A PRACTICAL RESEARCH DIGEST FOR TURF MANAGERS

TURFGRASS TRENDS

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DISEASES

Disease Management:

It's not just fungicides!

By Monica L. Elliott, Ph.D.

I have one of the best family doctors in the country, and yet there are times when I want to take his perfectly knotted tie and, well, you get the picture. Why? Despite my puffy eyes, chills, runny nose and hacking cough, he will not give me an antibiotic to make the flu go away immediately. He says it is better just to go home, drink lots of fluids and get some bed rest, and then with a smug look, he reminds me that I refused to get a flu shot back in October.

Another time when we were discussing diet, he had the nerve to inform me that Tootsie Rolls, Twinkies and chocolate donuts are not part of the five basic food groups and could very well explain my increasing cholesterol level. And no, he wouldn't give me a drug to lower my cholesterol until I had met with the nutritionist about changing my diet. Alas, I can't argue with him. These are the same basic recommendations I give for turfgrass diseases.

Some diseases simply are not manageable with only fungicides. The root-rot patch diseases (take-all patch, summer patch, spring dead spot) are probably the best examples.

All too often a turf manager calls to inform me that their turf has been diagnosed with a specific disease. Their first and last question is always: what would be the best fungicide to apply? If only it was that easy!

Neither simple nor easy

While turfgrasses may be affected by diseases all year long, individual turfgrass diseases are prominent for only a few months each year, usually due to weather patterns and the resulting environmental effects. However, any stress (environmental or manmade) placed on turf will weaken the turf, and thus make it more susceptible to disease development.

There are four basic steps to disease management. First, the disease must be correctly identified. Second, the environmental conditions or management methods that are promoting infection and disease development must be determined. Third, identify the short-term management techniques that will alter or eliminate these conducive conditions or that will suppress the fungal pathogen while the disease is active. Fourth, (especially if this is a recurring disease problem), identify the long-term management techniques that can be implemented to prevent disease development or minimize the damage to the turfgrass from the disease.

An integrated management program that includes both chemical and cultural methods

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is the key to preventing and controlling turfgrass diseases. Fungicides are one part of a management system, not the management system for disease control.

Miracle fungicides — not!

I always look with dismay at a turfgrass manager who tells me that he or she does not worry about disease "X" because a couple applications of fungicide "Z" easily takes care of the problem. My follow-up questions to them include: But why do you have the disease problem in the first place? And, what will you do when that pathogen develops resistance to that particular fungicide?

Dollar spot disease caused by Sclerotinia homoeocarpa is an excellent example of how fungicide use influences pathogen populations and eventually fungicide choices. The number of fungicide active ingredients this fungus has become resistant to in the United States is astounding. Field resistance to three different chemical fungicide groups has been documented in the dollar spot fungus. These include the benzimidazole, dicarboximide and DMI (sterol inhibitor) fungicide groups. Note the emphasis is on groups, meaning, for example, that the fungus is considered to have developed resistance to not just one DMI fungicide but to all fungicides in the DMI group.

Development of fungicide-resistant pathogens is not a recent phenomenon. One can find reports concerning the dollar spot fungus dating back to the late 1960's. Furthermore, it is not a natural phenomenon, but a man-made phenomenon directly related to fungicide applications.

An excellent study out of Canada reaffirms that the dollar spot fungus is not naturally resistant to the DMI fungicides, but that the extensive use of such fungicides has induced this resistance. Until recently (fall 1994), DMI fungicides were not registered in Canada for use on turfgrass. The research team collected 435 Sclerotinia homoeocarpa isolates from diseased turfgrass in Ontario during the summer of 1994, just prior to the legal use of DMI fungicides. Except for one population, which just happened to be near the U.S. border, the Canadian isolates were all very sensitive to DMI fungicides. Hopefully, the Canadian golf course superintendents will learn from the U.S. situation that the importance of cultural management should not be overlooked as part of a dollar spot control program.

Any practice that reduces disease pressure will also reduce the amount of fungicides required.

Another situation that concerns me are the phone calls from turfgrass managers indicating they have been applying fungicide "X" routinely, and yet they still have a disease problem. The disease observed usually turns out to be one that is not controlled by fungicide "X". This phenomenon occurred with the release of Heritage fungicide, which is a fungicide in the strobilurin chemical group. This fungicide is unusual because it does control a much wider range of fungi than most systemic fungicides. For example, it suppresses diseases caused by both Pythium and Rhizoctonia. However, Heritage has no effect on the dollar spot fungus. In some studies, it even appeared to increase dollar spot disease.

The point is that if you are going to use fungicides as part of a preventive program, it is imperative to know exactly which diseases you are trying to control. After all protecting the turfgrass from one disease, only to see it die from another disease does not encourage good customer or membership relationships!

Growth regulation effects

Furthermore, instead of preventing diseases, fungicides can promote disease problems or turfgrass injury.

CORRECTION

Last month's article on the FQPA by Dr. David Gardner mistakenly noted that the product Cyproconazole was sold to Bayer. In fact, Syngenta still retains the use of it for coffee bean production.

