Fight spring dead spot

By Gordon L. Kauffman, Ph.D.

I first encountered spring dead spot (SDS) in 2000 on a Tifway 419 bermudagrass fairway in Virginia Beach, VA while traveling with a USGA agronomist. I remember the agony on the superintendent's face as we discussed potential chemical control options and cultural practices to help reduce the damage from SDS the following spring. Finally the conversation turned to complete renovation and we contemplated a conversion to another species such as creeping bentgrass, or a more resistant cultivar of bermudagrass. At the time, options for this turf manager seemed bleak to say the least.

Researchers understood less back then about environmental and cultural practices impacting the life cycle of SDS, and there was no commercially acceptable chemical control. While a 30-40% reduction in disease severity was attainable, fungicide programs were costly because they typically required two or more applications. In addition, we understood less about the number, method, and timing of chemical applications necessary to provide an effective fungicide program for improved SDS control. Unfortunately, turf managers had very few options other than getting through the season with some turf recovery and hope for the best the following year.

Currently, more insight and information exists on how to fight SDS. Scientists now understand more about the life cycle of the causal pathogens, cultural and environmental factors that influence SDS development and breeding programs designed to select for more resistant bermudagrass cultivars. Also, chemical control options, including the timing and method of application of specific fungicides, are currently being assessed to develop more effective and improved fungicide programs to combat SDS. While my experiences with SDS have been primarily on golf courses, the disease can be problematic for sports turf managers. Athletic field managers often have, or are likely to deal with this disease if they are managing common bermudagrass (Cynodon dactylon) and Bermudagrass hybrids in the transition zone, and primarily in the northern most range of bermudagrass growth in the United States.

Symptoms and causal pathogen

SDS is a particularly devastating perennial disease to Bermudagrass because the pathogen begins its colonization by infecting turfgrass roots, stolons, and rhizomes. After visual diagnosis, control options are limited and likely too late. SDS infects bermudagrass of all ages,

One difficulty in interpreting SDS fungicide trial data is that test plots are often not uniformly infested, resulting in plot rather than treatment effects.

but most often occurs on established, 2-4 year old, intensely managed turfgrass stands. SDS kills Bermudagrass down to the soil surface while destroying roots, rhizomes, stolons, and shoots, leaving well defined, sunken, circular patches. Patches range in size from an inch up to a few feet in diameter and usually form as the bermudagrass breaks winter dormancy, although the infection likely occurs the previous fall. If left untreated, the patches begin to coalesce and devastate large turf areas.

The causal pathogens of SDS are three different root-infecting fungi called Ophiosphaerella herpotricha, O. korrae, and O. narmari. These pathogens are classified as ectotrophic root-infecting fungi (ERIF) based upon the site of primary infections. Species of these fungi are soil borne and grow over living turfgrass roots, rhizomes, and stolons similar to summer patch (Magnaporthe poae), which infects primarily bluegrasses, and take-all-patch (Gaeumannomyces graminis) of creeping bentgrass (Agrostis stoloniferous). Infected roots and stolons typically become rotted and covered with dark brown or black hyphae. O. korrae also causes necrotic ring spot disease of annual bluegrass (poa annua) and Kentucky bluegrass (poa pratensis).

Environmental, cultural factors

Several key environmental factors increase the chances of SDS infection and subsequent colonization. SDS is most active when temperatures and soil moisture favor fungal growth. Bermudagrass becomes most susceptible when growth slows in the early fall and spring during periods of cool, wet weather. Scientists believe, however, that much of the damage caused by SDS results from winter desiccation, making the initiation of fall dormancy, severity of the winter, and bermudagrass cold hardiness important factors for disease development. It appears that during the winter, SDS kills roots and crowns directly by infection, or indirectly by predisposing the Bermudagrass to winter injury and subsequent desiccation. bermudagrass cultivars with increased cold hardiness tend to exhibit greater resistance to SDS.

