

FIGURE 1

Application rates and intervals

Application interval (days)	Number of applications	Application rate (oz/M)	Total amount applied	Total cost ^b (fung. + labor \$)	Benefit ^c
14	6	1.0	6.0	1,160	63.2
14	6	2.0	12.0	2,140	94.7
14	6	3.0	18.0	3,120	100.0
14	6	4.0	24.0	4,100	100.0
21	4	2.0	8.0	1,427	68.4
21	4	3.0	12.0	2,080	84.2
21	4	4.0	16.0	2,734	94.7
28	3	4.0	12.0	2,050	84.2
No spray	0	0.0	0.0	0	47.4

Adapted from Latin, 2011

^b Estimated retail cost of Chipco 26 GT applied to 3 acres of putting greens.

^c Percentage of 19 evaluation days dollar spot severity was less than or equal to 0.5%

accurate diagnosis of the problem, you will succeed when applying fungicides.

Once an accurate diagnosis is accomplished and plant health has been addressed, how do you select the right fungicide? There are many sources that can aid in fungicide selection and I will list just a few of my favorites.

Dr. Paul Vincelli from the University of Kentucky produces a document each year called "Chemical Control of Turfgrass Diseases" (<http://www2.ca.uky.edu/agc/pubs/ppa/ppa1/ppa1.pdf>) that is an excellent resource for fungicide selection. Dr. Vincelli gathers data from all over the U.S. when compiling and updating this publication.

At N.C. State my predecessor Dr. Lane Tredway developed an excellent disease management utility called NCSU Disease Management Utility (<http://turfdisseasemanagement.ncsu.edu/nc>). Right now we are working to update this

tool and we hope to have that complete by this summer.

Many turf scientists publish results of fungicide trials on their program website. For example, when I was at the University of Wisconsin-Madison, we published our fungicide trial work on our website (www.tdl.wisc.edu). Here are just a few more websites that I have used in the past for management information; these are by no means exclusive (<http://plant-science.psu.edu/research/centers/turf>, <http://turfpath.missouri.edu>, and <http://turf.rutgers.edu>).

Dr. Rick Latin at Purdue University published a book entitled, "A Practical Guide to Turfgrass Fungicides," which is an excellent source for the basics of fungicides and for fungicide efficacy. Finally, if you are still uncertain about fungicide selection, call your local turfgrass pathologist or turfgrass extension specialist.

The next step is picking the

application rate and volume and timing. Fungicide timing can be tricky as there are many factors that govern timing of fungicide application. However, in order to maximize efficacy, typically preventative applications are best. Dr. Latin showed this very well in his book. He conducted a study examining application rates and intervals for dollar spot control using Chipco 26GT (see Figure 1). He determined the benefit of each strategy he examined, which was calculated as the percentage of 19 evaluation dates that dollar spot severity was less or equal to 0.5 percent.

He also included a total cost of the application strategy that included the fungicide cost and labor. He found that applying the fungicide at two oz. every 14 days provided 94.7 percent benefit at \$2,140. One hundred percent

Continued on page 32

Continued from page 31

control was achieved in the study, but it required more products and more money. With preventative control, fewer products are typically used and in many cases less labor when compared to curative applications. Once a disease develops, high rates and short intervals are normally required to maintain adequate turfgrass quality.

Fungicide selection is a complicated task and has become extremely difficult as more products are released.

For foliar diseases, watching nighttime temperatures are essential for timing fungicide applications. For example, dollar spot typically starts developing when nighttime temperatures exceed 50°F and relative humidity consistently exceeds 70 percent. For anthracnose, the rule of thumb is to schedule fungicides when nighttime temperatures consistently exceed 65 to 68°F. For brown patch and Pythium blight, they usually do not develop unless nighttime temperatures exceed 72 to 75°F. These are not set in stone and many turfgrass pathologists are working to refine our understanding of the environmental conditions that promote these diseases, but for now, using these nighttime temperatures have been fairly successful in our trials at N.C. State.