For example, the use of DMI fungicides are not recommended on Bermudagrass turf for disease control because of the negative growth-regulating effect they may have on the turf, especially with repeated applications. In a study on hybrid Bermudagrass in southern Florida, we made a total of three fungicide applications applied on 28-day intervals, beginning in late April of 1992 and again in 1993. Eight different DMI fungicides, five registered products and three experimental products, were evaluated.

Cyproconazole (Sentinel), bromuconazole (experimental), myclobutanil (Eagle), propiconazole (Banner) and triadimefon (Bayleton) significantly decreased turfgrass quality compared with the control (water only) in the study.

In both years, the negative effect often did not appear until some other stress was placed on the turfgrass. In other words, the Bermudagrass initially appeared to be unaffected by the fungicide applications. Then, for example, we would have a tropical storm pass through the region, resulting not only in ample rainfall but also in very low light intensity for five to seven days.

The Bermudagrass plots that had not received any DMI fungicide treatments (the control) recovered from this stress, but the DMI-treated plots did not. This negative impact from the fungicides can be compounded if they are being used in combination with triazole plant growth regulators, as DMI fungicides are also triazole chemicals.

Tough diseases

Some diseases simply are not manageable with only fungicides. The root-rot patch diseases (ex: take-all patch, summer patch, spring dead spot) are probably the best examples. This group of diseases also illustrates an example of when disease suppression with a fungicide only occurs if the fungicides are applied preventively, prior to any disease symptoms, and not curatively, after disease symptoms are observed.

The recurring theme in discussions by pathologists on these diseases is while many fungicides may reduce the severity of the disease, the level of control by any particular fungicide seems to vary from year to year. Plus, even though disease control may be better with a fungicide than without a fungicide, the level of control is often commercially unacceptable.

So, despite a fungicide application, you may still lose your job or the account! Remember, just because a fungicide label has a disease listed on its label does not mean that you will observe control.

Never assume that there is independent research data from your area that backs up the information on the pesticide label. That is not the case at all. Check with your local university turfgrass research or extension pathologist to determine if they have evaluated these products and what their results were.

Never assume that there is independent research data from your area that backs up the information on the pesticide label. That is not the case at all.

Let's examine spring dead spot disease on Bermudagrass more closely to determine why fungicides may not be effective.

This is a disease that is caused by not just one fungal species, but by three or four fungal species. The majority of the species belong to the fungal genus Ophiosphaerella. They also share some common biological characteristics. One is that these root-infecting fungi are most active at temperatures that severely inhibit Bermudagrass root growth, around 60°F. Plants that are infected by these fungi in the fall are going to be more sensitive to cold damage. Thus, when the temperatures increase in the spring to normal Bermudagrass growing temperatures, the plants infected in the fall that were killed in the winter by cold damage never green-up, leaving the ugly dead patches characteristic of the disease.

Obviously, applying a fungicide in the spring will have no effect. A dead plant will not be revived by a fungicide. Therefore, a fungicide will need to be applied in the fall. But, when will you apply it? Since the fungicides that may be useful are systemic, the Bermudagrass must still be actively growing when the fungicide is applied in order for the fungicide to be absorbed into the plant.

However, if you apply the fungicide too early in the fall, there may not be enough material left in the plant roots to inhibit the fungus. Why? The Bermudagrass plant is still growing, so the material becomes diluted in the new growth. Since precise long-term weather is extremely difficult to forecast, fall fungicide applications are difficult to time correctly.

Therefore, pathologists highly recommend the use of cultural practices to manage this disease, rather than relying on fungicides. Similar statements apply to other diseases that occur in the winter months, such as snow molds or Fusarium patch.

Fungicides suppress fungal growth

You already knew that fungicides suppress fungal growth, right? But, all too often turfgrass managers take this statement one step further to add "and then the turfgrass will recover." The last statement is often only partially true. The turfgrass will recover only if it is growing!

What will you do when that pathogen develops resistance to that particular fungicide?

A problem I often observe relates to Rhizoctonia blight (brown patch) on St. Augustinegrass, a disease that occurs in late fall through early spring. This would be the problem scenario. The disease occurs on a lawn in the fall, as the temperatures start to decrease. An appropriate fungicide is applied. However, within a week, the temperatures drop even further and stay at a level that does not permit growth of the St. Augustinegrass. The patch symptoms remain throughout the rest of the winter and into spring.

Did the fungicide work? Yes, I am sure it did. Is the grass dead? No. Why are the symptoms still present? The grass was not growing due to the cold weather, so the symptomatic leaves are left in place until new growth occurs.

This will be true for all leaf diseases — no recovery without turfgrass growth, even after a fungicide is applied.