Cultural practices that promote increased winter hardiness can minimize SDS damage. For example, excessive fall nitrogen applications are not recommend in SDS prone areas. Avoid more than 4-5 lb. N/M/year, but most importantly, discontinue nitrogen applications at least six weeks before expected bermudagrass dormancy. Additional cultural practices used by turf managers to reduce the damage from SDS include routine core cultivation as an integral part of a thatch management program, improving soil drainage and compaction, maintaining adequate potassium fertility, and the use of acidifying fertilizers. Implementing these cultural solutions can be an effective first step when designing an SDS management program.

Chemical control

Control of SDS with fungicides has been spotty at best in the field and in control studies at turfgrass research plots throughout the United States. In order to suppress disease development, a systemic fungicide should be applied in the fall, when the pathogen begins to infect root tissue. The major factors influencing the control of SDS with fungicides include the timing and dilution rate of the application. When targeting a soil borne pathogen like SDS, chemical applications should be made in sufficient volumes of water so that the fungicide can effectively move through the turf canopy and positioned for absorption by root and crown tissue. One difficulty in interpreting SDS fungicide trial data is that test plots are often not uniformly infested, resulting in plot rather than treatment effects.

Tredway and Butler (2003) studied both the timing and application method on SDS control for two Tifway bermudagrass athletic fields. In general, they found that Banner Maxx (4 oz/M) and Rubigan 1AS (6 oz/M) provided the best control of SDS, improving control by 41% compared to the control. On one field, the method of application significantly affected SDS suppression. Applications in 5 or 10 gallons/M were more effective than applications in 2.5 gallons/M, or 2.5 gallons/M and watered in with one-quarter inch of water. Therefore, in this study higher dilution rates led to better control of SDS. Syngenta's university sponsored research trials uncovered similar results. Increasing the spray dilution rate led to better control of dollar spot and brown patch on turfgrass maintained as a golf course fairway.

In the same SDS study, trends were noted regarding the most effective timing of fungicide applications on the control of SDS. Multiple applications were most effective and a single application made in August, September, or October was more effective than a one made in November. Fungicide applications were most effective when soil temperatures were between 60-80 degrees, prior to soil temperatures falling below 60 degrees, when bermudagrass root growth declines (Tredway and Butler, 2003). Based on these and other field trial data, a fungicide program should be used as one component to an integrated SDS management approach rather than as a silver bullet.

Biocontrol options are worth mentioning as an alternative approach to fighting SDS in the future. A bacterium was recently discovered that suppressed the growth of O. herpotricha in an Oklahoma State University laboratory. Applying bacterium as a soil drench has the potential for an effective component to an SDS management program. Research designed to test these bacterium on field plots started a couple of years ago, and the results will likely be available in the near future.

Breeding and the future research

According to turfgrass pathologists, bermudagrasses with good winter hardiness will better resist SDS. If feasible, selecting a more cold resistant variety of Bermudagrass like Midlawn, Midfield, Midiron, Mirage and Sundevil is recommended. Some common cold susceptible cultivars include Princess, Sonesta, Tifton 10, Sunturf, Tifway, Tifgreen, Tropica, and Oasis. Researchers are also focusing on specific pathogen-plant interactions in an attempt to breed for cultivars more directly resistant to the causal pathogens of SDS. The greatest limitation for turfgrass breeders remains the lack of a quick screening procedure. Five to six years are generally needed to gather meaningful results. Therefore, controlled studies have been initiated in parallel with breeding to determine specific plant genes that correspond to increased resistance to SDS.

SDS remains a devastating disease on bermudagrass turf in transition zone and specifically in the northernmost range of bermudagrass adaptation because of the variation in over-wintering weather conditions and different levels of bermudagrass resistance to cold. These factors largely dictate the extent of disease severity in the spring. Turf managers currently have more tools to fight the disease now compared to 5 years ago, but we still have a long way to go. Similar to fighting other tough to control diseases that affect turfgrasses, a multifaceted, integrated approach is essential. A program that uses every option including species selection, advantageous cultural practices, careful monitoring of environmental conditions, and both chemical and biocontrol options remains the current best defense used to fight SDS.

