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Research

BY WAYNE W. HANNA, PH.D.

Improving turf quality

How Bermudagrass genotypes respond to mowing height and nitrogen or growth regulators

TifSport, a high turf quality and fine-textured ▲ interspecific triploid (2n=3x=27 chromosomes) Bermudagrass hybrid, was released in 1995 (Hanna, Carrow and Powell, 1997). It's genetic purity, improved cold resistance, superior sod strength, pest resistance, turf density and improved traffic tolerance have made it a popular choice to plant on golf courses, athletic fields, lawns and landscape areas.

L. Cella and other researchers (2005) found that golf ball lie varied among Kentucky bluegrass cultivars and the number of plant tillers showed the highest correlation to ball lie. It was brought to our attention that, although TifSport performed well on golf courses, high handicap golfers wanted to see the ball with a higher lie. Therefore, we initiated this study to see if nitrogen levels combined with growth regulators would increase the lie at four different mowing heights or schedules. We used a modification of an instrument (see top-left photo on page 96) described by Cella and others (2004) to measure ball lie.

EXPERIMENTAL PROCEDURES

TifSport Bermudagrass (plot established in 2004) and two experimental vegetatively propagated Bermudagrasses - Tifton 11 and Tift No. 4 (ST-5) - were established in 2005. Tifton 11 and Tift No. 4 also were selected for testing because both of these experimental cultivars show potential for golf course use. The design was a strip plot test with four replications. Treatments included three nitrogen levels combined with Primo (trinexepac-ethyl) and Cutless (flurprimidol) and four mowing heights. A treatment with one pound of nitrogen per 1,000 square feet per month plus Primo was considered a general practice used by golf course superintendents.

The nitrogen/Primo/Cutlass treatments

- 0.5 pound of nitrogen per month per 1,000 square feet
- · 1 pound of nitrogen per month per 1,000 square feet
- 1.5 pounds of nitrogen per month per 1,000 square feet
- · 1 pound of nitrogen per month per 1,000 square feet plus Primo
- · 1.5 pounds of nitrogen per month per 1,000 square feet plus Primo
- · 1 pound of nitrogen per month per 1,000 square feet plus Primo plus Cutless

 1.5 pounds of nitrogen per month per 1,000 square feet plus Primo plus Cutless

Primo was applied at nine ounces per acre in Primo-only treatments and at four ounces per acre in Primo/Cutless treatments. Cutless was applied at four ounces per acre. Treatments were applied once a month during the growing season, May through October.

The mowing heights were:

- 0.5 inch (12.5 mm), twice a week
- · 1 inch (25 mm), twice a week
- · 1.5 inches (37.5 mm), twice a week
- 1.5 inches (37.5 mm), once a week

Mowing heights were selected to approximate practices used in various areas of the golf course. Quality and color ratings usually were taken at the end of the month before the new treatments were applied.

BALL LIE

Ball lie measurements were taken by dropping two golf balls into each plot from a height of six feet and then measuring the distance the ball sank into the turf (see top-right photo on page 96). Data on turf quality were collected in 2005 and 2006. Data on ball lie were collected in 2005 (three dates) and 2006 (three dates) for TifSport but only in 2006 (one date) for Tifton 11 and Tift No. 4 (ST-5). Rating used ranged from one to nine with nine being the best turf quality. A rating of at least seven is needed for acceptable turf quality.

A golf ball is 1.65 inches in diameter. The values listed in tables for ball height indicate the number of milimeters the ball sank into the surface of the grass. Therefore, the smaller the number, the higher the ball lie. All ratings and ball-lie measurements were rounded to the

Summary points

- Treatments with one or 1.5 pounds of nitrogen per 1,000 square feet produced similar turf quality and color in TifSport, Tifton 11 and Tift No. 4.
- Treatments with nitrogen plus Primo or nitrogen plus Primo and Cutless didn't have considerable effects on improving turf quality or color.
- An application of Primo or Primo plus Cutless produced a denser turf that provided a higher ball lie in TifSport. Ball lie in Tifton 11 and Tift No. 4 were similar for all treatments.

whole number because decimal values have little practical value. An analysis of variance was used to determine the effects of various treatments on turf quality and ball lie. Fisher's LSD test was used to determine differences between treatments (SAS Institute, Cary, N.C.).