Overusing fungicides

Another conversation that is common with golf course superintendents concerns the number of fungicide applications that have been made. They applied "A" fungicide on Monday, and then, since there was no response by Wednesday, they applied "B" fungicide. Today is Friday and they have just applied "C" fungicide. Their question is what should they do next? I really, really, really want to say "pray that the grass doesn't die" or "what in the !@#$% were you thinking." Instead, I ask what disease are they trying to control. Then, if they have applied one of the appropriate fungicides, we discuss what is the appropriate interval between fungicide applications.

I am sure that do know this information already, but simply are not thinking clearly when faced with a disease crisis. While we have become a society that demands instant action, turfgrass managers need to remember that Mother Nature is still an essential component of the turfgrass system.

Summary

I do not want to leave you with the impression that fungicides have no place in turfgrass disease management. That is not my intent. I do want to impress upon you that fungicides are only one part of a management program.

Applications of fungicides should be made after a thoughtful analysis of the disease problem. They should not be applied simply for the sake of doing something that looks good to the client or membership. When they don't resolve the problem, those same people are going to ask what did you do wrong or why did you waste their money.

Because turfgrass is in the public spotlight, it is imperative that the industry use pesticides efficiently, effectively, and safely.

— Dr. Monica Elliott is Associate Professor of Plant Pathology at the University of Florida's Fort Lauderdale Research and Education Center. She received her M.S. and Ph.D. at Montana State University. Her primary research interests are soil-borne plant pathogens and soil/root bacteriology.

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Interseeding: A New Approach

By Kevin E. Kenworthy and M.C. Engelke, Ph.D.

Since its release almost 50 years ago, Penncross creeping bentgrass (Agrostis palustris) has been the dominant cultivar planted on golf course putting greens.

As popularity for the game of golf has increased, so have the demands placed on golf course superintendents to provide superior putting surfaces. These demands prompted the use of Penncross in areas where creeping bentgrass is marginally adapted. The environmental stresses present in these areas often lead to a severe decline in turf quality of Penncross.

Over the last decade, many new cultivars of creeping bentgrass have been released which are more tolerant of environmental stresses than Penncross. Many of these grasses exhibit improved heat tolerance, higher shoot density, finer texture, more vigorous root and shoot growth, and can tolerate lower mowing heights. With the improvements in turf quality that can be achieved, many golf course superintendents are interested in converting to one of the improved cultivars of creeping bentgrass.

Over the last decade, many new cultivars of creeping bentgrass have been released which are more tolerant of environmental stresses than Penncross.

Conversion of greens by means of a complete renovation is costly and leads to a significant loss of play while the new greens establish. Therefore, many superintendents resort to interseeding, which is a process in which the desirable cultivar is seeded into the existing cultivar.

Figure 1. Drop spreader for mechanical distribution and surface application of seed.

The goal is that, over time, the newly planted creeping bentgrass will become the dominant variety on the green. Achieving this can be very difficult, because young germinating seedlings are not competitive against the established grass for sunlight, nutrients and moisture. Also, current methods that are effective at moving the seed through the existing turfgrass canopy to achieve seed to soil contact are disruptive to the turf surface. This leads to a decrease in putting quality that may result in less play causing a loss in revenue.

How interseeding works

Current interseeding practices include broadcast seeding (Figure 1), verticutting prior to broadcast seeding and the use of "jobsaver" tines prior to broadcast seeding.

Topdressing is typically applied in conjunction with these methods. Primo (trinexepac-ethyl) may be used as well to further

Figure 2. Seed captured from the fan nozzles of the Envirojet.

suppress the competitive advantage of the established cultivar. Bowman (1998) reports that by using a combination of jobsaver tines plus Primo, 21% of a Penncross putting surface was converted to Penn A-4.

Jobsaver tines alone led to a conversion of 16% while simply broadcasting seed resulted in a conversion of almost 14%. Clearly, the methods that are disruptive to the turf surface are more effective because the seed is moved through the turfgrass canopy onto the soil surface.

Therefore the question remains, is it possible to efficiently convert a Penncross green to a new cultivar without being disruptive to the turf surface? Rossi (1999) states, "There is no known easy, nondisruptive way to establish new cultivars on old greens."

The objective was to determine if use of an Envirojet using high-pressure injection (HPI) might allow for a nondisruptive means of placing seed beneath the turfgrass canopy.

The Envirojet is a sub-surface injection machine that may be used for aerification or injection of fertilizers and pesticides. It allows for adjustment of injection depth and distance between injection periods. This is accomplished through the use of different accumulators. The large accumulator (62 in3) injects to a depth of five inches. and distances between injections vary from five to 9.5 inches depending on the speed of travel.

The smallest accumulator (6 in3) injects to a depth of approximately one inch. Distances between injections vary from one to two inches depending on the speed of travel.

The objectives for this project were to determine:

- **Will creeping bentgrass seed pass through the pump and nozzles? (physical size)**

- **Will the seed remain viable after injection? (mechanical damage to seed)**

- **Will surface disruption of putting surfaces occur, reducing playability?**

- **Will seed germinate on a green and how deep are the seed injected?**

Note that the focus was to determine if this method is a feasible method of interseeding, not to compare it to other methods of interseeding.