References:

Tredway, L.P. and E.L. Butler. 2003. Developing Effective Fungicide Programs for Spring Dead Spot Control. Turfgrass Trends. Dec. 1, 2003.

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Beat insects in 2006

By Daniel A. Potter

Sports turf managers need to maintain safe, attractive, playable athletic surfaces regardless of whether their fields serve recreational players or provide the competitive arena for varsity or professional-level athletes. While insects are rarely the first motivation for field management decisions, certain pests can be highly destructive when outbreaks occur. Biting or stinging insects can also be a hazard when they occur on or near playing fields. Use of insecticides in public areas, especially where children are present, is an increasingly volatile issue, requiring field managers to manage pests by means that are non-hazardous to players, bystanders, and the environment.

Fortunately the past 15 years saw the advent of new kinds of insecticides that work selectively against pest insects, are applied at low use rates, and pose low hazard to people and the environment. Many of these products are more versatile and effective than past ones. Let's look at current trends in turf insecticides and what may be on the horizon, and also some non-chemical control options for insect pests of sport fields.

Turf damaged by white grubs can be rolled back like a carpet. Photo by Daniel Potter.

Grubs and billbugs

Root-feeding white grubs are the most destructive insects to sport fields in the cool-season and transitional turfgrass zones. Damage from grubs causes turf to die in irregular patches that can be lifted or rolled back like a loose carpet. Grub damage is worst in late summer and autumn. Skunks and other varmints may dig up the turf to feast on the grubs. Masked chafer and Japanese beetle grubs are abundant throughout most of the eastern and central U.S. Asiatic garden beetle and Oriental beetle are troublesome in the Northeast, and European chafer grubs occur from the New England states west across New York to northern Ohio and southern Michigan.

Green June beetle grubs are abundant in the transitional climatic zone. They feed more on decaying organic matter than on living roots, but damage turf by burrowing, uprooting the grass, and pushing up mounds of soil. They commonly are associated with bermudagrass fields, sites with high organic matter, or areas where manure or other organic fertilizers have been used.

Registration of Merit (imidacloprid) and MACH 2 (halofenozide) revolutionized grub control during the 1990s, and recent (2005) registration of Arena (clothianidin) provided a third powerful product for preventive grub control. Residues of Merit, MACH 2, and Arena remain active for as long as 2-3 months, providing flexibility in application timing. All three products are available in granular and spray formulations.

Merit and Arena, which belong to a relatively new class of insecticides called chloronicotinyls, selectively disrupt the insect nervous system. MACH 2 mimics the action of the insect molting hormone, causing a premature lethal molt. All three therefore are target-selective, meaning that they have low inherent toxicity except to insects. They usually provide excellent (>90%) control when applied preventively, before egg hatch. Throughout most of the northern two-thirds of the U.S. the optimal treatment window for preventive grub control is mid-June to mid-July. That timing ensures that fresh residues are in the soil just before and during egg hatch, which for grub pests of sport fields mainly occurs in July and early August. Grub treatments should be watered in as soon as possible to move the residues into the root zone. All three preventive products are, however, relatively forgiving even if rainfall or irrigation is unavoidably delayed for a few days.

Preventive grub insecticides do have limitations. None of them works that well against large grubs, or as "rescue" treatments after damage appears. All three products are highly active against masked chafer and Japanese beetle grubs, the most common and widely distributed grub species. MACH 2 seems to be less effective than Merit or Arena against Asiatic garden beetle, European chafer, and green June beetle grubs, but it may be more active than the others against cutworms and other caterpillars.

