

EVALUATING BERMUDAGRASS FOR PUTTING GREENS
ALABAMA AGRICULTURAL EXPERIMENT STATION
AUBURN UNIVERSITY

E.A. Guertal
R. Dickens
C.Y. Ward

A 5,000 ft² USGA-type golf putting green was constructed in August of 1993 at the Auburn University Turfgrass Research Unit, located in Auburn, AL. This putting green, along with a similarly sized native soil putting green, were used for evaluation of 12 bermudagrass cultivars. These cultivars consisted of 8 selected ecotypes of Tifdwarf or Tifgreen, plus four experimental lines: T596 and TW72, from GA, and 2747-OK and 2474-OK, from Oklahoma. Oklahoma State grasses were African bermudagrasses, *Cynodon transvaalensis*.

Tifgreen or Tifdwarf ecotypes were collected from various sources, including selected golf course greens. Bermudagrass cultivars were sprigged into native and USGA putting greens on April 14-15, 1994, using a Ryan aerifer at a 6-inch plug spacing. Twelve cultivars were planted in 4 blocks, with cultivars arranged in a completely random design within each block in each putting green. Each cultivar main block was 3 feet wide and 25 feet long.

All plots were irrigated and mowed uniformly. Sand topdressing was initiated in the summer of 1994 with monthly topdress applications of 1/3 yard³/1000 ft² per month. Plots were evaluated for percent ground cover during grow-in, fall color (Nov), seedhead production (fall and spring) and spring greenup.

Putting green type affected percent cover at both evaluation dates (19 May and 21 June). There was no difference in percent cover among bermudagrass cultivars grown on the same type of putting green. Percent cover was greater in the native (96%) than USGA (85%) putting green, when measured on June 21. It may be that ecotypes selected from native putting greens were more adapted to rapid growth on native soil rather than USGA putting greens.

Bermudagrass cultivars grown on the USGA putting green were usually darker than when grown on the native putting green. When grasses were compared the two Oklahoma *Cynodon transvaalensis* bermudagrasses were significantly paler than any other cultivars. Tifdwarf, T596 and a Tifdwarf ecotype (from green #10, Mobile) were greener than other cultivars.

The only bermudagrass ecotype to produce fall seedheads was the selection from green #10 at Mobile. This grass produced seedheads on both the USGA and native putting greens. Turf quality was severely impacted. In the spring, seedhead production was affected by both green type and bermudagrass selection. When averaged over type of green, the Lakewood and 2747-OK cultivars produced significantly more seedheads than any other grass. Only the Mobile #10 and TW72 selections did not produce spring seedheads. When averaged over all grasses seedhead production rating on the USGA putting green was 4.7 and seedhead production rating on the native putting green was 3.5.

Both putting green and bermudagrass selection affected spring greenup. Greenup ratings on the USGA putting green were higher, with an average greenup rating of 5.2. Grasses on the native putting green had an average greenup rating of 4.4. When averaged over green type, the 2747-OK selection had the significantly lowest greenup (rating of 2.6) of any of the grasses.

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Bermudagrass (*Cynodon dactylon*) is the best adapted species for putting greens in the warm humid regions of the United States due to its superior heat tolerance and recuperative ability under low mowing heights. To date, limited effort and resources have been expended to identify or develop bermudagrass cultivars with the quality of creeping bentgrass (*Agrostis palustris*).

Soon after 'Tifgreen' was released, distinct 'offtypes' appeared in greens over the Southeast. Although 'Tifdwarf' was the dominant cultivar released, others, such as 'Pee-Dee' and 'Tif Turf' were said to be distinctly different from Tifdwarf. Although Tifdwarf was the only one of the offtypes to become established in the trade, there is considerable evidence that it is not the only variant existing originally, or at the present time. Turf managers have continually reported the occurrence of variants within Tifgreen and Tifdwarf greens. In many cases attempts have been made to interest researchers in testing these strains of grasses which are said to exhibit superior performance under conditions of excess moisture, heavy traffic, or poor soil structure common to the Southeast. To date, there has been little or no evaluation of these unique ecotypes to determine their value.

Thus, the objective of this research was to evaluate bermudagrass cultivars or Tifgreen or Tifdwarf ecotypes on both a USGA green and a native sandy loam soil. Main plots of bermudagrass cultivars will receive split plot treatments of mowing height and topdress frequency, beginning in the spring of 1996.

Green Construction and Bermudagrass Establishment

A 5,000 ft² USGA-type was constructed in August of 1993 at the Auburn University Turfgrass Research Unit, located at Auburn, AL. Materials for construction of the green included 60 yards gravel, 30 yards coarse sand, 240 yards root zone mix and 500 feet of drain tile. Root zone mix was an 80:20 mix of sand and rice hulls. Soil testing of the root zone mix and native soil indicated that 80lbs K₂O/acre was recommended for both the root zone mix and native soil. Both P and Mg received a 'very high' soil test rating, so additional P or Mg was not added. The green was left fallow through the winter of 1994.