The 6 in3 accumulator was used along with fan nozzles to provide uniform placement of seed. The Envirojet was calibrated to apply 20 gallons of water per 1000 square feet. One pound of Crenshaw creeping bentgrass was added to the tank per 20 gallons of water. Two passes were made over an area to provide a seeding rate of two pounds per 1000 square feet.

A major concern was the degree of damage, if any, caused to the injected seed.

Project results

We answered the questions raised as objectives for the project as follows:

WILL SEED PASS THROUGH THE PLUMBING OF THE ENVIROJET?

The Envirojet ran stationary for a few seconds with a geotextile fabric placed under the nozzles to capture emitted seed. Figure 2 shows the amount of seed that was able to pass through the machine.

WILL THE SEED REMAIN VIABLE?

A major concern was the degree of damage, if any caused to the injected seed. The geotextile fabric used to capture the seed was placed on a misting bench in a greenhouse to determine percent germination. Samples taken from the geotextile fabric gave an average germination rate of 61% (Figure 3). Under normal conditions creeping bentgrass should germinate at a minimum rate of 85%. Therefore, it appears some seed was damaged during injection. However, we feel that a germination rate of 61% was acceptable and justifies the use of a high seeding rate.

WILL SURFACE DISRUPTION OF PUTTING SURFACES OCCUR?

The high-pressure injection of water using the fan nozzles does not lead to any soil displacement. Seed is projected through the turf canopy into the thatch/soil interface with minimal surface disruption. The existing thatch and mat layers act as a stabilizer as well as holding moisture levels near the seed at a more optimum level for germination with only a modest increase in irrigation. On a bare soil surface significant soil displacement will occur and therefore, this is not recommended for new plantings.

Therefore, the question remains: is it possible to efficiently convert a Penncross green to a new cultivar without being disruptive to the turf surface?

Figure 4 shows the resulting pattern following injection. The watermarks disappear as the turf surface dries. The injection process had only a minimal impact on turf quality or playability.

WILL SEED GERMINATE ON A PUTTING GREEN AND WHAT IS THE DEPTH OF SEED PLACEMENT?

Initially seed was injected into a green with a thin stand of creeping bentgrass to determine if germinating seedlings could be located. We saw the presence of germinated seedlings in thin areas on the green.

Seed was then injected into an area of a creeping bentgrass green that had previously been killed. This allowed for an easy assessment of germination and subsequent plant densities. Figures 5a and 5b show the excellent germination rates and plant densities achieved using the Envirojet.

Depth of seed placement was determined by excavating soil from areas where seed was injected and placing that soil in petri dishes for germination. Soil was excavated at $^{1}/_{8}$-in. increments to a depth of $^{3}/_{4}$-in. No seed germinated in petri dishes containing soil from depths lower than $^{1}/_{8}$-in.

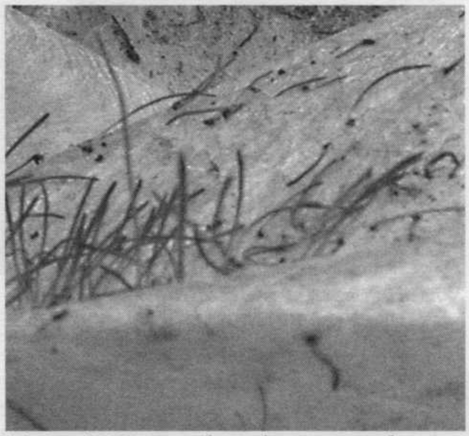

Figure 3. Captured seed germinated on cheese cloth to check mechanical damage of viable seed.

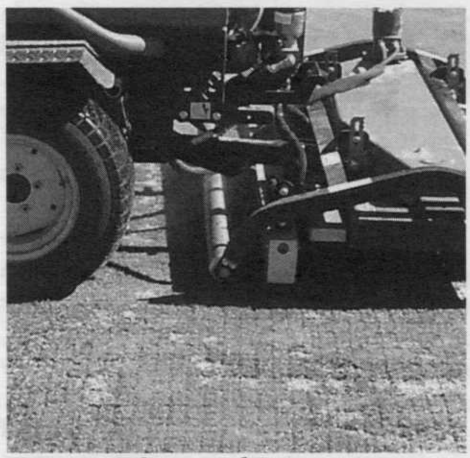

Figure 4. Side view of Envirojet inserting seed into weak and damaged turf.

