieties suffer extensive damage unless treated heavily with fungicides.

One can control dollar spot on these varieties with fungicides, at least for a time. However, the use of hypersusceptible varieties increases the potential for the development of fungicide-resistant strains of dollar spot. So fungicides are at best a short-term solution. The key to selecting a variety is to weigh these and all other pertinent factors, and to select the variety that represents the best balance of strengths and limitations for your conditions.

Another biological factor is a golf course's recent history of dollar spot infestation. Any location that has experienced several years of repeated dollar spot appearance will have accumulated higher levels of fungal biomass in the turfgrass ecosystem. This situation

increases the likelihood and severity of disease appearance each spring, which creates a scenario of ever-worsening conditions. More disease appears, and more efforts are needed more often to keep it under control.

### Chemical factors

Industry statistics consistently show that fungicide treatments alone represent 50 percent of a typical golf course chemical budget. This high expense is because of the low tolerance for disease damage in golf course settings. Disease management is often a complicated challenge because there are numerous diseases and many treatment options.

With regard to dollar spot, there is no question that many golf courses have strains of the dollar spot fungus with reduced sensitivity to several of the available treatments. Reduced sensitivity to demethylation inhibitors (DMIs), which are also called sterol inhibitors, has been

## Foot and golf car traffic may also increase the turf's susceptibility.

found in many situations across the Midwest and beyond. Examples of the DMI fungicides are propiconazole, triadimefon, myclobutanil and fenarimol. Other fungicides to which the dollar spot fungus has developed resistance in many locations are thiophanate-methyl products and fungicides in the dicarboximide class, such as iprodione and vinclozolin.

Although the emergence of fungicide resistance on a particular site can neither be predicted nor prevented, it is possible to reduce the risk of resistance. Superintendents can benefit from

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## It's Academic

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understanding the difference between a multisite inhibitor and a fungicide with a single target site. Fungicides that have multiple biochemical targets in the fungal cell, such as mancozeb and chlorothalonil, have little risk of resistance. In contrast, fungicides that poison a single biochemical target in the fungal cell, such as the DMI fungicides and thiophanate-methyl, are vulnerable. All a fungus has to do is mutate to a form that can overcome the poisoning of that one biochemical step, and it's able to infect and cause disease despite fungicide applications.

With fungicides that are at risk for resistance, such as many of the best dollar spot materials, it is important to avoid applying the same fungicide over and over because this runs the risk of selecting a resistant strain. Thus, it's highly recommended the superintendents rotate and tank-mix fungicides in different chemical classes that have different biochemical modes of action.



**University of Kentucky turf professor Paul Vincelli recommends rotating and tank mixing fungicides from different chemical classes that have different biochemical modes of action.**

The following is an example of a strategy that shows how a varied combination of products can work best to reduce the risk of fungicide resistance in the dollar spot fungus:

- First application: multisite inhibitor A with single site inhibitor X.



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■ Second application: multisite inhibitor A with single site inhibitor Y.

■ Third application: multisite inhibitor A with single site inhibitor Z.

This principle of rotating among fungicides extends to other fungicides in the same chemical class. For example, a superintendent may spray, at two-week intervals, three very effective products: myclobutanil, propiconazole and triadimefon. On the surface, this rotation may appear to include different fungicides, but consider this: They are all DMI fungicides that poison the fungal cell in exactly the same way.

Therefore, on the biochemical level, these fungicides are all identical — one might as well have sprayed the same fungicide. Thus, when planning a dollar spot spray program, pay attention to selecting products from different fungicide classes.

### The future

Considering the potential for resistance to current dollar spot treatments, it's important to use the available treatments as wisely as possible. Use cultural practices to reduce dollar spot to the extent possible. Reduce morning leaf wetness by dragging fairways on the days that you don't mow. When establishing a new sward, give serious thought to the dollar spot susceptibility of the varieties under consideration.

Because of the continuing importance of dollar spot, chemical manufacturers continue to search for new fungicides with entirely new biochemical modes of action. This is a welcome trend. If you have a greater selection of fungicides with differing modes of action, you have a wider selection of weapons at your disposal for your rotations and tank-mixes.

The combination of new product options and cautious planning can be the key to improving dollar spot control in the long run.