TURF QUALITY

There were only small differences in overall turf quality except for the 0.5-pound-of-nitrogen-per-1,000-square-feet treatment in which turf quality was reduced for TifSport and for Tifton 11 in 2005. We also observed lighter green color (data not shown) for the 0.5 nitrogen treatment for TifSport and Tifton 11, but not for Tift. No. 4. We observed a little discoloration in the Cutless treatments for a few days after treatment. Cutless appeared to discolor Tift 97-4 more than the other genotypes, probably because this cultivar is the most naturally dense grass of the three tested. We observed the least discoloration in Tifton 11, and it's the most coarse grass of the three tested.

One pound of nitrogen per 1,000 square feet per month appeared adequate for maintaining desirable turf quality in all three grasses (see comparison photo, bottom right, on page 96). However, 0.5 pound of nitrogen per 1,000 square feet per month might be adequate for Tift No. 4, a dense, naturally dark green, shade-resistant genotype. Neither Primo nor Cutless improved overall turf quality in this test. However, clipping removal (not measured in this test) probably would have been reduced by the growth regulators.

Turf quality tended to improve for TifSport from 2005 to 2006 as the turf 'matured'. Treatments with Cutless (at the rate used) caused browning and swirling of the turf at 0.98 inch and 1.46 inches mowing heights for about a week after treatment in TifSport and Tift 97-4, which was especially pronounced at the October treatment. There were only small differences in turf quality because of mowing heights (see table 2 at right).

Table 1. Mean turf quality ratings for TifSport, Tifton 11 and Tift No. 4 in 2005 and 2006.

Turf Quality										
	TifS	port	Tifto	n 11	Tift No. 4					
Treatment	2005	2006	2005	2006	2005	2006				
0.5 N	7	7	7	8	7	7				
1.0 N	7	8	8	8	7	7				
1.5 N	7	8	8	8	7	7				
1.0 N + P	7	8	8	8	7	7				
1.5 N+ P	7	8	8	8	7	7				
1.0 N+ P + C	7	7	8	8	7	7				
1.5 N+ P + C	7	8	8	8	7	7				
LSD - 5%	1	1	1	1	1	1				

Table 2. Mean turf quality ratings for TifSport, Tifton 11 and Tift No. 4 in 2005 and 2006.

Turf Quality											
	TifS	port	Tifto	n 11	Tift	No. 4					
Mowing height (inch.)	2005	2006	2005	2006	2005	2006					
0.5 - 2x/wk	7	8	8	8	7	7					
1.0 - 2x/wk	7	8	7	8	7	7					
1.5 - 2x/wk	7	7	8	8	7	7					
1.5 - 1x /wk	7	8	8	8	7	7					
LSD - 5%	1	1	1	1	1	1					

Research

BALL HEIGHT

The nitrogen level had little effect on keeping the golf ball from sinking into the grass (see table 3 on page 97). All combinations of nitrogen, Primo and Cutless were effective in improving ball lie in TifSport. As TifSport (planted in 2004) matured from 2005 to 2006, the ball lie improved. Treatments had almost no effect on ball lie in Tifton 11 and Tift No. 4. Tifton 11 is quite vigorous – producing dense turf – so it

Top left: Researchers used a modification of an instrument described by L. Cella and other researchers. Top right: Ball lie measurements were taken by dropping two golf balls into each plot from a height of six feet and then measuring the distance the ball sank into the turf. Bottom left: As TifSport (planted in 2004) matured from 2005 to 2006, the ball lie improved (right). Treatments had almost no effect on ball lie in Tifton 11 (left). Bottom right: One pound of nitrogen per 1,000 square feet per month appeared adequate for maintaining desirable turf quality in all three grasses. Photos: Wayne Hanna



IMPACT ON THE BUSINESS

They know what they like...