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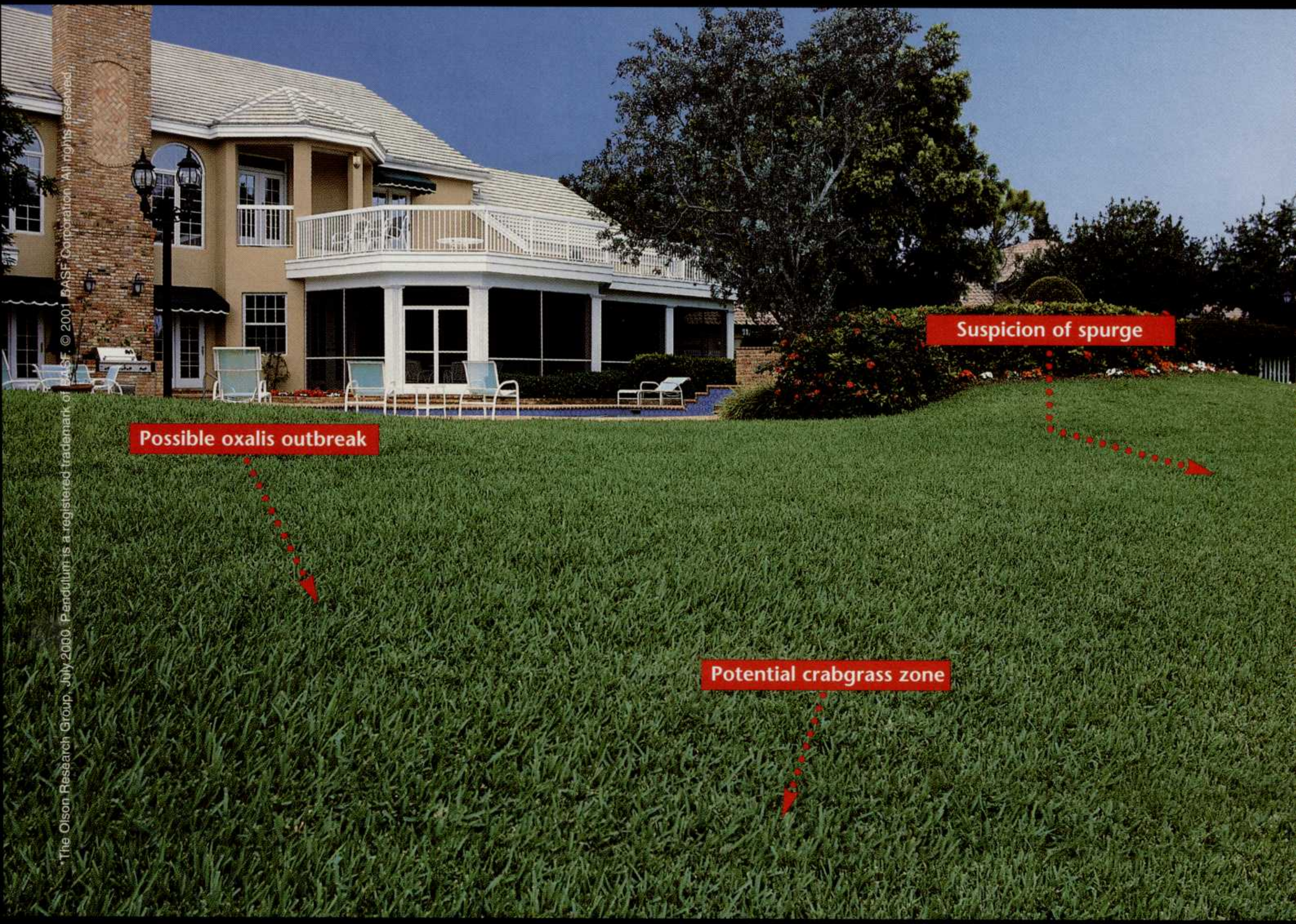

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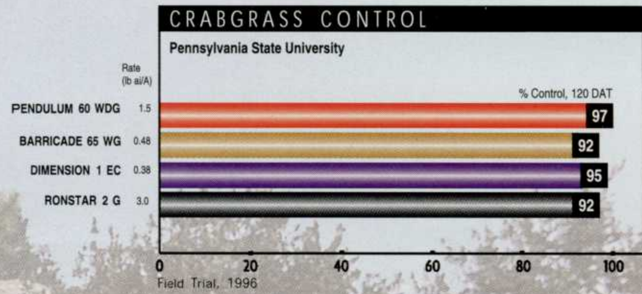

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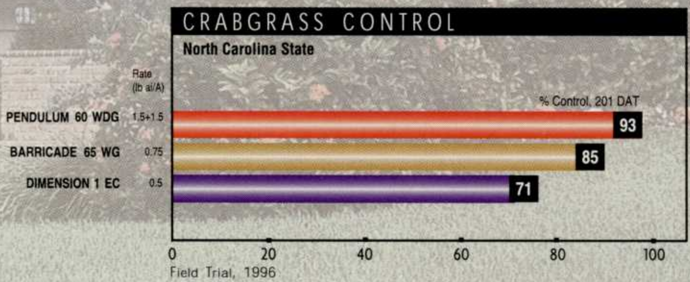

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Figure 5a. Germinating seedling one week following HPI seeding.

