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THE LEADER. SINCE 1961.

Continued from page 20

"I participated in the project to get experience in aspects of the job I wouldn't have gained otherwise," Schneider says. "I didn't have experience building greens."

The construction of the chipping green didn't disrupt play. With the size of the crew, Dye knew the project wouldn't take

long. Barstow and Sell did much of the prep work. "On paper, the project sounded more daunting than it really was," Schneider says. "Even though I left the industry, I still wanted to help."

"It was easy to work with superintendent Barstow, who made the project a real pleasure," Sell says.

Sell, inspired by time lapse videos made popular with GoPros, borrowed a trail camera, mounted it and took pictures of the site every 15 minutes. He created a video with the pictures and music. It can be viewed at [youtube.com/watch?v=cr84Tsm3Uuo](http://youtube.com/watch?v=cr84Tsm3Uuo).

### Valuable experience

For Sell, it's important that assistants are getting experience they normally wouldn't gain in their jobs. That's one of the benefits of being on the assistants committee, providing those types of opportunities.

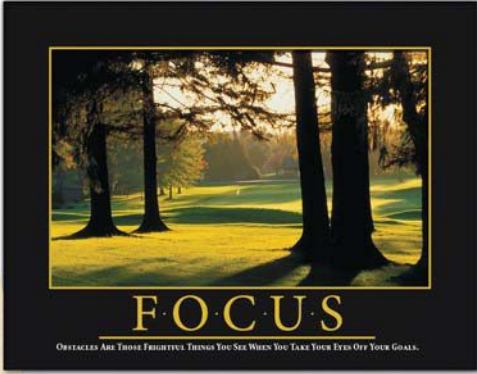
Sell says many local GCSAA chapters don't have assistant committees that can involve assistants or connect them to projects in which they can learn. He says there are a steady number of assistants who are members of the WGCSA, but the assistants committee is trying to grow that number by getting the word out.

"The education session is our signature event in the winter," he says. "We're trying to get that off the ground and focus on building our team."

Various economic forces influence assistants to become more long term in their position, so being part of the assistants committee results in valuable experiences that connect them to more people in the industry. Sell acknowledges that because of the economy and the lack of new golf courses being developed, many assistants don't have opportunities to move up and become superintendents as soon as they might like.

But, more than anything, Sell feels it's important to give back to the community and help grow the game. "I really wanted to do something educational for the assistants, while also doing something for the community. There are small groups out there that think golf courses don't do anything good, (they) just take their clean water and put chemicals in it. It meant a lot to do something to give back to the community."

"We haven't had a chance to use it," says Dye, who retired Dec. 16. "The green grew in in the fall, so we're chomping at the bit to set up a chipping challenge for the kids." ©




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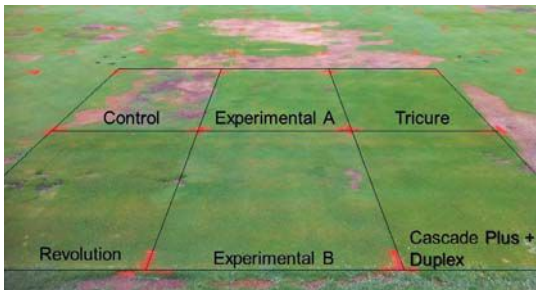
// **WET WORKS**

## WETTING AGENT PROGRAM AND IRRIGATION EFFECTS ON PUTTING GREEN PERFORMANCE

Ethan Charles

**G**olf course superintendents often use wetting agents and weather station data to conserve water. Irrigating based on evapotranspiration (ET) losses will help ensure an appropriate amount of water is available to maintain visual turf quality while keeping the putting surface firm for desired ball roll and shot holding characteristics. The objective of this research is to evaluate the effectiveness of commonly used wetting agents while irrigating at various levels of replacement ET on a sand-based creeping bentgrass (*Agrostis stolonifera*) putting green.