Golfers – even high-handicappers – are a notoriously picky breed. When it comes to turf conditions, the old statement about art appreciation holds true for even an average hacker: They don't know much, but they know what they like.

One of the things they appear to like is a lie in the rough where the ball sits up, making it easier to make contact and rescue themselves from lousy shots. In short, even though they've hit the ball where they're not supposed to, they believe lies where the ball sits down are bad.

Thus, Wayne Hanna, Ph.D., and his team at the University of Georgia – the home of the various Tif species – took a look at how the ball rests when dropped on their turf. More specifically, the question is whether nitrogen and plant growth regulator inputs impacted the way the ball sits up on TifSport.

The bottom line of the study – which was largely funded by the USGA – is that growth regulators have a positive impact on how high a ball will sit in TifSport mowed at between 0.5 inch and 1.5 inches.

Trend

More superintendents are using PGRs in the rough than ever before, according to chemical company representatives. The primary value is reduced growth, which translates to less mowing, thus lowering labor

costs. But a secondary benefit such as improved lies provides a nice opportunity to improve the playability of the course for mediocre players who despise bad lies.

BY PAT JONES

Cost/benefit

PGRs aren't inexpensive, but the documented benefits continue to multiply as turf researchers and superintendents experiment with them. Regular treatments using the Primo/Cutlass combination described would add more than \$5,000 annually to a facility's PGR budget.

However, this is offset by the potential for:

- · Reduced mowing costs;
- . Thicker turf;
- · Upright growth (better lies);
- · Better annual bluegrass performance (seedheads); and
- · Fewer clippings.

Bottom line

Southeastern courses catering to mid- to high-handicap golfers could consider a program like this to manage TifSport fairways and roughs, thus improving ease of play and perhaps speeding up play to accommodate more rounds and make those picky golfers happy. GCI

apparently can mature turf soon after planting. Tift No. 4 is a naturally dense turf. The highest ball lie was achieved with 1.5 pounds of nitrogen combined with Primo and Cutless.

It appears from these results that one pound of nitrogen plus Primo can produce a good ball lie. Users would need to decide for themselves whether the slight improvements in ball lie are worth the extra cost of another half pound of nitrogen and/or Cutless per month. A lower level of Cutlass also might prevent some of the discoloration observed in this study.

Mowing at one-half inch twice a week produced the best ball lie in all three Bermudagrasses (see table 4 at right). The lowest mowing height produced the most dense turf. As mowing height increased and mowing frequency decreased, the ball sank further into the grass for TifSport and Tifton 11, and for Tift No. 4 going from the one-half inch to one inch mowing height. There were no differences in ball lie at the 1.5 inch mowing heights for Tifton 11 and Tift No. 4. The ball lie in TifSport improved from 2005 to 2006, probably because of the production of a more mature turf.

Another consideration in this mowing height is how far the bottom of the ball is from the ground for the various mowing heights (numbers in parenthesis in table 4). Although the ball sinks less into the grass at the half-inch mowing height, the ball is further from the ground at the one inch and 1.5 inches mowing heights.

Treatments with Primo or Primo plus Cutless were the most effective for preventing the golf ball from sinking into TifSport. The nitrogen level by itself appeared to have little effect on ball lie. Tifton 11 was exceptional at all treatment levels and mowing heights for keeping the ball from sinking into the turf. **GCI**

Wayne W. Hanna, Ph.D., is a professor in the department of crop and soil sciences at University of Georgia, Tifton Campus. He can be reached at 229-386-3184.

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Table 3. Mean ball height measurements (mm) for TifSport, Tifton 11 and Tift No.4 in 2005 and 2006.

	TifS	port	Tifton 11	Tift No4
Treatment	2005	2006	2006	2006
0.5 N	24	14	5	5
1.0 N	21	14	5	5
1.5 N	20	13	5	5
1.0 N + P	14	10	5	4
1.5 N + P	16	9	5	5
1.0 N + P + C	15	10	5	5
1.5 N + P + C	11	8	5	5
LSD-5%	3	2	1	1

^{*} The smaller the number, the higher the ball lie.