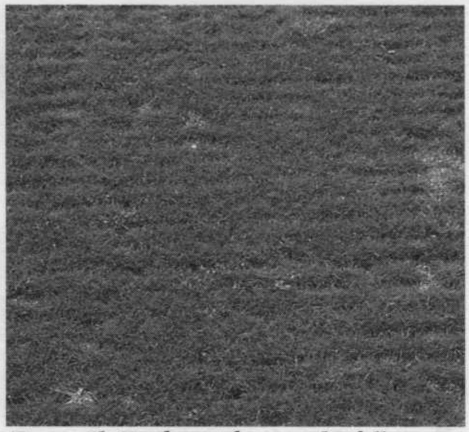

Figure 5b. Turf area four weeks following planting with HPI.

This indicates that no seed was injected deeper than $^1/_8$-in. This is an ideal depth for creeping bentgrass germination.

Conclusions

- Seed can easily pass through the Envirojet. Use of a wetting agent did not increase the amount of seed being injected.
- The majority of the seed remains viable after injection.
- Seed is effectively placed beneath the turfgrass canopy but not injected to a depth that would prevent germination.
- The Envirojet is not disruptive to the turf surface.
- Playability of the green is not reduced.
- More research is required to determine the percent conversion from the established cultivar to the one being injected. However, preliminary data indicate the Envirojet provides a non-disruptive effective means of interseeding.

Kevin Kenworthy is a former research associate under Dr. Milt Engelke. Currently, he is an Instructor of Horticulture at Tarleton State University in Stephenville, TX. Kenworthy also serves as Director of the Golf Course Management Program there.

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Future of Green Speed

What are your options?

By Douglas Linde

If you have ever watched golf footage from the 1960s it's obvious that the greens look slow—at least according to today's standards.

Since the1960s, cutting heights have dropped from 3/16 inch to 1/8 inch and speeds have doubled. As a result, maintenance budgets have ballooned, cupping area has decreased and some greens have become unplayable. In fact, today's speeds are significantly changing green design and architecture.

Putting surfaces are larger, flatter and smoother. Slopes of new greens today average 1% to 3%, whereas slopes of greens built during the early 1900s averaged 5% to 8%. Placing a hole on a slope greater than 3% at today's green speeds would make putting ridiculously difficult. Many older U.S. courses have discovered that their undulating greens become treacherous to play when maintained at high speeds.

As a golfer, I can appreciate the challenge of fast, sloping greens. As a turf manager, I have mixed feelings concerning fast putting greens—especially when speed is increased by lower mowing.

As a golfer, I can appreciate the challenge of fast, sloping greens. As a turf manager, I have mixed feelings concerning fast putting greens.

Maintenance headache

Simply put, as turf is mowed lower, maintenance increases. This applies to turf in any situation—golf course, athletic field, lawn. Less leaf tissue results in less photosynthesis, less evapotranspiration, less carbohydrate production, and shallower roots. These reductions lead to less heat, cold, drought, and wear tolerance, which lead to more core cultivation, topdressing, hand watering, pesticides, mowing, labor, etc.

For superintendents, lower mowing translates into more sleepless nights in July; for the equipment and chemical industry, lower mowing means more revenue. For the golfer, lower mowing means higher fees or membership costs. I commend the USGA and other golf organizations for studying ways to make golf more affordable. One area to consider is cutting height.

Will this trend continue? Or will cutting heights and green speeds stabilize over the next decade?

It's hard to tell, but I believe the economy will have a significant influence. An economic downturn that decreases rounds played will cause courses to find ways to cut costs. We may start seeing budget cuts in 2001 along the Eastern U.S., since many courses in that region reported a decrease in number of rounds played in 2000.

If the economy heats-up again, budgets will continue to skyrocket. Green speeds of 14 feet and hand-mowed fairways may become common.

The golf organizations that set up professional golf tournaments typically set the standard for course conditions because so many other courses try to mimic those tournament conditions for their everyday play. Green speeds of 12 feet, firm, uniform bunker sand, and uniform rough have become common tournament conditions.

Your best strategy

What can you do as a superintendent? One strategy is to fight for higher heights by using basic plant physiology and economics. Explain and demonstrate to the greens committee or owner the economic consequences of lower mowing. Do some number crunching to estimate the increased cost of shorter grass.

Years ago, the superintendent set the course conditions. Today, members, owners, and golfers have a larger role. Of course, *What can you do as a superintendent? One strategy is to fight for higher heights by using basic plant physiology and economics.*

they have the final say on conditions, but by educating them in this area you may receive some sympathy when some grass dies during the dog days of summer or when the budget gets out of control.

Also, you may suggest to your members other ways to make their course more difficult besides super slick greens. For example, Scott Anderson, Superintendent at Huntingdon Valley C.C., Huntingdon Valley, PA, encourages grain on his bentgrass/Poa annua greens. The grain adds another factor for the golfer to consider.

Or, how about making the rough actually rough and non-uniform, or making bunkers more penal by changing to a more uniform sand that doesn't pack well? Ever consider keeping greens dry and firm?

Don't forget to consult your greens committee or owner before making any changes.