*Vincelli is a professor of turfgrass pathology at the University of Kentucky.*

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# Feeling the Squeeze

Demands for lower rates and shorter residuals make bringing new insecticides to market much more difficult

By Frank H. Andorka Jr.  
Managing Editor

In a previous era, insecticides were easier for companies to create. The organophosphates, carbamates and arsenicals provided broad-spectrum control on numerous turf-destroying bugs. But superintendents also realized the effect those chemicals had on the environment.

The regulatory climate has changed dramatically over the past 10 years, and such broad-brush insecticides are no longer acceptable to either the EPA or superintendents

— or the companies that manufacture them, for that matter. That makes the job of the basic manufacturers more difficult when it comes to developing new insecticide technology.

A confluence of EPA regulations and superintendents' changing attitudes toward insecticides mean that companies

Given those parameters, it may sound like the chemical manufacturers have an impossible task on their hands. But despite the hurdles that are now placed in front of them, they're still doing the research and making investments to meet superintendents' needs.

## EPA gets tougher

Chemical companies have been so effective in meeting the EPA's requirements for shorter residual times and lower application rates that they may be victims of their own successes — at least when it comes to developing new insecticide products.

Costs for registering new products are on the rise, in part because of the success of new products like Topchoice and Merit (see related story, pg. 82). Bayer Environmental Science's insecticides set the standard by which new insecticides are judged, says Bryan Gooch, business manager of insecticides for Bayer.

The active ingredients of each act on specific sites within insects' nervous systems, which greatly lowers mammalian toxicity. They are regarded as more environmentally friendly because they provide long residual control at low application rates.

"Merit was one of the first insecticides on the market to have low use rates and a short residual," Gooch says. "From an EPA per-

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DAVID SHETLAR

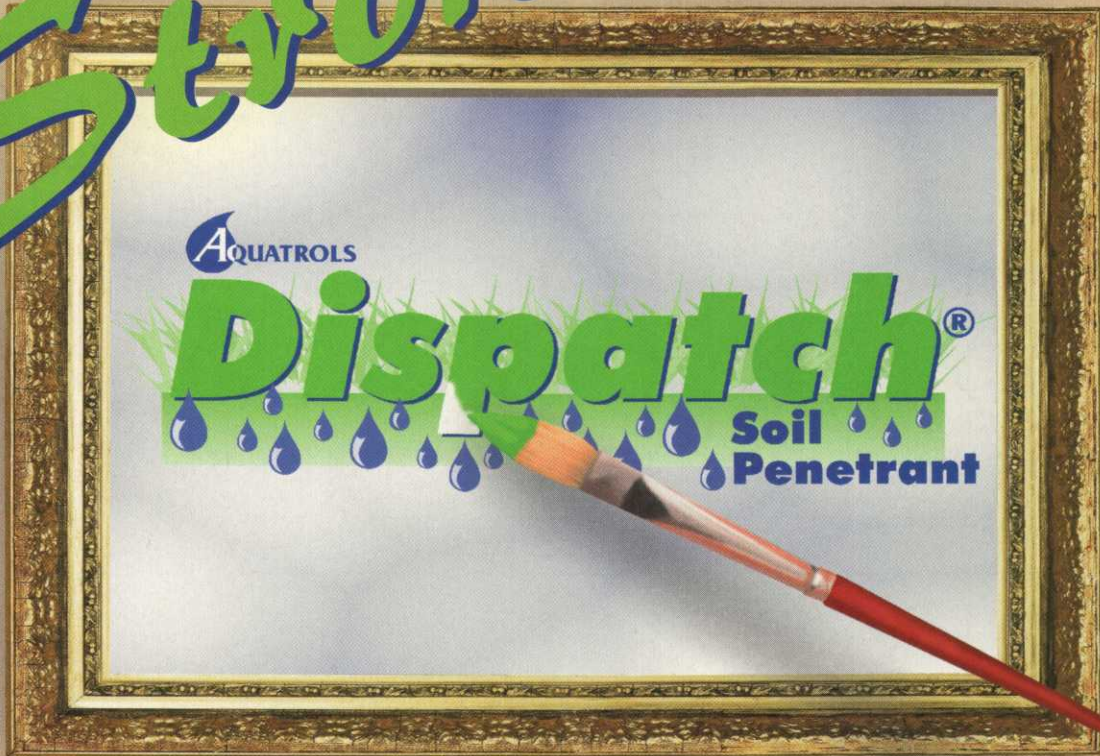
The hunting billbug appears to have prolonged adult activity periods that result in both the adults and larvae being present during the season.

now have to produce products that:

- have shorter residual times;
- can be applied less frequently;
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## Feeling the Squeeze

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spective, the bar has been raised, which makes it more difficult to bring anything new to market.”