Soil borne diseases are a little different. Soil temperatures are the key for scheduling preventative fungicide applications. For fairy ring, Dr. Lee Miller's work demonstrated that DMI fungicides successfully limited or prevented fairy ring development when they were applied when soil

temperatures were between 55 and 75°F. Make sure soil temperatures are consistently 55 to 60°F for four or five days before pulling the trigger. Then one or two follow-up applications a month apart should alleviate your fairy ring issues.

A similar soil temperature regime exists for take-all patch and Pythium root dysfunction. With Pythium root rot and summer patch, they can continue development into the summer months even with preventative applications. More follow-up applications for these diseases may be necessary. However, scheduling the first application when soil temperatures reach 65°F is a good rule of thumb, especially in areas where creeping bentgrass is under extreme physiological stress. For spring dead spot, the best starting point for fungicide applications is when soil temperatures cool down to around 65 to 70°F in the fall.

Fungicide selection is a complicated task and one that has become extremely difficult as more products, both brand name and post-patent, are released. The most important considerations for maximizing fungicide performance is to address agronomic practices that affect plant health and getting an appropriate diagnosis of the potential problem. After considering fungicide selection, plant health, diagnosis, rate and timings, the next consideration is residual. The next article will cover how long fungicides persist in a turfgrass environment and the factors that govern disease pressure.

Jim Kerns, Ph.D. is an assistant professor and extension specialist in turfgrass pathology in the Department of Plant Pathology at North Carolina State University. Dr. Kerns can be reached at jpkerns@ncsu.edu.

References

- Latin, R.X. 2011. A Practical Guide to Turfgrass Fungicides. APS Press. St. Paul, MN.
 Miller, G.L., L.P.Tredway, and M.D. Soika. 2012. Preventative fairy ring control on putting greens. GCM: December (80): p 74-76, 78, 80, 82.

Golfdom

Seven-time winner of the national Folio: Award for editorial excellence

EDITORIAL ADVISORY BOARD

Mike Bavier, CGCS-Ret.
Barrington, Ill.

Conrad Broussard, CGCS
ST. JAMES PLANTATION
Southport, N.C.

Julio Diaz
PUNTACANA BEACH AND GOLF CLUB
Punta Cana, Dominican Republic

Damon Di Giorgio
FIELDSTONE GOLF CLUB
Wilmington, Del.

Chris Erickson
SHADOW HAWK GOLF CLUB
Richmond, Texas

David Hay, CGCS
INDIAN WELLS COUNTRY CLUB
Indian Wells, Calif.

Bill Irving
LAWRENCE CC
Lawrence, Kan.

Rees Jones
REES JONES, INC.
Montclair, N.J.

Tim Kreyer
EXECUTIVE DIRECTOR
CAROLINAS GCSA

Tom Lively, CGCS
TPC SAN ANTONIO
San Antonio, Texas

Tom Marzolf
FAZIO GOLF COURSE DESIGNERS
Hendersonville, N.C.

Roger Meier
VALHALLA GOLF CLUB
Louisville, Ky.

Jeff Plotts
TPC SCOTTSDALE
Scottsdale, Ariz.

Jackson Reiswig
CORAL CREEK CLUB
Placida, Fla.

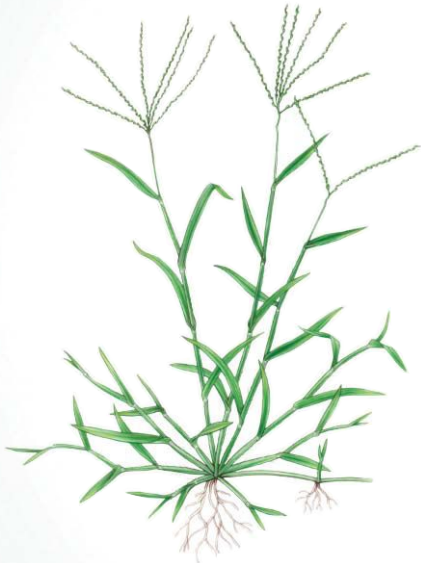
Steve Sarro
PINEHURST COUNTRY CLUB
Denver, Colo.