Irrigation treatments were applied at 50 percent, 75 percent, 100 percent and 125 percent ET replacement combined with six wetting agent treatments applied to each irrigation regime. Turf quality and color declined significantly when



Irrigation at 75 percent ET replacement with application of six different wetting agents. Photo taken in Fayetteville, Ark. during July.

irrigation was applied at less than 75 percent ET. Among irrigation treatments, plots irrigated at 50 percent ET had more localized dry spots (LDS) than any other plots. Similarly, the untreated control plots had more LDS than all wetting agent treatments, regardless of the irrigation level.

Volumetric soil moisture evaluations at various

depths indicated that the use of wetting agents did not affect the overall volumetric water content average, but improved uniformity of rootzone moisture across all irrigation levels. Wetting agent treatment did not have a significant effect on surface hardness when sufficient irrigation was applied, but decreased hardness at the 50 percent ET irrigation level. There were no effects of irrigation or wetting agent on golf ball roll distance. A favorable playing surface is attainable using less water when wetting agents are applied.

Ethan D. Charles, Douglas E. Karcher, Ph.D., and Michael D. Richardson, Ph.D., Department of Horticulture, University of Arkansas, Fayetteville, AR. Ethan Charles can be contacted at [echarles@uark.edu](mailto:echarles@uark.edu) for more information.

**NEWS UPDATES**

**VALENT AND NUFARM ANNOUNCE PARTNERSHIP**

Valent U.S.A. Corp. has entered into an agreement with Nufarm Americas that appoints Nufarm as the exclusive distributor of its branded professional products for professional turf, ornamental and aquatic uses in the United States.

The partnership expands the portfolios of the two companies into one broad portfolio that will be sold by Nufarm in the U.S. In 2012, Nufarm acquired Cleary Chemical Co. and its line of fungicides.

"Valent still owns the registrations, still owns the trademarks. The arrangement is a sales agreement with Nufarm," Scott Todd, national business manager for Valent Professional Products, told *Golfdom* during the Golf Industry Show. "We don't see any short-term changes in branding/packaging."

The partnership will be led by a team of top talent from both Nufarm and Valent, as the sales and technical teams of both companies join forces.

"People can do the math — taking No. 5 and No. 7 and putting them together makes us a top-tier player," Todd said. "Whether that's No. 1, 2 or 3 I don't know. I'll let the numbers speak for themselves."

The partnership became effective as of Feb. 16th, 2014.

**OF THE NUMEROUS SAMPLES WE RECEIVE EACH YEAR, AT LEAST 30 TO 50 PERCENT OF THEM ARE DIAGNOSED WITH AN ABIOTIC PROBLEM."**

**Jim Kerns, Ph.D.**

(see full story on page 30)

## // SEEING SPOTS

# Dollar spot control 2014

## New fungicides and modern approaches

By Rick Latin, Ph.D.

It is sometimes difficult to imagine that more than 80 years after dollar spot was first described, this disease commands so much attention from superintendents, academics and the turf industry in general. The causal agent (currently *Sclerotinia homoeocarpa*) is an unpretentious fungal pathogen. Infection occurs by direct penetration of mycelium into plant tissues with no spores (at least none observed by scientists in the U.S.) to complicate the disease cycle. The present consensus is that *S. homoeocarpa* survives in infected and infested plant tissues.

### THE DOLLAR SPOT PROBLEM

Dollar spot is the first turf disease that students learn to identify because the unmistakable signs and symptoms (Figures 1, 2 and 3) are described in great detail. The environmental conditions (temperature, moisture, plant

### Disease management involves integrating four categories of control options: genetic, cultural, biological and chemical.

nutrition) that promote infection and disease development are well documented and familiar to most turf managers. Since 1990, researchers have published twice as many papers and reports on dollar spot than the next most popular disease topic, Rhizoctonia blight, and more than all root diseases combined. I think it is fair to say that we know as much about dollar spot as any turf disease. It is the common cold of turf diseases, easy to identify, affecting almost all species and without a cure.

And yet, more money is spent on fungicides to control dollar spot than any other infectious disorder of turf. New products were recently added

to the fungicide arsenal. Although there are no magic bullets, the new compounds improve our ability to execute sound strategies to limit the threat of dollar spot outbreaks. Before we fully engage the 2014 season, it would be prudent to review our approach to dollar spot control, while paying special attention to fungicide selection and application timing.

