Routine Nitrogen Fertility, PGRs Influence Ball Roll on Bermuda

By Patrick McCullough, Haibo Liu and Bert McCarty

While everyone seems interested in ball roll on bentgrass greens, ball roll on bermudagrass greens has received no prior research.

Hybrid bermudagrass (Cynodon dactylon Pers. x C. transvaalensis Burtt-Davy) putting greens require intensive management practices to promote surface uniformity and ball roll consistency. Turfgrass professionals traditionally consider bermudagrass putting green surfaces inferior to finer-textured creeping bentgrass (Agrostis palustris Huds.) from their inability of previous cultivars to withstand routine mowing heights lower than three-sixteenths of an inch (Beard, 1973).

Recently introduced dwarf-type bermudagrasses have lower growth habits with the capability of withstanding long-term mowing heights of one-eighth of an inch (McCarty and Miller, 2002). Compared to traditional bermudagrass putting green cultivars, dwarf-type bermudagrasses have finer leaf textures and higher per area shoot densities (Beard, 2002). These morphological characteristics provide bermudagrass putting green quality once exclusive to creeping bentgrass greens (McCarty and Miller, 2002).

One of the greatest differences in routine management of bermudagrass and bentgrass putting greens is the fertility requirements. Bermudagrass putting greens generally require two to three times as much annual nitrogen (N) inputs, ranging from 8 pounds to 24 pounds of N per 1,000 square feet, to meet growth requirements and compensate for nutrient loss through daily clipping removal (McCarty, 2005). Consequently, active shoot growth resulting from heavy fertilizations may disrupt surface uniformity and decrease putting green ball roll distances.

A practice commonly implemented to enhance putting green ball roll distances is the applications of plant growth regulators (PGRs). Suppressing leaf growth with PGRs may produce smoother putting surfaces by promoting lateral growth instead of undesirable top growth (Murphy et al., 2005). A gibberellic acid inhibitor, trinexapac-ethyl (TE), is safe for routine applications on dwarf-type bermudagrass putting greens to promote ball roll distances and surface uniformity (McCullough et al., 2005a). Turf managers also routinely apply TE to creeping bentgrass putting greens and other fine turfgrass areas.

Ball roll distances of dwarf bermudagrass putting green as influenced by N or TE have not been reported. However, research with TE on creeping bentgrass putting greens has been reported. Fagerness et al. (2000) evaluated monthly applications of TE on Penncross creeping bentgrass ball roll when maintained at one-eighth, five-thirty-seconds and three-sixteenths-of-an-inch mowing heights.

Long-term ball roll improvements were more consistent from reducing mowing height, while TE enhanced ball roll distances over the course of a given day. L-93 creeping bentgrass putting green ball roll distances have shown to be greater or equivalent to turf receiving supplemental and subsequent mowing operations following TE applications (McCullough et al., 2005b).

Turf managers may be able to reduce bentgrass putting green mowing frequencies without compromising ball roll distances following applications of TE.

Since bermudagrass putting greens may require a broad range of routine N fertilizations, evaluating the effects of N input with TE would advance the potential for practitioners to promote longer ball roll distances. A two-year field experiment investigated effects of routine N fertility and TE applications on TifEagle bermudagrass putting green ball roll distances.

Materials and methods
Field experiments were conducted over 12 weeks.


When choosing granular pre-emergent herbicides, the keys in assuring the expected results are particles per square inch uniformity, consistency and quality in formulation. The Andersons' pre-emergent formulations are the best in the business.
Pooled ball roll distances from 11 weekly samples taken with a 36-centimeter Stimpmeter on a TifEagle bermudagrass putting green in field experiments. Initial nitrogen treatments were April 26, 2003, and April 24, 2004. Trinexapac-ethyl was applied at 0.05 kilograms per hectare every three weeks beginning May 8, 2003, and May 4, 2004. Weekly ball roll measurements began one week after initial trinexapac-ethyl applications.

Continued from page 81 from April to August in 2003 and 2004 on a TifEagle bermudagrass putting green at the Turf Service Center, Clemson (S.C.) University. The bermudagrass green was established in July 2002 and built approximately to USGA specifications (USGA Green Section Staff, 1993). The experimental design was a split block with four replications of 5-foot by 7-foot plots (Picture 1).