Anthony Williams, CGCS, CGM
STONE MOUNTAIN GOLF CLUB
Stone Mountain, Ga.

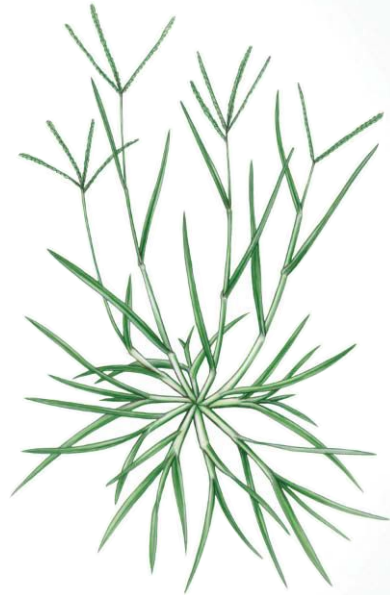
Andy Wilson
BETHPAGE STATE PARK GOLF COURSE
Farmingdale, N.Y.



*Take a good look.
You may never see them again.*



{fig. w-42}
Digitaria sanguinalis



{fig. w-76}
Eleusine indica



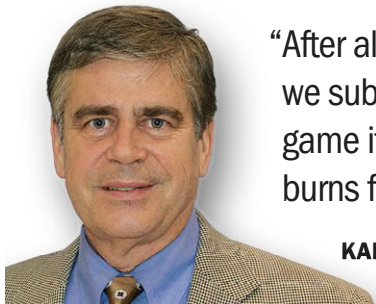
Specticle[®]

Apply less. Achieve more.

Specticle[®] from Bayer provides effective, long-lasting pre-emergent weed control. Specticle gives you superior control of crabgrass, goosegrass and *Poa annua* as well as 75 other troublesome grasses and broadleaf weeds. Get ready to achieve more with Specticle. For more information, visit www.BackedbyBayer.com/Specticle.

Follow us on Twitter @BayerGolf

Specticle G is now available as a spreadable granule.



“After all the things that can go wrong, we subject it to further abuse from the game itself: bruising, stomping, divots... burns from cigars and cigarettes.”

KARL DANNEBERGER, PH.D., *Science Editor*

Respect the putting green

I have found that one of the thrills in golf is hitting a green in regulation, taking that long walk up the fairway through the approach area onto the putting green, where if I'm lucky, I have the opportunity to fix my ball mark and then wait for my playing partners. What I often overlook, and most golfers take for granted, is the 100 million — give or take several million — individual turfgrass shoots waiting for me on that green. Think about it, a single putting green has the approximate population of Bangladesh (150 million). From a geographical point, Bangladesh is roughly the same size as the state of Illinois; however we have crowded that same population number into a 6,000- or 6,500-square-foot putting green.

Originally, each creeping bentgrass shoot on that green can be traced back to a germinating seed. What is fascinating is that the seedlings that emerged from these tens of millions of seeds are all a little different genetically. Creeping bentgrass cultivars are synthetic. Golfers may think putting greens are pure and uniform and each plant is exactly the same, but actually we are dealing with a whole lot of individuals. And then once they grow and develop a little, we mow them down to a height of cut as low as 0.090 of an inch in some cases.

Getting to mowing heights this low didn't occur overnight. The ancestors

of creeping bentgrass emerged some 70 million years ago during the Mesozoic era and over 40 million years of continual grazing and adaptation, the basal internodes became shortened. Through recent breeding efforts and advances of mowing equipment technology, incredibly small plants can be maintained.