Kyle Miller, senior technical specialist for the turf and ornamental division of BASF Professional Turf, agrees that registering new insecticides has become more difficult.

“Insecticides have traditionally been characterized by higher toxicity than other pesticides,” Miller says. “The EPA is requiring more and more testing to make sure new products have a minimal impact on the environment. Those standards increase development costs



R. CHRIS WILLIAMSON

**The winged reproductive (swarmer) ant perpetuates the colony by fertilizing the queen's eggs.**

and slow down the production of new compounds.”

More state-specific regulations are also raising the cost of bringing new chemicals to market, Gooch says. “The additional research and data that state and federal

governments now require is an expensive undertaking, even for large companies.”

Gooch says such restrictions are fueling the merger activity within the market as companies hope to pool their research-and-development resources in the search for new chemistries, such as BASF's merger with TopPro Specialties and Bayer's merger with Aventis.

### What superintendents want

Ironically, the experts say that what superintendents want in their insecticides dovetails nicely with the EPA's restrictions.

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### Key Turfgrass Pests, Their Host Plants, Symptoms and Suggested Damage Thresholds.<sup>a</sup>

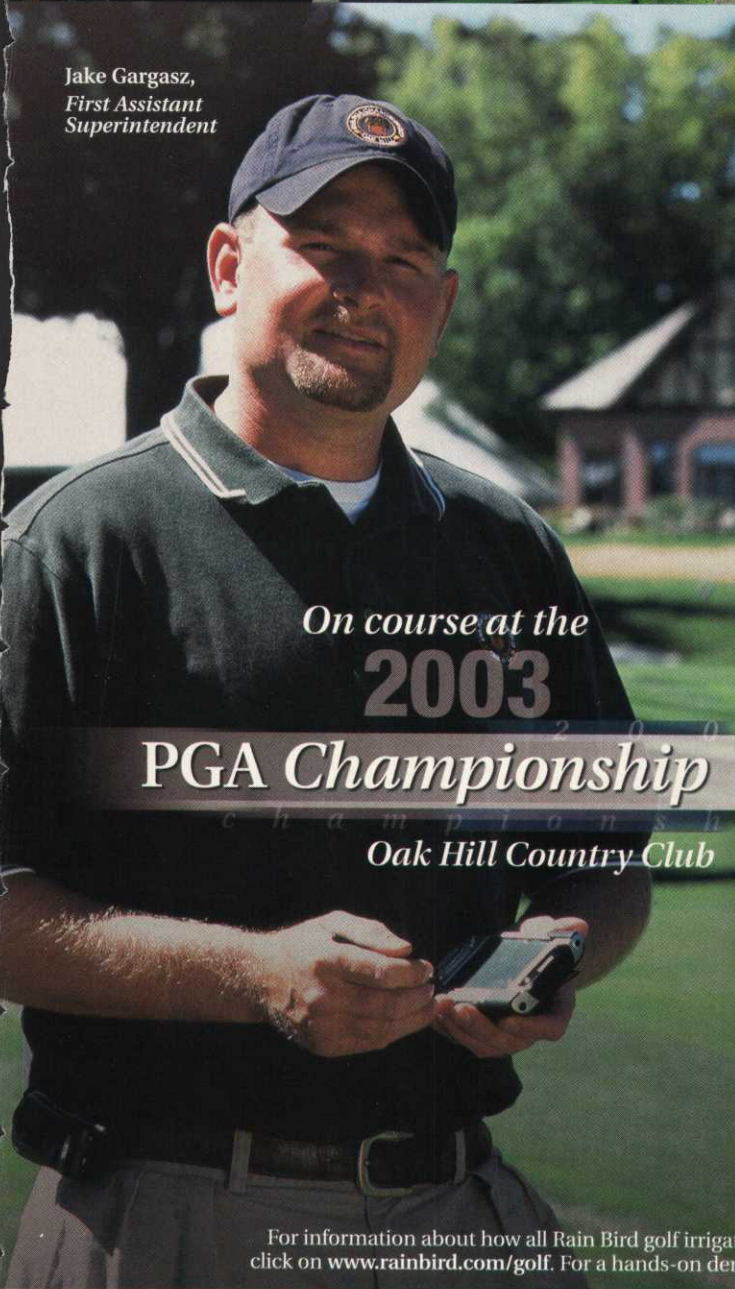
Arthropod pests	Preferred hosts	Damage symptoms	Suggested damage thresholds
<b>Bermudagrass mite</b>	Bermudagrass	Yellowed leaf tips, shortened internodes resulting in tufted growth.	Not determined
<b>Billbugs</b> ■ Bluegrass, Denver, Hunting, Phoenician)	Cool-season grasses, bermudagrass, zoysiagrass	Larvae burrow down grass stems to the plant crown, killing stems and larger turf areas. Often misdiagnosed as drought, other insects or disease.	1 to 6 billbugs per sq. ft.
<b>Caterpillars</b>			
■ Armyworm	Many grasses, small grains, legumes	Skeletonized or completely consumed foliage, with circular bare spots.	3 to 4 larvae per sq. ft.
■ Cutworm	Many grasses and crops	Circular spots of clipped or dead grass near holes.	Not determined
■ Fall armyworm	Bermudagrass, cool-season grasses, grains	Skeletonized or completely consumed foliage.	Not determined
■ Sod webworm	Cool-season grasses, small grains	Small patches of chewed leaves or stems.	Not determined