Beginning the first week in May, turf was mowed daily at one-eighth of an inch and irrigated as needed to prevent plant stress. Bermudagrass was aerified with half-inch-diameter hollow tines with 1-inch spacing and 4-inch lengths on May 20 and July 28 in 2003 and May 27 and July 28 in 2004. Potash was applied at 1 pound of potassium (K) per 1,000 square feet a week before initial treatments in 2003 to help correct deficiencies. Ammonium nitrate solution was applied weekly beginning April 26, 2003, and April 24, 2004.

TE (Primo Maxx) was applied every three weeks beginning 10 days after initial fertilization treatments. Applications were made with a CO₂ sprayer at 30 gallons per acre and rates are presented in Table 1. On June 21, 2003, and June 18, 2004, 0.25 pounds of N per 1,000 square feet was applied to all plots with an 18-3-18 (N:P₂O₅:K₂O) greens-grade granular fertilizer.

Weekly ball roll measurements were made approximately two hours after morning mowing (9 a.m. to 11a.m.) and in the evening (4 p.m.). Six ball roll measurements (three rolls in opposite directions) were made with a 14-inch Stimpmeter. The Stimpmeter was raised off of the ground until gravity caused ball roll off the cleft located on the opposite end. Ball roll distances were obtained with tape measurers running parallel with the plots. The six rolls were pooled per treatment for data analyses. Weekly ball roll distances were measured eleven times in both years beginning one week after initial TE application. Data analyses were made using the analysis of variance with SAS General Linear Model procedure (SAS Institute, Cary, N.C.).

**Results and discussion**

Since treatment effects were consistent on every sampling date, ball roll results were pooled and presented in Figure 1. Daily bermudagrass leaf growth reduced evening ball roll distances 5 percent from morning distances.

Similar diurnal differences have been reported on Penncross and L-93 creeping bentgrass putting green ball roll distances (Fagerness et al., 2000; McCullough et al., 2005b). Increased N rate linearly decreased both a.m. and p.m. ball roll distances. Reduced ball roll distances with increased N fertilizer generally results from greater shoot growth and wider leaf blades that increase ball roll resistance (McCarty, 2005a). Effects of N fertility on dwarf bermudagrass ball roll have not been reported. However, increasing N fertility appears to significantly reduce a.m. and p.m. ball roll distances.

TifEagle bermudagrass treated with TE had a.m. and p.m. ball roll distances increased about 15 percent from untreated turf. Enhanced ball roll distances from TE results from decreased leaf surface area and the inhibition of uneven shoot growth. TifEagle bermudagrass treated with TE had p.m. ball roll distances reduced 5 percent from a.m. distances. However, bermudagrass treated with TE had p.m. ball roll distances 10 percent longer than a.m. distances of the untreated. In the presence of TE, ball roll distances decreased with N rate, but TE-treated plots had longer ball roll distances compared to respective N inputs in the a.m. and p.m.

Although TE did not mask the influence of daily leaf growth, p.m. ball roll distances were longer for TE-treated turf relative to the untreated over the two-year experiment.

Turf managers who incorporate TE into dwarf bermudagrass management will have an effective tool for enhancing putting green ball roll. Inhibiting dwarf bermudagrass shoot growth with TE also enhances chlorophyll concentrations, inhibits seedhead formation, improves

**TABLE 1**

<table>
<thead>
<tr>
<th>Trinexapac-ethyl (1EC)</th>
<th>Nitrogen*</th>
</tr>
</thead>
<tbody>
<tr>
<td>fl. oz. of product/acre 9 wks.</td>
<td>lbs. N/1,000 ft²/wk.</td>
</tr>
<tr>
<td>0</td>
<td>0.125</td>
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<tr>
<td>0.25</td>
<td>0.375</td>
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<td>0.5</td>
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<tr>
<td>6</td>
<td>0.125</td>
</tr>
<tr>
<td>0.25</td>
<td>0.375</td>
</tr>
<tr>
<td>0.5</td>
<td>0.5</td>
</tr>
</tbody>
</table>

*Nitrogen was applied with 34-0-0 ammonium nitrate solution.
nutrient-use efficiency and delays winter dormancy (Bunnell, 2003; McCullough, 2004). Applying TE at 6 ounces per acre every three weeks to TifEagle bermudagrass may initially cause discoloration in late spring and early summer. TifEagle bermudagrass has shown to recover within one or two weeks with enhanced color and quality relative to non-TE-treated turf. In field experiments at Clemson, turf discoloration was significantly minimized by reducing TE application rates in May and June. Finally, this experiment was conducted on TifEagle bermudagrass. Ball roll distances of Champion, MiniVerde, FloraDwarf and other dwarf-type bermudagrasses may differ following N and TE treatments. Bermudagrass putting green ball roll distances may also vary when maintained with various cultivation techniques, watering regimens and mowing heights.