Disease management involves integrating four categories of control options: genetic, cultural, biological and chemical. Although we turf pathologists often preach utilizing non-chemical options before chemical control, in this narrative I address fungicides first. That's because at any site where dollar spot becomes problematic, fungicides remain the only stand-alone option to reduce damage to tolerable levels and maintain high quality playing surfaces. Furthermore, the non-chemical options serve only to reduce disease pressure and we know that fungicides will be more effective and efficient when disease pressure is reduced.

### THE MODERN FUNGICIDE ARSENAL

Until recently, the foundation of dollar spot control was based on a contingent of four effective fungicides or fungicide classes including chlorothalonil, thiophanate-methyl, DMI compounds (metconazole, myclobutanil, propiconazole, tebuconazole,

FIGURE 1



Dollar spot symptoms on a creeping bentgrass putting green.

FIGURE 2



Mycelium is produced within infection centers after long periods of surface moisture.

triadimefon, triticonazole, difenoconazole) and dicarboximides (iprodione, vinclozolin).

The contact fungicide chlorothalonil remains an important part of any program because of its broad spectrum of activity. It is effective against many diseases, including dollar spot and its multi-site nature. The multi-site feature is essential in anti-resistance strategies because the likelihood of a pathogen population evolving a resistance to a multi-site compound is zero or near zero. It kills fungal cells without the risk of selecting for resistant individuals.

However, there are government-imposed limits to the amount of chlorothalonil we can apply and these restrictions complicate the task of controlling disease on fairways. Successful superintendents rely on their understanding of fungicide strengths and deficiencies to schedule chlorothalonil sprays at the most opportune times to get the most

out of each application.

The new fungicide fluazinam (Secure, Syngenta) will be especially helpful where fairway outbreaks are a serious concern. Fluazinam is actually an old fungicide that was only recently introduced to the turf market. It is also a contact material and is advertised as a multi-site compound. Fluazinam's forte is in dollar spot control and it should be used judiciously to relieve some of the burden from chlorothalonil. In reality, it is not multi-site to the same degree as chlorothalonil. Fluazinam has a FRAC code of "29" as opposed to chlorothalonil's FRAC code of "M." There is suspected resistance to a *Botrytis* (related to *Sclerotinia*) pathogen of crops in Japan. The point in making the distinction is that we should be careful not to "over-use" fluazinam and tempt fate with the evolution of fungicide resistance.

Other fungicides for dollar spot

control are classified as penetrants. Active ingredients diffuse into leaves and stop or limit pathogen growth inside turf plants — that's the main reason why they tend to keep dollar spot outbreaks at bay for longer periods of time than contact fungicides.

Among the most widely recognized penetrants are the DMI compounds, the dicarboximides and thiophanate-methyl. They can be effective against many different turf pathogens, but are site-specific fungicides, like all penetrants, meaning that populations may evolve to the point where the majority of individuals become resistant to the active ingredient. This results in failure to control.

The newest active ingredients introduced into turf markets are in a class called SDHI (Succinate DeHydrogenase Inhibitors). It is likely that this class will be subdivided since active ingredients do

Continued on page 28

**FIGURE 3**



The characteristic dollar spot lesion — bleached white leaf blades with brown borders.

Continued from page 27

not have the exact same mode of action, as in other classes, and from a practical perspective, includes compounds with widely varying efficacy.

Boscalid (Emerald) and flutolanil (Prostar) are in the SDHI class. Of course Prostar is not a new fungicide, nor is it the least bit effective against dollar spot. Emerald is both relatively new and primarily targeted to control dollar spot. New SDHI compounds include penthiopyrad (Velista, Syngenta) and fluxapyroxad (Xzemplar, BASF). All research reports to date support very good to excellent efficacy of these fungicides against dollar spot, but results are mixed with regard to control of other diseases.

Again, they are site-specific (FRAC Code 7) penetrant compounds and anti-resistance tactics should be considered when positioning SDHI applications in the season-long fungicide program.