These extremely short plants face challenges each and every day. Looking at the environment that surrounds the green, we find it is not very uniform. Turf shoots are exposed to varying microclimates. Some shoots are living in low areas that might be susceptible to water logging, or flooding to them,

while higher areas are prone to moisture stress. All of this happens within a few yards of each other. These shoots also live in their own waste that we describe as thatch or organic matter accumulation. If we do not adjust and modify our microclimates through drainage, irrigation and air movement, or manage organic matter accumulation, we run the risk of catastrophic injury to our shoots.

Our putting green is also under constant assault from internal and external invaders. Crowded populations like that found on a putting green can serve as a catalyst for disease. Sanitation and control of pests is critical to the health of our putting green. The constant battle to protect and provide a healthy environment for our shoots and in turn produce the perfect surface is an ongoing battle that often escapes the attention of golfers.

And then, after all of the things that can go wrong with these shoots, we subject them to further abuse from the game of golf itself: bruising, stomping, being rolled over, divots from angry golfers who happen to miss a putt or even burns from a cigar or cigarette left behind, to name a few examples. The amazing thing is, new shoots emerge to take the place of injured or dead ones. Through all of these trials and tribulations, our putting green may actually be 100 years or older!

I wrote this column to remind myself that oftentimes we look at a putting green as an innate object to be manipulated and modified like some sort of electronic device because, as many things become part of our daily life, we take them for granted. This is unfortunate because a putting green is a living, ongoing and evolving system much like nature itself. It should be respected and cared for.

Karl Danneberger, Ph.D., *Golfdom's* science editor and a professor at The Ohio State University, can be reached at danneberger.1@osu.edu.

REST ASSURED...

THE E-PAR EMS FOR GOLF
PROVIDES GOLF COURSE SUPERINTENDENTS
WITH A GREAT NIGHT'S SLEEP.



Regulatory Compliance | Environmental Risk Management
Liability Containment | Best Environmental Management Practices
Strategic Environmental Management | Business Value



Phone **855-372-7872** Fax **646-395-1455**
email **info@eparusa.com**
address **90 State Street, Suite 700**
Albany, NY 12207



Fans improve creeping bentgrass greens in the Southeast

Bert McCarty, Ph.D., is a professor of turfgrass science at Clemson University and has conducted research on the impact of fans on creeping bentgrass greens. Bert can be reached at bmccrty@clemson.edu.

Q What are the benefits of fans on creeping bentgrass greens in the southeast U.S.?

In my opinion, fans have been the biggest development in helping to grow high quality creeping bentgrass greens in the summer in the Southeast. Fans cool the turf plants, which lowers heat stress, resulting in healthier plants. In addition, fans dry the putting surface and reduce the number of consecutive hours of leaf wetness. Between having a healthier plant and a drier turf canopy, disease pressure is also reduced.

Q How much is the surface putting green temperature lowered with use of fans?

On a sunny 90° F day, the surface temperature of the green is in the range of 100 to 105° F. With a fan running, the surface temperature will drop to about 85° F. With the use of mist nozzles on the fan, the surface temperature can drop to 75 to 80° F.

Mist nozzles on a fan can be a double-edged sword. If used for short periods during the heat of the day, mist nozzles and the fan can help reduce surface temperatures. If overused, the surface will become too wet, leading to turf decline and more disease.

Q What are the situations where fans are most effective?

My experience is to use fans on the worst greens and soon they will be the best greens. What were formerly the best greens will look bad in comparison to the greens that have fans.

Any green that has restricted airflow is a prime candidate for a fan, as are greens that are in a high humidity microclimate, such as greens near or surrounded by open water.

Q What is the trigger to turn fans on and off?

The scientific answer is to turn on the fans anytime the air temperature is greater than 86° F. Above 86° F, the rate of respiration exceeds the rate of photosynthesis and the plant is using more energy than it is producing. The practical answer is any time there is going to be a long period with air temperatures above 86° F and/or the greens are wet and the humidity is high.

In the Carolinas, superintendents generally run fans 24 hours a day from Memorial Day through Labor Day on the worst greens and from about 10:00 a.m. to 7:00 p.m. on the best greens. A general guideline is that it costs about \$300 per month, per fan for electricity.