Grass samples were collected from the sources listed in Table 1 and populations were expanded in the greenhouse throughout the summer of 1993 and winter of 1994. Bermudagrass cultivars were sprigged into native and USGA greens on April 14-15, 1994, using a Ryan aerifier at a 6-inch plug spacing. Twelve cultivars were planted in 4 blocks, with cultivars arranged in a completely random design within each block. Each cultivar main block was 3 feet wide and 25 feet long.

Table 1. Bermudagrass cultivars selected for evaluation.

Cultivar or Variant	Location/Supplier
Tifdwarf	Mobile green #9, AL
Tifdwarf	Mobile green #10, AL
Tifgreen	Auburn, Alabama
Tifdwarf	Auburn, Alabama
Tifdwarf	Lakewood C.C., LA
Tifdwarf	Texas
Tifdwarf	Southern Turf
T596	Wayne Hanna, GA
TW72	Wayne Hanna, GA
Tifdwarf	Gulfshores, AL
<i>Cynodon transvaalensis</i> 2747-OK	Oklahoma State
<i>Cynodon transvaalensis</i> 2747-OK	Oklahoma State

General maintenance of the plots included fertility applications of 1 lb K₂O/1000 ft² (0-0-60) on 14 Jun, 1994, and 1 lb N-P₂O₅-K₂O/1000 ft² (13-13-13) on 8 July, 22 July, 6 Aug and 26 Aug, 1994. Pesticide applications included MSMA (2 lbs ai/A) and Sencor (1/4 lb ai/A) on 8 July, Basagran (1 lb ai/A) on 12 July and MSMA (1 lb ai/A) on 8 August, 1994. Orthene 75G (3 lbs ai/A) was applied on 26 August and Simizine (1.5 lb ai/A) was applied 28 Nov for winter weed control.

All plots were irrigated and mowed (3/16-inch) uniformly. Plots were mowed every-other-day until September of 1995, at which time plots received daily mowing. Topdressing was initiated in the summer of 1994 with monthly topdress applications of 1/3 yard³ sand/1000 ft² per month.

Plots were evaluated for percent cover on 19 May and 21 June, 1994. Plots were rated for fall color and seedhead production on November 11, 1994. Plots were rated for spring greenup on 3 March, 1995 and seedhead production on 5 April and 29 May, 1995. Plots were vertical mowed on 12 October, 1995 and overseeded with *Poa trivialis*. Ratings of turf response to overseeding were taken on 20 October, 1995.

1995 Research Results

Percent Cover

When analyzed over both USGA putting green and native soil, the only significant difference in percent cover was due to putting green type, and not bermudagrass cultivars. When averaged over all grasses, percent cover in the native putting green was 74%, significantly greater than the 56% average cover observed in the USGA putting green. These significant differences were still observed on 21 June, when percent covers were 96 and 85 for the native and USGA putting greens, respectively.

Table 2. LSD tests of significance for percent cover in USGA and native soil putting greens on 19 May and 21 June.

Grass	19 May		21 June	
	Native	USGA	Native	USGA
	% cover			
Mobile #10	80 a	60 abc	98 a	90 ab
Tifdwarf	79 a	58 abc	98 a	86 abcd
Gulfshores	79 a	59 abc	98 a	88 abc
2352-OK	78 a	61 ab	96 a	87 abcd
Tifgreen	77 a	46 c	97 a	79 cd
TW72	77 a	49 bc	97 a	81 bcd
Lakewood	76 a	70 a	97 a	93 a
2747-OK	72 a	61 ab	96 a	87 abcd
T596	70 a	54 bc	93 a	85 abcd
Mobile #9	70 a	50 bc	93 a	85 abcd
Southern Turf	70 a	46 c	93 a	77 d
Texas	70 a	56 bc	93 a	85 abcd

Means not followed by the same letter are significantly different at $\alpha = 0.05$.

Differences in rate of establishment on USGA putting greens and native putting greens may be a result of many factors, including soil moisture or soil fertility. It could be that rice hulls in the USGA putting green soil mix were immobilizing N, creating nutrient deficiencies and lowering rate of cover in the USGA putting green. Native soil may have contained secondary or micronutrients that were deficient in the USGA putting green, deficiencies that may have affected growth rates.

Bermudagrass selections from native golf course greens may be more adapted to

native soil, and growth may not be adapted to USGA putting greens. New studies are planned to examine factors that affect rate of grow-in on USGA and native putting greens.