### APPROACHES TO UTILIZING FUNGICIDES EFFECTIVELY

Given these effective tools to stop pathogen growth and allow turf

recovery to proceed, how has this simple pathogen morphed into such a relentless problem?

Consider that infection and colonization occur over a broad temperature range. Therefore dollar spot outbreaks are a threat for most of the growing season and superintendents must be constantly vigilant of conditions that promote infection. Depending on expectations, season-long protection against outbreaks is warranted. We have an impressive array of fungicides to do the job, but regulatory restrictions and the threat of fungicide resistance present a serious challenge to superintendents as they formulate an effective approach to dollar spot control.

The “program” approach is the *de facto* preventative approach. It is my opinion that this approach will result in the most effective and efficient use of our chemical assets for disease control. If you are skeptical, consider the tried-and-true axiom: an ounce of prevention is worth a pound of cure.

I understand the argument for the “curative” approach. We have very effective fungicides that stop pathogen

growth in turf, they are “chemotherapeutic.” However, because pathogens are microscopic, with one dollar spot infection center containing tens of thousands of infectious cells and the infection process including an incubation period, there is so much more disease than meets the eye. As a result, the pathogen component of disease pressure is increased.

Over a given season, depending on the weather, more fungicide will be required for adequate control under conditions of high disease pressure than low disease pressure. There are countless reports of season-long efforts to “catch-up” after a dollar spot outbreak has occurred. Results are not always satisfactory and unless cool, dry weather lends a helping hand, it will always be more expensive than the preventative approach. This may also hasten the evolution of fungicide-resistant pathogen populations.

Non-chemical control options cannot stand alone in controlling dollar spot when weather conditions favor infection. However, they do serve to reduce disease pressure and therefore may be exploited to improve the efficacy and efficiency of any chemical control program.

Some modern creeping bentgrass cultivars (Declaration and others) possess a genetic resistance to infection. They are not immune to dollar spot, but compared to more susceptible creeping bentgrass cultivars (e.g., Penncross, Pennlinks, L-93), disease develops more slowly and infection centers are often smaller in size. As a result of the improved genetic resistance, less fungicide will be required to achieve acceptable levels of control than on the more susceptible cultivars.

Certain cultural practices such as maintaining turf with ample nitrogen nutrition, displacing morning dew by poling or mowing and implementing a lightweight rolling regimen also reduce disease pressure and contribute to optimal use of fungicides.



I think the benefit of most biological treatments for dollar spot control remains questionable. However, most research with mineral oil applications shows a reduction in dollar spot severity compared to untreated turf and suggests that control with conventional fungicides can be improved by including the mineral oil in a tank mix.

Some turf scientists have rediscovered the fungistatic nature of two plant growth regulators (PGR), flurprimidol (Cutless) and paclobutrazol (Trimmit). These compounds are related to DMI fungicides and will reduce disease severity. However, because of their chemical similarity to DMI compounds, they are likely to accelerate the rate at which pathogen populations evolve towards resistance to registered DMI fungicides. Fungicide resistance within dollar spot pathogen populations should be a consideration in any program that involves these two PGR compounds.

Because of the season-long dollar spot threat, most effective approaches involve repeated application of fungicides at regular intervals. Higher rates and shorter intervals will result in a reduced risk of serious dollar spot outbreaks. One of the more contemporary issues with regard to dollar spot control involves the timing of the initial application. There is the notion that early, first or second mowing applications of a certain fungicide will limit dollar spot development for months afterward.

Any explanation must be based on logic and the biology of the dollar spot pathogen rather than unsupported supposition. Given the nature of apical growth in fungi, the pathogen must be active (growing) for the fungicide to be effective. If environmental conditions favor pathogen growth and an effective compound is applied at that time, the fungus will acquire the fungicide. Once inside the mycelial threads, the fungicide disturbs cellular functions stopping pathogen growth, allows turf to recover and effectively controls the potential outbreak. For any geographic location, historical temperature averages define the dollar spot "window." In most cases, the initial fungicide application scheduled at the beginning of the window is most effective.