■ Tropical sod webworm	Most warm-season grasses	Notched leaves, ragged appearance.	5 to 8 larvae per sq. ft.
<b>Chinch bugs</b> ■ (Hairy, Southern, Common)	Cool-season grasses, St. Augustinegrass	Foliage yellows, wilts and dies in small spots, then larger patches.	15 to 25 chinch bugs per sq. ft.
<b>Mole crickets</b> ■ ( <i>Scapteriscus</i> spp.)	Bermudagrass, bahiagrass, other warm-season grasses	Tunneling below the soil surface and root feeding result in bare patches of turf.	2 to 4 tunnels per sq. ft.
<b>Spittlebugs</b>	Centipedegrass, St. Augustinegrass	Purple-red striping in turf, wet and spongy to walk on.	Not determined
<b>White grubs</b>			
■ Black turfgrass ataenius	Annual bluegrass Kentucky bluegrass, bentgrasses	Root feeding results in wilting and gradual thinning of turf.	40 to 100 grubs per sq. ft.
■ Green June beetles	Kentucky bluegrass, tall fescue, bermudagrass, thin-skinned fruits	Root feeding results in wilting and dying grass. Grubs make mounds.	5 to 7 grubs per sq. ft.
■ Japanese beetle	Most grasses	Grubs feed on roots and root hairs, resulting in turf wilting and thinning. Adults skeletonize tree and shrub leaves.	10 to 20 grubs per sq. ft.
■ Masked chafers	Pasturegrasses and turfgrasses	Larval root feeding weakens grass, resulting in wilting and dieback. Adults do not feed.	10 to 20 grubs per sq. ft.
■ May and June beetles	Many grasses	Grubs feed on roots, resulting in wilting and dieback. Adults eat leaves of grasses, herbs, shrubs and trees.	3 to 6 grubs per sq. ft.
■ Oriental beetle	Turfgrasses and sugarcane	Grubs feed on roots near the soil surface. Adults feed on several flowering plants.	6 to 8 grubs per sq. ft.

<sup>a</sup> Thresholds vary depending on the condition and use of the turf.





Jake Gargasz,  
First Assistant  
Superintendent



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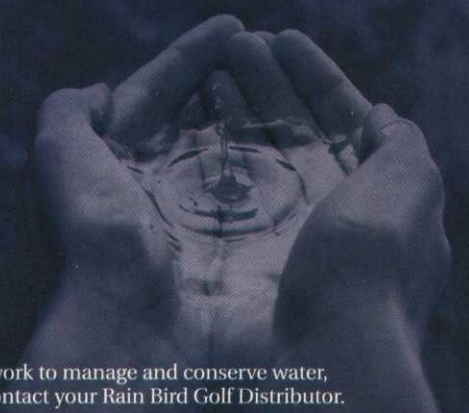
*- Paul Latshaw, Superintendent*

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## Feeling the Squeeze

Continued from page 76

"Superintendents are looking for insecticides that are not going to cause them problems," says Dave Ross, turf and ornamentals technical manager for Syngenta Professional Products. "They're looking for products that are more targeted to specific pests and products that don't damage the environment."