Patrick McCullough is a research program associate at Rutgers University. Haibo Liu and Bert McCarty are professors in the department of horticulture at Clemson University.

REFERENCES


was cruising around the course the other day, scouting for signs of disease or insect activity, and I wondered, "Just how many real signs are out on the course with actual words on them, in plain view, that the golfer's don't see? And why exactly can't they see them?"

I think every golfer under the sun has read at least a million times that they should repair their ball marks and replace their divots. Or that their golf cars should go here and not there, or that they should allow faster golfers to play through. So I ask you why, then, are these things not taking place?

My solution? Better sign verbiage. My theory is if you can say the same thing in a new and creative way, it just may be what's needed to make people notice. So let's edit. Take, for example, a sign that anyone who has ever gripped a club has probably read more than once:

"REPLACE DIVOTS AND REPAIR BALL-MARKS"

Obviously that doesn't seem to have the desired effect, so we'll start in with the begging: "PLEASE replace your divots, etc. ..."

Alas, unrepaid ballmarks seem to multiply on our greens, and unreplaced divots still dot our fine fairways.

The typical everyday signs just don't do the trick anymore, and I think it's partly because of complacency. When golfers first learned the game, these things were a very important part of their training.

Then, as their games started improving, they found "The Zone." The obvious upside of The Zone is the improvement in their game. The downside is the resulting tunnel-vision and hard focus that replaces common sense. I don't know how many times I've come across someone I've known all my life who's out playing golf, gone up to say hello, and they look at me as if I was trying to sell them earthquake insurance.

So what we need to do with our signage is to get creative. Make our signs 'Zone Breakers,' even if it's only for a second.

For divots — "STOMPING ON THE BARE EARTH WHERE PERFECTLY GOOD TURFGRASS HAD BEEN GROWING AN INSTANT BEFORE YOU EXCAVATED IT WITH YOUR WEDGE DOES NOT." REPLACING A DIVOT TAKES FIVE SECONDS TOPS. GO FOR IT.

And on the ballmark issue — "BELIEVE IT OR NOT, EVEN THOUGH YOUR APPROACH SHOT IS 15 YARDS OFF THE BACK OF THE GREEN, IT GOT THERE AFTER FIRST IMPACTING THE PUTTING SURFACE WITH THE FORCE OF A BOWLING BALL DROPPED FROM A 10- STORY BUILDING. FIXING A BALLMARK TAKES FIVE SECONDS. GO FOR IT."

I know I'm sounding a little cynical here, but it gets maddening sometimes. Especially at my "upscale daily-fee" course. I expected people to be a little more respectful to the course after dropping twice as much money to play it. Boy, was I surprised.

The thing I find to be most "upscale" about the golfers at my facility is the quality of their lost golf balls. Their behavior, however, isn't much much better. The divots are still the same, too, as are the ballmarks and the beer cans tossed into the woods.

Golf offers plenty of other situations in need of creative signage. Here are a few ideas:

IT SHOULDN'T TAKE SO LONG TO WRITE "7" ON A SCORECARD! YOU'RE HOLDING UP THE GROUP BEHIND YOU. PLEASE MARK YOUR 7 ON THE NEXT TEE.

Or ... "IF YOU TAKE A DIVOT FROM THE BLUE OR GOLD TEES ON PAR 4'S AND PAR 5'S, FEEL FREE TO MOVE UP TO THE WHITE TEES WITH NO SHAME OR BLOW TO YOUR FRAGILE GOLFING EGO. THE GOLFERS BEHIND YOU WILL THANK YOU.

Or ... SWING ALREADY?

Any ideas?

Jim Black, a veteran superintendent, can be reached at greenkeeperjim@yahoo.com.
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Matt Shaffer
Director of Golf Course Operations,
Merion Golf Club, Ardmore, PA
Profile Products named Michael Chase the manager of its market development division. Profile also named Rob Yoakum to its soils solutions team, while Michael Schupp was hired as a regional sales manager.

RDC Golf Group named transition specialist Pat Vanderstine the general manager of Blue Heron Pines West Golf Club in Cologne, N.J. One of only a few female GM's in the Garden State, she will oversee all facets of the club's management.