The downside of preventive control is that the treatment must be made before the extent of infestation is known. Field managers who reserve preventive treatment for high-risk fields (ones having a history of grubs) or who prefer the "wait-and see" approach may have to spot-treat grub-damaged areas in late summer. Dylox (trichlorfon) is the most effective fast-acting soil insecticide for such curative or "rescue" situations. Water it in immediately (or apply just before a good rain if there is no irrigation) and keep people off the field for 24 hours after application. Insect-parasitic nematodes, specifically Heterorhabditis bacteriophora, are an option for non-chemical curative control of white grubs.

Avoid rescue treatment for large green June beetle grubs unless you plan for a cleanup. Grubs of that species die on the surface following such treatments!

Billbugs are small weevils (beetles) that lay eggs in turfgrass stems in spring. Their larvae hollow out the stem and crown, and later migrate to the thatch and soil to feed externally on the crown and roots. With heavy infestations, scattered small patches of dead turf resembling dollar spot disease, may merge into large areas of dead grass in June to August. With billbugs, tufts of straw-colored dead grass are easily pulled out by hand, the hollowed out stems breaking off at the crown and showing bits of fine sawdust-like frass at their base.

Merit, MACH 2, and Arena also work well against billbugs. They systemically control the young larvae within grass stems, as well as older ones in the soil. Applied at high label rate from mid-to-late May, they will preventively control billbugs with residues persisting long enough to control white grubs later in summer. Alternatively, billbugs can be controlled curatively using MACH 2 or Dylox in early June, or a pyrethroid (see below) can be applied in late April of early May to intercept female billbugs before they lay eggs in the stems. Consult turf specialists at your state university for proper timing in your area.

Mole cricket damage. Photo by Eileen Buss, University of Florida

Surface-feeding pests

Several caterpillar pests including sod webworms, cutworms, and fall armyworms can damage sport fields by chewing the grass blades and stems. Sod webworms and cutworms feed from burrows in the soil and thatch whereas fall armyworms cling to the grass plants while chewing them to the ground. Spot treating with a pyrethroid insecticide easily controls these pests. Options include Talstar (bifenthrin), Tempo (cyfluthrin), DeltaGard (deltamethrin), Scimitar (lambda-cyhalothrin), and Astro (permethrin). Pyrethroids work fast and are applied at very low rates. Remember this when comparing costs because the price per gallon seems high until you factor in cost per application. Pyrethroids also work well against chinch bugs and other sucking pests. They aren't effective against grubs because they bind to thatch and don't reach the root zone. Although pyrethroids have low toxicity to mammals and birds, some formulations are labeled as "Restricted Use" because they're toxic to fish. MACH 2 also will control turf caterpillars.

For turf caterpillars, liquid applications work better than granules because the objective is to leave residues on the foliage and upper thatch. Withhold irrigation and mowing for 24 hours after the application.

Conserve (Spinosad), a reduced-risk insecticide derived from a naturally occurring bacterium, is effective against turf-feeding caterpillars and an excellent choice for sites where use of conventional insecticides might be questioned. Steinernema carpocapsae, an insect-parasitic nematode, is another option for caterpillar control.

Mole crickets and fire ants

Mole crickets and fire ants are the most important insect pests of southern sport fields. Mole crickets cause extensive damage by tunneling just under the surface, physically uprooting and stressing the grass, leading to thinning and weed encroachment. They are especially damaging to newly seeded or sprigged fields. Tawny mole crickets also feed extensively on the roots, stems, and leaves. Heavily infested turf has almost no root system and is easily damaged by sport activities.

Tawny mole cricket. Photo by Eileen Buss, University of Florida.

Fire ants are a hazard and liability risk on Southern sport fields. Photo by B. Drees, Texas A & M University.

The red imported fire ant occurs throughout the southeastern United States. Like stepping on a biological land mine, disturbing a fire ant colony results in a rapid defensive response by worker ants that swarm up legs or other body parts to inflict numerous bites and stings. Fire ant stings cause an intense burning itch, pustule-like sores, and can be life threatening to persons allergic to the venom. Field managers can become entangled in lawsuits should athletes, spectators, or children at play inadvertently stand or fall on the mounds, which may be inconspicuous when during early stages of colony development. The mounds themselves smother grass and cause damage to mowing equipment.

