

BY WAYNE W. HANNA, PH.D.

## Improving turf quality

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

**T**ifSport, 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 were:

- 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 millimeters 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-foot 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						
Treatment	TifSport		Tifton 11		Tift No. 4	
	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
Turf quality: 9=best, 7=acceptable quality			N=Nitrogen, P=Primo and C=Cutless			

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

Turf Quality						
Mowing height (inch.)	TifSport		Tifton 11		Tift No. 4	
	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...

BY PAT JONES

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.

#### 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 Cutless 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**

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

Ball height- mm*				
Treatment	TifSport		Tifton 11	Tift No._4
	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

N=Nitrogen, P=Primo, and C=Cutless

\* 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 †				
Mowing height (inch.)	TifSport		Tifton 11	Tift No. 4
	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.

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

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