Superintendents stop using fans when the daytime air temperature drops below 86° F and the night-

time temperature drops below 70 to 75° F.

Q How big of an area do fans impact?

That depends on the fan, but we recommend that the fan generate a wind speed at the putting surface of three to nine mph. Lower than three mph and there is not much benefit to the turf, higher than nine mph the turf tends to dry out.

Most greens have two fans and some have three, depending on the surface contours. Orient the fans to take advantage of the prevailing wind. On the best greens, only one fan may be needed.

Q Anything else you would like to add?

Location of the fan is critical. It is the surface of the green that needs increased air flow; not six feet above the surface. Take advantage of oscillating fans. Most golf courses start with fans on two or three of the worst greens and when they see the improvement, they gradually add fans to all the greens.



Clark Throssell, Ph.D., loves to talk turf. Contact him at clarkthrossell@bresnan.net.



LANDSCAPING PROFESSIONALS'
#1 Choice for TOP DRESSER

Let the **Ecolawn** team help you. We provide free Demos, Financing, Marketing Tools, FAQ, Tips, & Contacts.

Call now: **802-673-9077**
View it in action: www.ecolawnapplicator.com

Expand Your Business with Sustainable Lawn Care / Top Dressing - the Fastest Growing Segment in the Green Industry



Protect your work of art.



You're an artist, and Turfcide® is your powerful brush.

Nothing, pound for pound, is more effective at stopping snow mold from ruining your masterpiece.

Contact your AMVAC/AEP distributor today or call us directly at 888-462-6822. Online visit amvac-chemical.com for more information.

Professional Grade

NEW PRODUCT HIGHLIGHTS // 2014 GOLF INDUSTRY SHOW

A GIS TO REMEMBER

THREE EDITORS AND TWO DAYS OF MEETINGS MEANS WE HAVE LOTS TO WRITE ABOUT.

BY SETH JONES, MOLLY GASE AND JOEIE HARM S

1. A40 and V40 PrecisionCore Aerators

The A40 and V40 PrecisionCore Aerators from **JOHN DEERE** were designed to increase productivity and efficiency for operators. The patented articulating frame provides more consistent hole depth in undulating terrain and shift-on-the-fly technology allows for users to change the hole spacing while the machine is in motion. The equipment also feature a tighter turning radius, aiding in sharper, quicker turns. On the efficiency front, the aerators are compatible with an optional verticutter attachment. Another feature is reduced levels of handlebar vibration. These features were based on extensive field research, testing and input from superintendents. johndeere.com/golf

2. Sand Pro 2040Z

THE TORO CO.'S Sand Pro 2040Z is a zero-turn mechanical rake that turns on a dime. Its patent-pending Lift in Turn system, paired with a flex tooth rake, allows the 2040Z to groom contoured bunkers, steep slopes and tight fingers without leaving tire marks or

teardrop mounds of sand. The 84-inch-wide flex tooth rake has three reversible rubber trowels designed to keep bunker liners from tearing and turf on the bunker edge safe. The Sand Pro 2040Z has a top transport speed of 12 miles per hour, is a 12.2 horsepower Kawasaki gas engine and has a unitized transmission design for low maintenance performance. Optional accessories include an LED light kit, a mesh storage bag for tools, trash or debris and a Bimini sunshade. toro.com/2040z

3. Bi-Directional Turf Groomer & Brush

JACOBSEN launched a new bi-directional turf groomer and brush at the GIS. The system allows course managers to vary their greens maintenance program depending on turf conditions with the option of using either a turf groomer or a brush in forward or reverse directions. The switch between groomer and brush takes less than five minutes, the company says, using just a 1/2-inch socket. The bi-directional groomer began shipping last month and is available for the Eclipse2