A lot depends on budgets when managing these pests. TopChoice (fipronil) is the premier mole cricket and fire ant control product being used in the southern states. The cost is relatively high, about $180 to $220 per acre for one treatment, but a single broadcast application provides season-long control of both pests. Merit is less expensive and gives good control of mole crickets when applied before or at egg hatch (May to June, depending on latitude). It will simultaneously control white grubs, but has little or no efficacy against fire ants. Arena is in the same ballpark as Merit insofar as mole crickets and grubs, and may also have some activity on fire ants. Some field managers spray as-needed with a pyrethroid (e.g., Talstar) to knock back mole crickets and fire ants. Some recent trials suggest that Allectus, a new combination product containing the active ingredients in Merit and Talstar, may give better mole cricket control than either Al alone. For non-chemical control, try insect-parasitic nematodes, Steinernema scapterisci (Nematac S), targeting larger mole cricket nymphs and adults.

If fire ants are the main concern, baits are cheaper ($10 to 15 per acre, per treatment) and can provide seasonal suppression (e.g., for softball season in spring, football season in fall) with a single application, or sustained suppression with periodic re-treatments. Try the "Texas Two-Step" method (http://fireant.tamu.edu/). The first step is to broadcast a bait insecticide over the entire field. The second step is to spot-treat individual mounds with an approved mound drench, granule, bait, or dust insecticide. Baits containing fipronil (Firestar), Abamectin (Affirm), fenoxycarb (Logic, Award), and hydramethylnon (Amdro) are effective. Advion (indoxacarb) is the fastest-acting fire ant bait. It costs a bit more and provides no real residual effect, but is an excellent "rescue treatment" for use on sport fields.

Sound management reduces need for insecticides

Good turf management can reduce chemical inputs and costs. For grubs, use tolerant turf (e.g., turf-type tall fescue), manage thatch, mow at a reasonable height, and follow a balanced fertility regime to promote a deep, extensive root system with good recuperative potential. Consult your extension turf specialist for local recommendations. Night-flying adults of some insect pests (e.g., masked chafers, European chafers, mole crickets) are attracted to lights, so darkening fields when possible during their flight periods may pay dividends. Irrigated turf attracts adult Japanese beetles, masked chafers, and mole crickets, so cutting back on watering during the flights can discourage their egg laying. Tall fescue and perennial ryegrass cultivars that contain fungal endophytes resist billbugs, sod webworms, and chinch bugs. Overseeding with as little as 40% endophytic perennial rye can reduce populations of those pests, and their damage.

Insecticide labels change so read the label to ensure that a product is labeled for your purposes. For more information, the University of Kentucky Entomology Department website has up-to-date information on white grubs (http://www.ca.uky.edu/agc/pubs/ent/ent10/ent10.htm) and grub insecticides (http://www.uky.edu/Ag/Entomology/entfacts/trees/ef441.htm). The University of Florida Entomology and Nematology Department (http://entnemdept.ifas.ufl.edu/) is excellent on mole crickets, and Texas A&M University has a state-of-the-art website on fire ants (http://fireant.tamu.edu/).

Daniel A. Potter is Professor at the University of Kentucky. His book Destructive Turfgrass Insects: Biology, Diagnosis, and Control is available from Wiley (www.wiley.com) or Amazon (www.amazon.com). ■

Fire ant mound. Photo by Eileen Buss, University of Florida.