Table 4. Mean ball height measurements (mm) for TifSport, Tifton 11 and Tift No. 4 in 2005 and 2006.

Ball Height-mm †									
	TifS	port	Tifton 11	Tift No. 4					
Mowing height (inch.)	2005	2006	2006	2006					
0.5 - 2x/wk	8 (4) ‡	5 (7)	3 (9)	3 (9)					
1.0 - 2x/wk	10 (15)	8 (17)	5 (20)	4 (21)					
1.5 - 2x/wk	24 (13)	13 (24)	6 (31)	6 (31)					
1.5 - 1x /wk	28 (9)	17 (20)	6 (31)	6 (31)					
LSD - 5%	2	2	1	1					

[†] Distance (mm) the ball sank into the grass.

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[‡] Distance (mm) from the ground to the bottom of the golf ball.

BY KATIE MORRIS

Buying made easy

Online program simplifies a South Carolina superintendent's purchasing process

or most golf courses, handheld equipment is an afterthought compared to heavy-duty equipment such as mowers. But buying and repairing trimmers, edgers, blowers and chain saws can be just as involved as buying and repairing mowers.

For Mike Gregory, his days of anxiously waiting for parts have ended thanks to Husqvarna's new Golf Solutions program. Gregory, turf equipment manager at the 18-hole Long Cove Club in Hilton Head Island, S.C., has been at Long Cove for the past four years. Previously, he was the equipment technician at the Club at Seabrook Island in Johns Island, S.C.

"When I arrived, the club was using Stihl equipment exclusively," Gregory says. "We started buying Husqvarna last year when it came out with a program targeted to golf courses."

In 2006, Husqvarna introduced Golf Solutions, a direct business model designed especially for golf facilities that allows superintendents and equipment managers to

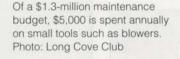
purchase tools and parts online. The program allows Gregory to order replacements parts straight from the manufacturer. When purchasing Stihl equipment, he goes through a distributor to get replacement parts.

The turnaround time for receiving parts using Husqvarna's program is quicker than going through Stihl's distributor, in which Gregory had to wait three to four days before receiving parts, he says.

"Husqvarna will ship the parts one day ground or overnight if needed," he says.

Since Husqvarna introduced Golf Solutions, Gregory's inventory of handheld equipment includes:

· Two FS 85 string trimmers (Stihl);







 Five 326 LX string trimmers (Husqvarna);

- · Two stick edgers (Stihl);
- · Four BR420 blowers (Stihl);
- · Three 356BT blowers (Husqvarna);
- One model 350 chain saw (Husqvarna);
- · One model 029 chain saw (Stihl);
- One model 025 chain saw (Stihl); and
- · One model 021 chain saw (Stihl).

Long Cove has a maintenance budget of \$1.3 million, \$5,000 of which is the annual budget for small tools such as trimmers, edgers, blowers and chain saws. Gregory says it's more cost effective to purchase handheld equipment instead of renting it because of the daily wear and tear on the tools.

"It was just cheaper for us to buy this type of equipment rather than rent it," he says.

Gregory's philosophy is to use the tools until they die or until it doesn't become cost effective to repair them.

"If you're repairing your equipment every week, then you're losing time and money and should just purchase new equipment," he says.

Gregory uses the trimmers and blowers for about five years before they wear out. He helps extend the tools longevity by cleaning and oiling them, as well as changing air filters once a month. He saves time and money by doing all the repairs himself. The only time he needs assistance from the manufacturer is when he needs a replacement part. There also have been times when Gregory has called for technical support while replacing parts. The Husqvarna technician he deals with is available anytime Gregory needs him.

The affects handheld equipment have on a course can be taken for granted. Without these tools, the course at Long Cove wouldn't look as neat and clean as it is. Gregory uses the trimmers along the cart paths and around bunkers; the edgers to trim around the asphalt cart paths; and the blowers to keep the tees, greens and everywhere else on the course clean. The staff uses the chain saws to trim trees and remove weather-damaged trees.