Miller says superintendents have been asking for insecticides that don't remain in the soil and pose a threat to the environment for an extended period of time.

In a tight economy, superintendents are also looking for insecticides that are cost effective, and on that front they may be in luck. Miller says several of the old insecticide chemistries are going off patent in the next few years, and he expects to see an increase in post-patent products. "These will introduce more competitive pricing into the market," Miller says.



R. CHRIS WILLIAMSON

**Manufacturers are seeing more insecticides, like those used to kill ants, being packaged in combination with other products like fertilizers.**

Gooch acknowledges that there will be competition for Bayer's Merit grub control product. "We expect Merit look-alikes to surface over the next several years."

Finally, Gooch says superintendents are looking for products they can use once per season instead of repeated applications.

"They're looking for guaranteed results," he says. "They want chemicals they can apply once and forget about for the rest of the season. That reflects a changed mindset for superintendents."

## Seeing into the future

Syngenta's Ross says the most likely products to reach the insecticide market in the near future are reformulations of established products and combinations with other chemicals. He says Syngenta is currently working on a granular formulation of its Scimitar® insecticide, a pyrethroid that kills surface insects like caterpillars and adult beetles. "We want to make it easy for superintendents to apply our insecticides in whatever manner is most convenient for their needs," he says.

Meridian, an insecticide with the active ingredient thiamethoxam that controls many chewing and sucking insects (including grubs) at low use rates, is currently being looked at by the EPA, Ross says.

Bayer's Gooch says he sees a trend toward packaging insecticides with other carriers such as fertilizer. He says superintendents are asking for the com-

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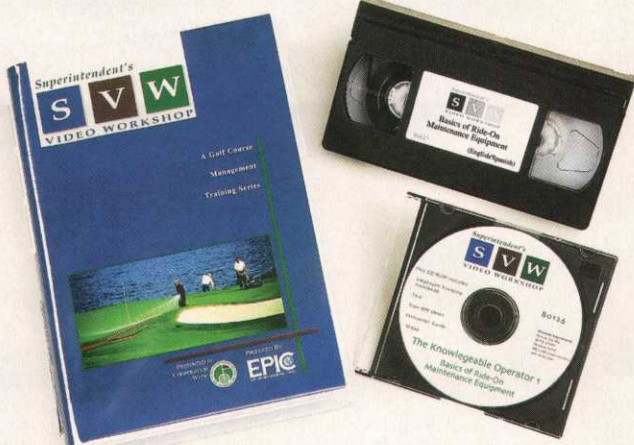
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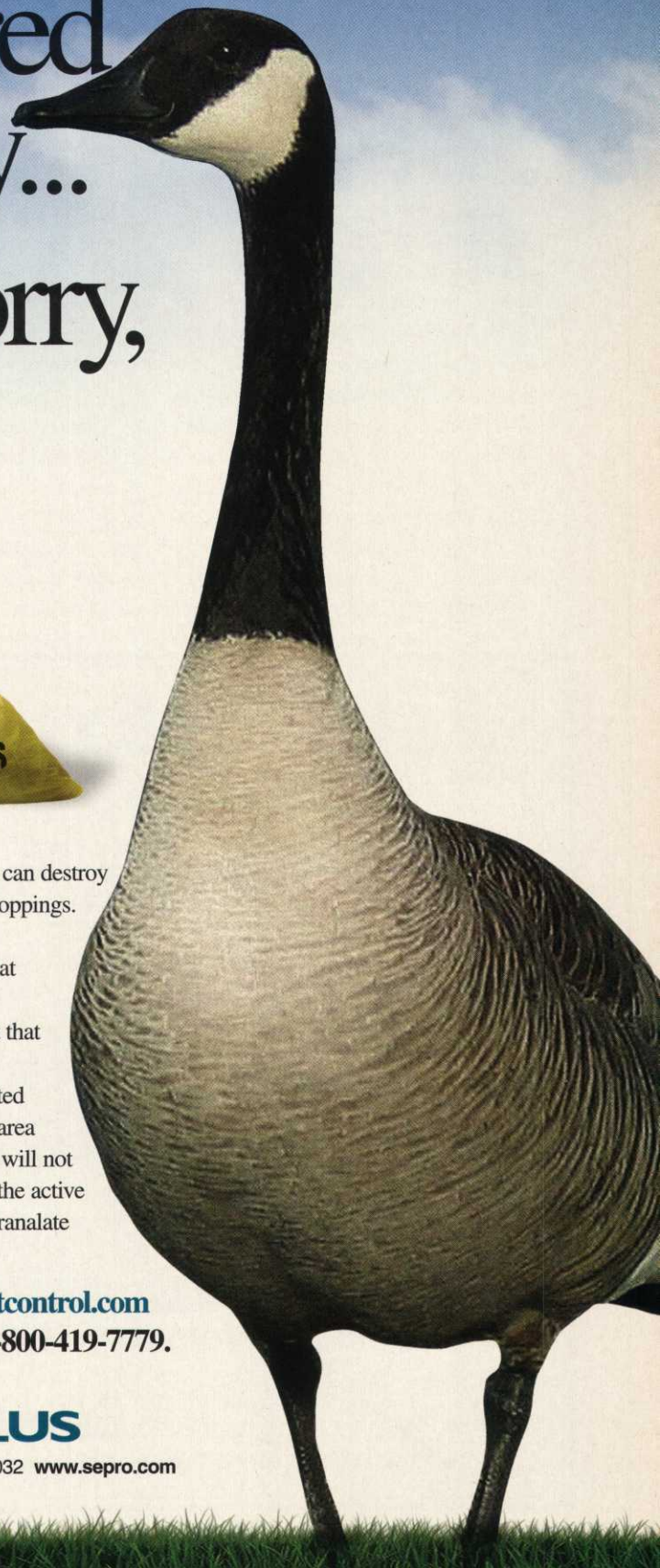
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## Feeling the Squeeze