Redeem Charterhouse named the recipients of its annual awards. They included: Lawn & Golf Supply, Phoenixville, Pa. (Distributor of the Year); Craig Scheidler, Malveze Equipment, Hicksville, N.Y. (Salesman of the Year); and Wilfred MacDonald Inc., South Hackensack, N.J. (Distributor Parts Department of the Year).

Marriott Golf named Lukas Harvey, former superintendent of the Blue Monster at Doral Golf Resort & Spa, as its director of golf grounds at The Ritz-Carlton Golf Club & Spa in Jupiter, Fla.

Syngenta Professional Products announced that Jason Whitecliffe joined its turf and ornamental team as a sales representative for Georgia and Alabama. He arrives from from Strategic Industries in Alpharetta, Ga., where he worked as a regional sales manager.

Syngenta also added Adam Neate to its turf and ornamental team as a sales representative for northern Ohio. He arrives from Syngenta Seeds in Minnesota, where he worked as a field sales manager.

Laughlin Ranch Golf Club in Bullhead City, Ariz., named Chris Sachen its superintendent of the newly opened 18-hole golf course.

Pacific Sod announced the hiring of territory manager Steve McLaughlin. He is responsible for the Inland Empire territory, including Riverside and San Bernardino counties and adjacent areas.

Mike Knudson joined Rain Bird Golf as a western regional manager. He is capable for evaluating and developing a golf distribution network for the western United States. Also appointed was Kerry Barnett as marketing manager.

Echo Inc. promoted Andrew Kuczmar to the newly created position of senior director of product training and support. A 30-year employee of Echo, he is well known within the outdoor power equipment industry for his expertise in two-stroke engine technology.

Craig Smith was named aquatic business manager of Phoenix Environmental Care. He was formally with Griffin, where he spent four years as territory manager. The company also named Rick Grant its director of business development. He had been with Griffin, where he was involved with sales and market development.

Wiedenmann North America awarded its distributor of the year honor to Commercial Turf & Tractor, Chillicothe, Mo. Salesman of the Year honors went to Roy Spielman of Spielman Enterprises. Spielman's sales territory includes North Carolina, South Carolina, Georgia, Tennessee and Virginia.

Gary Hart, an executive at Karsten Manufacturing Corp., joined Arthur Hills/Steve Forrest & Associates as director of business development for the Western/Pacific Region.

Some of this year's RIGCSA Scholarship recipients (left to right): Christopher Godet; Kevin Crawford; Brian Wendell; James Medeiros, RIGCSA Past President; Richard Lombardi, Scholarship & Research Committee Chairman; Lisa Donohue; Ashley Fox and Ryan Seyboth.

The Rhode Island Golf Course Superintendents Association awarded more than $23,000 in scholarships to the following students: Gary Arruda (Connecticut), Lisa Donohue (Plymouth State), Nicholas Farina (Keene State College), Ashley Fox (Framingham State College), Christopher Godet (Roger Williams), Michael Godet (Rhode Island), Meagan Leinhauser (Palm Beach CC), Brittany Liston (Bryant), Kathleen Reynolds (CC of Rhode Island), Kelly Richard (CC of Rhode Island), Ryan Seyboth (Stonebridge School of Agriculture), Kara Smith (Miami) and Brian Wendell (Eastern Connecticut State). The C. Richard Skogley Memorial Scholarship was awarded to Kevin Crawford, a student at the University of Rhode Island. The RIGCSA Research Fellowship was awarded to Whitney O'Hanian, a student at the University of Rhode Island.

The Turf-Seed Board of Directors elected the following members: Bill Rose (chairman of the board); Agostino Gaude (international director); Crystal Fricker (marketing director); Ed Rose (production director); Cara Tuggle (finance and operations director); and Gordon Zielinski (secretary/treasurer and chief executive officer).

Irrigation Association President David Zoldoske was named vice chair of a California task force to improve the efficiency of water use in urban landscapes.

James Doyle was named president of the engine business for Kohler Co. He will provide strategic business leadership for Kohler Engines worldwide. He arrives via Fasco Industries, where he served as the group president in Eaton Rapids, Mich.
Superintendent’s Son Will Receive Scholarship

Winning Essayist Tackles Hydrophobic Subject

Water is getting more valuable everywhere you go, and none can be wasted. Golf courses and landscaped areas are being heavily scrutinized for the amounts of water they use. One main concern that all people have is the amount of excess runoff and water wasting that happens. These water-shortage concepts hinge on water repellency and the amount of water that is actually infiltrated to plants. Not only does water repellency waste water, it is also harmful to plants.