The staff uses the blowers about 20 to 24

The maintenance staff at the Long Cove Club uses blowers about 20 to 24 hours a week. Photo: Long Cove Club

hours a week, Gregory says. All the other tools, including the edgers, trimmers and chain saws, are used on an as-needed basis. When the edges around the cart paths, bunkers and tees start to look overgrown, the staff will make time to make them look neat and clean.

Despite the maintenance staff's work on the golf course, it doesn't handle the maintenance around the clubhouse. The groundskeeping staff does. It has it's own separate equipment that includes:

- · Five trimmers (Stihl);
- · Two trimmers (Husqvarna);
- · Three blowers (Stihl);
- Two blowers (Husqvarna);
- · Six chain saws (Stihl); and
- · Three chain saws (Husqvarna).

The groundskeeping staff uses its equipment around the clubhouse pruning bushes and trees, edging around sidewalks, and trimming around lagoons.

Long Cove's entire maintenance staff – golf course and groundskeeping – consists of 27 workers including superintendent Ashley Davis and technicians. Of the 27 staffers, 20 are part of the golf course maintenance staff, which decreases to 13 during the winter.

It seems Gregory is a convert to Husqvarna's Golf Solutions. After being with Stihl for at least 10 years, Gregory says he's going to start purchasing more Husqvarna equipment.

"The pricing is cheaper with the new program, and the service and parts availability is quicker," he says. GCI

Editor's note: The inclusion or lack of inclusion of any manufacturer in this article doesn't mean the magazine endorses or favors any one product, program or company. BY KATIE MORRIS

Go with your gut

lowa superintendent knows what to expect when purchasing tools

owers may cut most of the turfgrass on a golf course, but it's the little things handheld equipment maintains that helps keep a course looking pristine. Superintendents look for quality products from suppliers, and for Calvin Van Rees, when it comes to purchasing handheld equipment, he opts for products of which he's familiar.

"I've worked with Stihl enough to know what I'm getting, and I like the quality," he says.

When searching for tools, Rees, who is the superintendent at the 18-hole Westwood Golf Course in Newton, Iowa, looks for a small equipment dealership in town he can help. After researching equipment, Rees purchases the best product he can, so he went to one of the manufacturer's dealers.

"We don't want the biggest and the best, but we also don't want the cheapest," he says.

Rees, who has been at Westwood five and a half years and previously worked at Newton Country Club as assistant superintendent, wants equipment that can stand up to the rigors of the job. The tools are going to be tossed around and dropped, so he wants products that are durable and dependable.

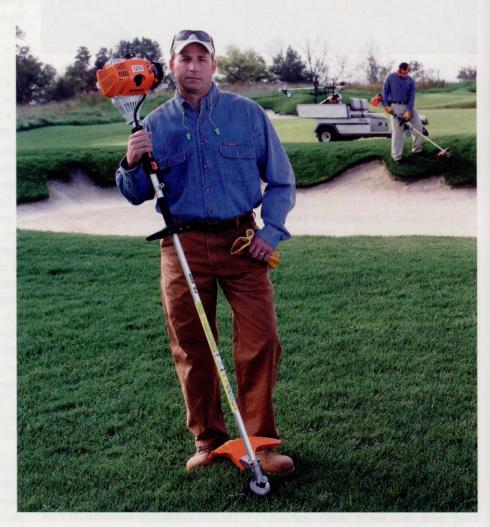
"Stihl products separate a good job from a half-ass job," he says.

Rees' fleet of handheld equipment includes.

- Three FS 85 string trimmers (Stihl);
- · One edger (Redmax);
- · One blower (Redmax);
- · Two Farm Boss MS 290 chain saws (Stihl); and

· One MS 280 chain saw (Stihl).

The Redmax blower and edger were bought previous to Rees' arrival, but when it comes time to replace them, he plans to buy Stihl equipment.



At Westwood Golf Course, handheld equipment lasts awhile because it's not used daily. Photo: Stihl