New turf alternatives

You could look for new grass varieties, equipment or practices that will maintain green speeds without lowering the mower. For example, the new ultradwarf bermudagrasses provide a surface as firm and fast as bentgrass. That's good news for transition zone courses. The new bentgrass varieties are better adapted to a 1/8-inch cutting height, but they will not necessarily decrease your budget because many require additional aeration and topdressing to control thatch.

Lightweight rollers have been proven effective for increasing green speed without mowing lower. Topdressing, lower fertility, walk-behind mowers, and drier greens are other ways to increase speed without lowering the mower, however each practice has some potential labor and cost increase side effects.

The Alka-Seltzer® solution

A final option you have is to stock-up on antacids and rise to the challenge of maintaining super-slick greens all year by lowering the mower. But you still should explain how lower mowing affects plant physiology and economics just in case Mother Nature decides to show who's in charge.

Whatever the future brings for green speed you can guarantee that superintendents will need to adjust their maintenance practices to accommodate. Understanding the consequences of lower mowing and clearly communicating them to your greens committee or owner could save your job.

In 2020, when you're watching footage from today, I wonder what comments you'll have about today's greens ... will Johnny Miller be quoting speeds of 10, 15 or 20 feet?

Douglas T. Linde, Ph.D., is an assistant professor of agronomy and heads the turf management program at Delaware Valley College, Doylestown, PA. When not teaching, consulting or conducting research, he can be found coaching the college's NCAA golf team.

Preventing Summer Dormancy

of cool-season grasses

By Doug Linde

What if you stop eating food for a few days? Your body begins using its stored carbohydrates—also known as fat. As these reserves are depleted, you become weak and more susceptible to illness. There is a similar relationship within the cool-season grass plant.

As temperatures get into the high 80s, photosynthesis by cool season grass slows and fewer carbohydrates are produced. Eventually, carbohydrate use from respiration can exceed production. During this period plants rely on stored carbohydrates to remain alive. Even though the plant is dormant and its leaves are void of chlorophyll, the plant continues to respire. If it doesn't respire, it's dead. As the stored carbohydrates become depleted, the plant becomes more susceptible to disease and climatic stresses.

Understanding basic plant physiology is critical in preventing summer dormancy. Although irrigation is a major component in dormancy prevention there are other practices that can improve the plant's ability to avoid, survive and recover from dormancy.

Carbohydrate production lag

Kansas State University researchers studying bentgrass have found that the respiration rate actually increases as soil temperature increases. Combine this with the natural reduction in photosynthesis during high temperatures and it results in a condition in which carbohydrates are used faster than they can be produced. This is a main reason for summer bentgrass decline.

They also determined that by raising the cutting height, the gap between carbohydrate production and consumption becomes smaller.

Summer dormancy is a survival mechanism of cool season turfgrasses. These grasses will enter dormancy when exposed to extended heat and moisture stress. Processes significantly slow and growth ceases but the plant remains alive. Letting cool season grasses fall into dormancy is not an option for many turf managers.

Most U.S. golfers demand green playing surfaces and extended dormancy can lead to plant death—although 1999 in the Northeast proved that grasses can be highly resilient even after an extended summer dormancy period. I was surprised how well grasses recovered, even those straw-brown areas in the rough that were battered by cart traffic.

Know plant physiology

Understanding basic plant physiology is critical in preventing summer dormancy. Although irrigation is a major component in dormancy prevention there are other practices that can improve the plant's ability to avoid, survive and recover from dormancy. Most of these practices must be implemented before the summer stress period. Some managers refer to these practices as pre-stress conditioning.

1. RAISE THE MOWER. Higher mowed turf results in a deeper and more dense root system.

2. **Irrigate deeply and infrequently** – This irrigation regime improves rooting and causes other morphological alterations that improve drought tolerance. Jack Fry from Kansas State University recommends "drawing-out the irrigations as far as possible without affecting quality of the putting surface". Mildly stressing turf between irrigations will slow shoot growth and promote root growth. Also, irrigate sparingly in the spring to force roots deeper before high temperature stress periods of summer. However, during high temperature stress periods make sure adequate soil moisture is available for transpiration cooling.

3. **Avoid N applications in spring or summer that produce rapid shoot growth.** Plants burn carbohydrates for shoot growth. Root growth is sacrificed during periods of rapid shoot growth.

4. **Establish species or varieties that are more heat and drought tolerant.** For example, Crenshaw bentgrass is more heat tolerant than Penncross bentgrass. Tall fescue is more drought tolerant than Kentucky bluegrass and perennial ryegrass.

5. **Encourage root growth** – Do everything you can to improve rooting throughout the year. A deeper, more extensive root system improves drought tolerance and the plant can extract water from a larger volume of soil. Core cultivation increases soil pore space in which roots can grow.

6. **Cool the soil** – Forcing cool air into drain lines of a putting green. This is gaining popularity—especially for greens that historically have problems during summer.

7. **Cool the turf** – Syringing and air movement cool the turf by evaporation.

8. **Limit traffic** – Spread traffic wear. Keep carts on paths or in roughs only.