Sprayer calibration: get it right

By J. A. Borger and M. B. Naedel

Today, materials applied through sprayers are commonplace. There are many different types and styles of spraying equipment. All have a common theme. Materials are mixed with a carrier, most commonly water, and then evenly applied to a turfgrass site via the spray unit. The uniformity of the sprayed material is imperative. In order to minimize equipment error and maximize the uniformity of the materials being applied, the spray unit needs to be calibrated. Calibration can be quite unique to the spray unit and the turfgrass manager that is conducting the procedure. Following are some general guidelines for sprayer calibration:

First, check the obvious by looking for broken hoses, clogged nozzles, leaking tank, that the gauges are working, etc. Many of these observations can be done just by starting the sprayer, adding straight water, and spraying a small section of a parking lot or any impermeable surface.

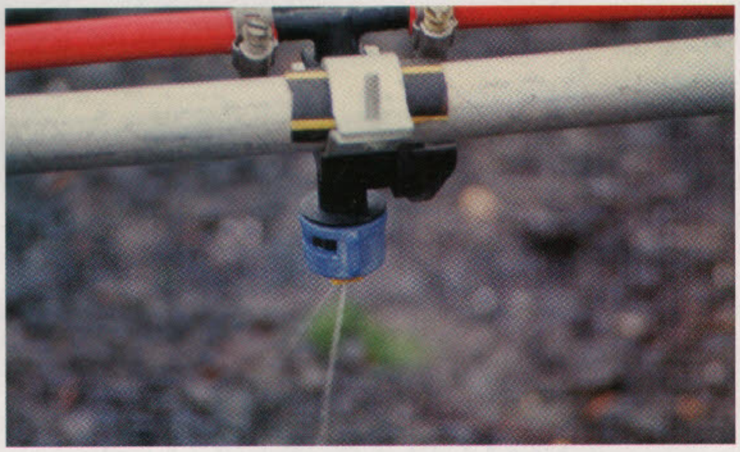
Once this test application has been made, let the spray unit sit at an idle (if it is motorized) with the water circulating in the tank and walk around the unit. This will allow for further examination of the equipment for leaking fluids. The actual sprayed area also serves a purpose. Watch the area dry because you can gain important information. This serves as a visual check of how uniformly the water has been applied. The water will evaporate eventually; if there is an area that has more water or less water than another it will dry slower or faster in comparison.

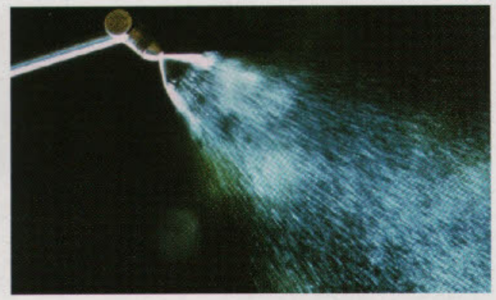
Streaking will be obvious when there are severe uniformity variations within the pattern. Correct this by checking the boom height, nozzle spacing, or replacing nozzles if needed. If there is little or no streaking, the spray unit passes the visual test of uniformity.

Next steps

Of course we're not done here. The calibration process is not complete. A simple question needs to be answered: "How much water does the sprayer apply to one acre?" Several items will be required: a stopwatch, measuring tapes (you may want to use two different tapes), a liquid measuring container, and a calculator. Your objective is to measure the volume of water applied to a known area over a given period of time (ATV–A = area, T = time, and V = volume). There are many ways to collect this information and the following is only one of them.

Define a calibration test area. Determine where the site is to be located and make several trial runs with the spray unit to be calibrated. A measuring tape should be used to find the distance (length) of the calibration test site, e.g., 100 feet. Once a workable distance is determined, again, make several trial runs with the spray unit applying water as if materials were being applied to a turfgrass area.





Measure the width of the application, e.g., 20 feet. The area can be calculated by multiplying the length by the width. In this example, length times width would be 100 feet X 20 feet = 2,000 square feet. The first variable of ATV, area (A), has now been defined.

To determine the second variable, time (T), make several additional trial runs over the same test area and time the procedure with a stopwatch. Make sure that the stopwatch is started and stopped at the beginning and end of the calibration test area. For this example, assume that it takes the spray unit 60 seconds, on average (of three or four trial runs), to travel from beginning to end of the designated calibration test area (T = 60 seconds).