*Continued from page 78*

binations for their convenience and predicts they will see more such products in the future.

"They're looking to save the associated labor and product costs by putting down one application instead of two separate ones," Gooch says. "Our formulators throughout the country are reporting a significant increase in those kinds of requests."

John Price, technical sales representative for Dow AgroSciences, says he's hearing the same sort of demand with Mach 2, an insecticide that targets the white grub larvae of several species, cutworms, sod webworms and armyworms with the active ingredient halofenozide. The company's distribution channel partners report that superintendents want to apply fertilizer with grub control.

"We've got a new 2-pound rate that works well with fertilizers," Price says. "It allows superintendents to give the

turf a nutrition boost at the same time they're preventing grubs from destroying turf from underneath."

BASF's Miller says his company is developing an insecticide to deal with surface insects, but that it's several years from production. Initial research indicates the new insecticide could be used at rates in the range of 3 grams to 4 grams of active ingredient per acre. He also indicated that it would have a shorter residual. "We think superintendents will welcome this new technology when it becomes available," he says.

But for now, superintendents will have to get by with what's currently on the market — and Dow's Price says that's OK.

"Right now, no matter what your pest problems, there are options out there for superintendents," Price says. "That's what's nice about the choices on the market — each superintendent can find a product that helps them deal with a specific problem." ■

## What Will Bug You This Year?

With the help of members of the USGA Green Section staff, here are some ideas about what may be the biggest insect pests of 2004.

Patrick O'Brien, director of the USGA's Southeast Region, says superintendents are already bracing for an onslaught of mole crickets once the soil starts to warm. He says superintendents in the area should also be on the lookout for nematodes and cutworms.

In the Mid-Atlantic Region, director Stan Zontek says the big news is the



DAVID SHELAR

**BTA adults (left) and third-instar grub (right) are what you should look for when scouting for these pests.**

pernicious hyperodes weevil is spreading south and west from New England. It has been spotted as far west as Pittsburgh and as far south as Annapolis, Md. His colleague, agronomist Darin Bevard, says superintendents can also expect annual visits from European chafers, Japanese beetles and cutworms.

Matt Nelson, agronomist in the Northwest Region, says billbug activity has spiked in the past several years in southern Idaho and northern Utah, but that superintendents are starting to use Merit to deal with them, thereby avoiding the worst of the damage.

Superintendents in the Southwest should be concerned about reports that mole crickets have been spotted near the California/Arizona border, says Pat Gross, Southwest Region director. That's a new bug to the area.

"We already have a few courses dealing with red imported fire ants," Gross says. "We'll also have the usual cutworms, armyworms and white grubs — but they aren't serious problems if superintendents keep their eyes open."

— Frank H. Andorka Jr., Managing Editor

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