Douglas T. Linde, Ph.D., is an assistant professor of agronomy and heads the turf management program at Delaware Valley College, Doylestown, PA. When not teaching, consulting or conducting research, he can be found coaching the college's NCAA golf team.

Documenting employee issues:

A shield or self-inflicted wound?

By Richard I. Lehr

It is good to document employment decisions, but at times, problems become more significant because they're documented. Here are several ways to make documentation work for you:

1. DOCUMENT FACTS, NOT OPINIONS. Speak opinions to others, but document facts only. A third party should be able to review your documentation and read what happened.

2. BREVITY IS BEAUTIFUL: Put down the pen. A manager often does not know when to stop writing. Generally, the documentation should not be longer than a page. Often, only a few paragraphs are needed.

Documentation of employment matters is a significant part of business today.

3. KEY COMPONENTS OF THE DOCUMENT:

a. **Date it** on the date you prepare it, not the date the incident arose.

b. **If the document reflects discipline**, provide the employee with a copy. It is the employee's road map to improved performance. The employee needs a copy of it to improve, not the employee's personnel file.

c. **State what occurred,** other related disciplinary matters, the action taken now, what the employee says he or she will do to improve and when, and the consequences. State what the employee will do so the problem does not arise again.

d. **Invite the employee to respond** if the employee disagrees or believes that something has been left out.

4. SHOULD YOU ASK THE EMPLOYEE TO SIGN THE DOCUMENT? Employers are concerned that if the employee does not sign, the employee will deny ever receiving a document. Have the one who prepared and reviewed it with the employee sign it.

5. DOCUMENT COACHING. Not all coaching sessions result in discipline, but the manager should make a record of the coaching either your own file or on your calendar, with a brief sentence or two.

6. DO EMPLOYEES HAVE THE RIGHT TO SEE THEIR FILES? Some states allow employees the right to review their personnel file and receive copies of documents. Review the file first and remove confidential memos, investigation notes, administrative charges and any correspondence from counsel. Also, give employees copies of documents they should have received, such as disciplinary actions or performance appraisals.

7. MAKING DECISIONS WITH NO DOCUMENTATION. Sometimes an employment decision (such as termination) needs to be made that is inconsistent with the documentation or performance appraisal. Prepare a memo stating the facts, which can help establish the documentation necessary.

8. DOCUMENT GOOD PERFORMANCE. Do not be reluctant to document the employee's efforts and express the hope that the employee will continue with a high level of service, performance, etc.

9. SEEK INPUT FROM HUMAN RESOURCES regarding documentation. Asking for someone else to review your documentation can help you become more comfortable with it.

10. REMEMBER DOCUMENTS' PURPOSE. Employers do not document just for legal protection; they document primarily because it is effective for teaching employees to improve.

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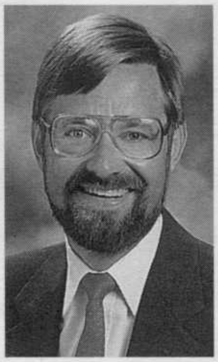
Whatever you do, don't scratch

By Curt Harler/Managing Editor



Curt Harler
Managing Editor

If you're like me, just reading the words "poison ivy" makes you itch. But poison ivy's rashes, blisters and infamous itch are really caused by urushiol ("oo-roo-shee-ohl"), a chemical in the poison ivy plants' sap. Since urushiol is found inside the plant, brushing against an intact plant will not cause a reaction, experts say. However, an intact ivy plant is rare.

The urushiol can also reach your skin indirectly when you touch clothing, boots, tools, pets or anything it comes in contact with.

Quick action is required when contact is made because urushiol penetrates skin in minutes. "The earlier you cleanse the skin, the greater the chance that you can remove the urushiol before it gets attached to the skin," says Hon-Sum Ko, MD, an allergist and immunologist with FDA's Center for Drug Evaluation and Research. Cleansing may not stop the initial outbreak of the rash if more than 10 minutes has elapsed, but it can prevent further spread.

After you have been exposed to poison ivy, take these steps immediately:

1. Cleanse exposed skin with lots of isopropyl (rubbing) alcohol, says William L. Epstein, MD, professor of dermatology, University of California, San Francisco. Don't return to the woods the same day. Alcohol removes your skin's protection along with the urushiol and any new contact will cause the urushiol to penetrate twice as fast.

2. Wash skin with water.

3. Later, take a shower with soap and warm water. Don't use soap before this point because "soap will tend to pick up some of the urushiol from the surface of the skin and move it around," says Epstein.

4. Clothes, shoes, tools and anything else that may have been in contact with the urushiol should be wiped off with alcohol and water. Be sure to wear gloves when doing this. Then, discard the gloves.

If affected areas are not cared for quickly, redness and swelling will appear in 12 to 48 hours. Eventually, the rash clears up without treatment. However, blisters and itching will follow. Since the rash and blisters don't contain urushiol, they aren't contagious. The rash, blisters and itch disappear in 14 to 20 days without treatment.

The only way to prevent poison ivy is to avoid contact with the plant resin and anything that has come in contact with it.

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