A major source area for dry spots and water repellence is on golf course greens. Water researchers generally agree that water repellency in soils is caused by a range of hydrophobic organic materials that forms nonpolar “coatings” on soil particles (Conard 2002). This hydrophobic action causes the most common type of water repellence that is associated with turf management.

There are several technological and simple solutions that can be used to treat water repellency. One of the new and more breakthrough techniques is the use of wetting agents or surfactants. As previously mentioned, water’s polarity attracts it to molecules that are polar and repels it from nonpolar molecules.

Wetting agents use a combination of nonpolar and polar molecules to help water flow through nonpolar regions and to flow better because of decreased surface tensions (Conard 2002). Surfactants increase the water’s capillary action and help the water infiltrate drier areas. Surfactants are also useful because they have added bonuses to their primary use.

Another method that is effective in removing water repellency is aerification, which is usually followed by top-dressing that fills the holes with sand which is also permeable and aids in water infiltration.

One other solution that is labor intensive but can be used to overcome water repellence is hand-watering.

Editors note: Jaron Andrews, the son of superintendent Marvin Andrews of Isleta Eagle Golf Course in Albuquerque, N.M., and a student at the New Mexico Institute of Mining and Technology, is the winner of the second annual Aquatrols Scholarship Essay Contest and receives a $2,000 stipend for his work. Excerpts of his essay, “Hydrophobic Turfgrass,” are featured below. Andrews’ entire essay and other winners’ works can be found on www.aquatrols.com. The essay competition is open to college-bound children of turf and landscape management professionals. For more information, contact info@aquatrols.com or 800-257-7797.

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The system also offers popular tools like Lightning Manager, which monitors lightning as it approaches and sounds alarms when a lightning strike occurs within a specified area of interest. The system’s Alert Manager notifies superintendents of significant weather changes such as temperature, wind and other critical weather parameters. For more information, contact www.meteorlogix.com.

Improved packaging
Milorganite has made several changes to packaging used for Milorganite 6-2-0 Classic and Greens Grade fertilizers. Production of these products will now be in plastic bags. These bags increase the ability of Milorganite products to be stored in moist locations. While not completely water-resistant (small pin holes are used to remove air during package filling), they are more weather-resistant than paper.

Another change is the inclusion of English and Spanish on all Milorganite 6-2-0 Classic and Greens Grade bags. This dual language labeling includes directions for use on golf courses, athletic fields, professionally maintained turf areas and various horticultural uses. A Spanish language Material Safety Data Sheet is also available. For more information, contact 800-287-9645 or www.milorganite.com

Sunscreen
Proderma Products LLC, maker of sun and skin care products, introduced its enhanced, clear Prism Sunscreen that dries in under 10 seconds. Fortified with transparent zinc oxides and non-alcohol-based absorption agents, the revamped non-greasy, non-slip formula provides an SPF of 30 plus for eight hours under normal sun and water conditions.

The enhanced Prism Sunscreen features Proderma’s breakthrough ABS-ZN45 technology and other active ingredients that allow it to absorb, block and scatter harmful UVA and UVB rays more effectively. Prism is odorless, sweat- and water-resistant, easy and smooth to apply, withstands the harsh weather conditions in which golfers play and discourages insects. A mixture of vitamins A, C and E and herbal extract help nourish the skin while Prism’s lack of alcohol and oil base prevents the skin from drying. For more information, contact 800-447-3035 or www.prodermaproducts.com.

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Herbicide available in California
Bayer Environmental Science’s Revolver herbicide, a postemergent herbicide for selectively removing cool-season grasses from warm-season grasses, recently received registration for use in California. Containing the sulfonylurea active ingredient, foramsulfuron, Revolver controls unwanted cool-season grasses, such as Poa annua, Poa trivialis, perennial ryegrass, bentgrass, bluegrass and tall fescue. It is registered for use on tolerant warm-season turfgrasses, including numerous cultivars of bermudagrass and zoysiagrass. For more information, contact www.bayerprocentral.com.

New Web site
Lofts/Pennington Seed has launched a new Web site (www.turfconnection.com) that gives information on the company’s seed, mulch, erosion and spreader products.

The site has 40 pages of content and 107 PDFs. It includes professional-level best practices, tips and techniques of the industry, product information, a seed calculator, FAQs and industry links.
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