So here we are at the beginning of the 2014 season, poised to do battle with this simple but stubborn pathogen. Our approach must be based on a sound disease control strategy that includes reducing disease pressure through implementation of sound cultural practices, understanding efficacy and limitation of fungicides registered for use against dollar spot, anticipating the initial outbreak and following a preventative rather than curative approach and positioning your dollar spot sprays with consideration of other diseases that threaten as the season progresses.

Rick Latin, Ph.D. is a professor in the Department of Plant Pathology at Purdue University specializing in turfgrass disease identification and control. Dr. Latin can be reached at rlatin@purdue.edu for more information.

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## // FIGURING OUT FUNGICIDES

# Factors affecting fungicide performance

## Part 1 of 3: Fungicide selection

By Jim Kerns Ph.D.

**I**n a perfect world fungicides would not be needed to manage diseases of turfgrass. However, we do not live in a perfect world and pesticides are necessary for managing pests. Yet there are ways to maximize the effectiveness of the products we choose to manage those pests. This article is the first in a series of articles that explores the factors affecting fungicide performance and ways to ensure we are getting the biggest bang for our buck when using fungicides. The first two things to consider when selecting a fungicide are plant health and deposition of the fungicide.

effects of fungicides. That being said, we do see benefits from certain fungicides with respect to turf quality. Yet it is important to select a fungicide for its primary purpose, controlling a plant pathogen.

What is plant health? How do we measure it? These are all difficult questions facing turfgrass managers and researchers. Typically we hear that rooting is a measure of plant health and in most respects roots are an excellent measure of plant health. Root depth is not the only measure of plant health though. We can also measure turf quality or growth. Growth is challenging for the golf industry

compaction, moisture stress and other abiotic issues that develop on golf courses. So if you have struggled with the efficacy of your fungicides, I would suggest examining your soil, fertility and moisture management. Of the numerous samples we receive each year, at least 30 to 50 percent of them are diagnosed with an abiotic problem. Not only will a fungicide not fix the problem, in many respects disease can become more severe as abiotic problems persist.

Another important factor for improving fungicide performance is accurate diagnosis. As I mentioned above, we receive numerous samples in which we cannot find disease activity. This is probably the simplest way to improve fungicide performance, as we can suggest alternative ways to manage abiotic problems.

Turf diseases are pretty difficult to diagnose, especially when dealing with root and crown diseases. For example, in the transition zone creeping bentgrass struggles with summer patch, *Pythium* root rot and *Pythium* root dysfunction. These are three totally distinct diseases with three different management strategies for each. Yet the symptoms can be very difficult if not impossible to diagnose without the aid of a microscope.

I have dealt with a few cases where superintendents were spraying preventatively for *Pythium* root dysfunction, but were still struggling to maintain their putting surfaces during the summer months. They actually had *Pythium* root rot. Moral of the story, if you have struggled to achieve efficacy with root diseases, send a sample to a local diagnostic lab. Once you have an

### What is plant health? How do we measure it? These are all difficult questions facing turfgrass managers and researchers.

Yes, I said plant health. This has become a buzzword with pesticides and with good reason. All fungicides are plant health products. We use them to manage a fungus or fungal-like organisms that feed on our precious turf plant. When we prevent that feeding interaction, we are promoting plant health.

I do not intend to discuss the effects of products in absence of disease because I believe that we do not have the entire story regarding fungicide applications and plant growth. Turfgrass systems are extremely complicated, dynamic systems and without a better understanding of the microbial ecology associated with our systems, we cannot begin to understand the true side

because we are always trying to limit growth. Therefore quality may be the best measurement we have for plant health in a turfgrass system.

So how do we maximize turf quality of golf course turf? I think this answer is fairly simple, agronomics. Plants need light, air (oxygen), food and water to be healthy, so fertility, irrigation, cultivation and mowing all are mechanisms that affect plant health as much or more than the pesticides we deploy. If we want to maximize plant health and fungicide efficacy, these practices need to be examined.

Fungicides are designed to suppress the growth of fungal or fungal-like organisms. They cannot remove or cure black layer, nutritional problems,