The final variable to determine is V, the volume of water applied to the calibration test area. To accomplish this, activate the sprayer so that water is coming out of the nozzles, but the spray unit is not moving. Collect a volume of water from each nozzle on the boom for 60 seconds (the time elapsed to travel the calibration distance) at least three times each. Average the three volumes from each nozzle. There should not be more than a 10% difference (5% would even be better) between nozzles. If this limit is exceeded, replace the nozzle.

Once an average output of all the nozzles is determined (e.g., each nozzle average output is 49 ounces), multiply that by the number of nozzles (e.g., 12 nozzles) to determine the volume of water applied to the calibration test area. Therefore, for this example, 49 ounces X 12 nozzles = 588 ounces of water applied to the calibration test area.

Because the way to evaluate this application is in gallons per acre (GPA), a conversion from ounces to gallons is needed. In this example, 588 ounces divided by 128 ounces (128 oz in one gallon) = 4.59 gallons. The final variable has been determined: volume (V) = 4.59 gallons.

All of the information has now been collected to determine "How much water does the sprayer apply to one acre?" Now you need to perform a simple calculation. The known information is that the spray unit applies 4.59 gallons of water to 2,000 square feet. To determine the GPA of this spray unit a proportion is used. The GPA can be expressed in numerical form: gallons/acre (one acre equals 43,560 square feet). Similarly, the example volume and area can be arranged in numerical fashion: 4.59 gallons/2,000 square feet. Setting both of these equations equal to one another is a proportion that can determine the GPA of the spray unit (see figure at right).

$$\frac{4.59 \text{ gallons}}{2{,}000 \text{ sq.ft.}} = \frac{? \text{ gallons}}{43{,}560 \text{ sq.ft.}}$$

Solving for ?:

$$? \times 2{,}000 = 4.59 \times 43560$$

$$? = \frac{4.59 \times 43560}{2{,}000}$$

$$? = 99.97, \text{ or approximately } 100$$

This means that the spray unit is calibrated to deliver approximately 100 gallons of water per acre or 100 GPA. If a change in the GPA is desired several variables could be adjusted. The ground speed of the spray unit may be increased to lower the GPA. Nozzles with larger/smaller openings could be used to increase or decrease GPA. Finally, to some degree the pressure could be changed. Note that nozzle manufacturers have a recommended operating pressure range for maximum performance that should be followed.

After the calibration procedure has been completed, you'll have a better understand of the spray unit's performance. This will enable you to apply materials with accuracy. To ensure uniform material applications spray units should be calibrated before every application.

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John Mascaro's Photo Quiz

Can you identify this sports turf problem?

Problem: Brown Turf
Turfgrass Area: Stadium field
Location: Florida
Grass Variety: 419 Bermudagrass

Answer to John Mascaro's Photo Quiz on Page 45

John Mascaro is President of Turf-Tec International

1 Synthetic surface adhesive

This photo shows the seam for a synthetic turf football field being bonded with **NORDOT** adhesive. At bottom, adhesive is being spread on green seaming tape while up top the synthetic turf is being unfolded onto the adhesive-coated tape. The almost invisible seam runs down the middle of the tape after closing. While NORDOT is curing, its strength holds the turf seam securely regardless of weather conditions.

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For information, circle 065 or
see http://www.oners.ims.ca/5905-065

2 Preemergence control

ProClipse 65 WDG is a water-dispersible granule containing 65% prodiamine for selective preemergence control of 30 grassy and broadleaf weeds in turf and ornamentals. It offers low rate, season-long control with a non-staining active ingredient and greater application flexibility. It can be applied in either in the spring to control weeds throughout the growing season or in the fall for early spring control.

Nufarm Americas
For information, circle 067 or
see http://www.oners.ims.ca/5905-067