THE 2014 GOLF INDUSTRY SHOW IN ORLANDO was a great show all around. The crowd was lively, booths were busy and for your friendly editors at *Golfdom*, we didn't have a free minute for two straight days. We loved the fake tree that is really a portable restroom (see page 40) and were even more flattered to see that our January issue was the preferred reading of those needing a bathroom break (visit our blog). We also had a great time at the Toro, John Deere and Jacobsen tours, and have enough material to last us a couple issues — look for more from those visits, as well as our other 50-plus meetings, on the website and in future issues. In the meantime, here are several products from the show that we think you'll want to know more about.

floating head walking greens mower, GP400 riding greens mower and Eclipse 322 riding greens mower.

jacobsen.com

4 Blinder Bunker Liner

From England comes **BLINDER**, a unique bunker liner developed using years of experience from top level superintendents and industry professionals. Blinder is a recycled, porous, rubberized liner that allows free draining and prevents stones rising to the surface. Once installed, maintenance is greatly reduced, the company says, while golfer injury and damaged clubs are avoided. Blinder helps solve the problems of consistency, drainage and contamination. The company now has an American licensee and installer in superintendent and industry veteran, Alan Fitzgerald.

theblinder.com

5. Triple Crown

A multiple action insecticide providing fast-acting, long-

lasting broad-spectrum control of more than 30 above- and below-ground turf pests, Triple Crown Golf Insecticide is now available from **FMC CORPORATION**.

Triple Crown is an innovative three-way combination of FMC bifenthrin, FMC zeta-cypermethrin and imidacloprid, offering multiple modes of action on key pests including armyworms, cutworms, sod webworms, grubs (masked chafer, European chafer), chinch bugs, annual bluegrass weevils, billbugs, mole crickets, and more. Among the fastest liquid insecticides now available for superintendents, Triple Crown is labeled for broadcast golf course turf applications. Available in a suspoemulsion formulation, Triple Crown Golf insecticide works through contact, translaminar and systemic activity, providing protection against sucking pests that feed on a plant's vascular system, as well as foliar-feeding insects.

fmcprosolutions.com



1



2



3



4



5

**CONTINUED
ONLINE**

For more products
from the GIS, go
to [golfdom.com/
category/
products](http://golfdom.com/category/products)



Continued on page 40



6

6. Rotorake 600HD

The Rotorake 600HD is one of two new products launched by **SISIS** at the Golf Industry Show. It is a heavy duty pedestrian dethatcher and linear aerator which can be used for regular, routine use at a shallow setting or a deeper setting as required. It also contributes to aeration and compaction relief by cutting clean, continuous slits to assist water and air absorption. Featuring a new, modern design with more responsive maneuverability, the Rotorake 600HD is more operator friendly.

sisis.com



7

7. Lely Thatchers

LELY Thatchers are built on a lightweight frame and have four rows of tines, staggered to allow debris to pass through while providing a close working space of 1 ½ inches. The 7mm tines work effectively in speeds up to 7mph and can be adjusted to nine different working positions without using tools. The thatchers are machine mounted using a three-point hitch. Four models are available with a working range of 7 ½ to 20 feet. An optional hydraulic fold assist is available for the 450 and 600 models.

lelyusa.com



8

8. Premier Porta Potties

NATURE CALLS has created Premier Porta Potties that stand out for their ability to blend in. The portable bathroom is not the typical blue box seen in parking lots of big events, but instead are made to blend into the woods. Constructed with no right angles, the 6'10" structure is a fully-enclosed, lockable, polyurethane shell that keeps weather and critters out, while blocking scents and sounds. Designed to blend in, the "tree" features an exterior that closely mimics tree bark. Weighing 295 pounds, the stump can be moved by a padded truck bed. Stumps can be ordered

to be handicap accessible and the exterior can be decorated to blend into nature. naturecalls.com

9. RG3 robotic mower

The RG3, from **PRECISE PATH ROBOTICS** is the industry's only robotic greens mower specifically designed to reduce operating costs while simultaneously improving the course quality conditions. The RG3 has been proven on golf courses across the country to make the golf course maintenance staff 50 percent more productive during the critical course preparation hours every morning, while providing unparalleled consistency