Fall Color

Fall color was visually rated on a scale of 1 through 9, with a 9 scoring the deepest green (dark) and lower numbers for paler green turf. Type of green and bermudagrass cultivar significantly affected color, and there was a significant green x bermudagrass interaction. Averaged over grasses, mean color rating for grasses grown on the USGA green was 7.6, significantly different from the mean color rating of 7.0 for grasses grown on native soil.

Table 3. Fall color ratings as affected by bermudagrass cultivar and green type.

	Native ----- color rating (1-10) -----	USGA -----
Mobile #10	8.0 (0.8)	8.0 (0.0)
Tifdwarf	7.8 (0.5)	8.5 (0.6)
Gulfshores	6.3 (1.0)	7.8 (1.0)
2352-OK	6.5 (0.6)	5.0 (0.0)
Tifgreen	6.0 (1.6)	7.8 (0.5)
TW72	7.0 (1.4)	7.5 (0.6)
Lakewood	6.8 (0.5)	7.5 (0.6)
2747-OK	7.0 (0.0)	5.8 (1.5)
T596	7.3 (1.0)	9.0 (0.0)
Mobile #9	6.8 (0.5)	9.0 (0.0)
Southern Turf	7.0 (0.8)	8.5 (0.6)
Texas	7.5 (1.0)	8.5 (0.6)

Numbers in parentheses represent standard deviation about the mean.

When averaged over green type, the Tifdwarf, T596, Mobile #10 and Texas grasses were greener than the remaining grasses. There was no significant difference in greenness between the Mobile #9, TW72, Lakewood, Gulfshores or Tifgreen turfgrasses. The two Oklahoma grasses were significantly less green than any of the other grasses.

Seedhead Production

Seedhead ratings were recorded on a scale of 1 to 9, with a 1 recorded for zero seed heads and a 9 recorded for 100% seedhead production.

Fall Seedhead Ratings

Only one grass produced seedheads in the fall (11 Nov) rating, the Mobile #10 grass. We have observed this same behavior in the fall 1995 ratings. Average seedhead rating in the Mobile #10 grass was 6.0 for the fall of 1994.

Spring Seedhead Ratings

Early spring seedhead ratings (5 April) indicated that only bermudagrass cultivars, and not putting green type, affected seedhead production. Most seedhead were produced by the Oklahoma varieties, with an average rating of 9.0 and 5.4 for seedhead production by the 2747 and 2352 cultivars, respectively. Of the remaining grasses, only the T596 had any seedhead production (2.0), but this value was not significantly different from a no-production rating (1.0).

Late spring seedhead ratings (May 29) indicated that both putting green type and bermudagrass cultivar affected seedhead production. When averaged over putting green type, the Lakewood grass (7.8) and the Oklahoma 2747 (7.1) had significantly more seedhead production than any other grasses. Only Mobile #9 and TW72 grasses did not produce seedheads, a rating which was significantly less than any other grass. When averaged over all grasses, seedhead production rating on the USGA putting green was 4.7 and seedhead production rating on the native putting green was 3.5.

Table 4. Late spring seedhead production ratings.

	Native -----seedhead production rating-----	USGA
Mobile #10	7.5 (0.6)	5.8(1.5)
Tifdwarf	2.3 (0.5)	6.3 (1.7)
Gulfshores	1.8 (0.5)	2.3 (0.5)
2352-OK	7.0 (0.0)	6.5 (0.6)
Tifgreen	3.0 (1.4)	8.5 (0.6)
TW72	1.0 (0.0)	1.0 (0.0)
Lakewood	7.0 (0.0)	8.5 (0.6)
2747-OK	6.8 (0.5)	7.5 (1.0)
T596	1.5 (0.6)	2.8 (1.0)
Mobile #9	1.0 (0.0)	1.0 (0.0)
Southern Turf	1.8 (0.5)	2.8 (1.0)
Texas	2.0 (0.0)	3.8 (1.7)

Numbers in parentheses represent standard deviation about the mean.

Spring Greenup

Spring greenup ratings were recorded on a scale of 1 to 9, with a rating of 1 indicating no greenup at this date (15 March) and a rating of 9 indicating 100% greenup. Both green type and bermudagrass cultivars significantly affected spring greenup. When averaged over grasses, greenup ratings on the USGA green were higher, with an average greenup rating of 5.2. Grasses on the native putting green had an average greenup rating of 4.4. When averaged over putting green type, the Oklahoma 2352 had the significantly lowest greenup (rating of 2.6) than any other grass. The next lowest greenup ratings were awarded to the Mobile #10 and Oklahoma 2747 grasses, both with an average greenup rating of 3.4. The TW72 and Tifgreen cultivars had significantly higher greenup (ratings of 5.9) than the remaining grasses.

Table 5. Spring greenup ratings.

	Native	USGA
	-----greenup rating-----	
Mobile #10	2.8 (0.5)	4.0 (0.8)
Tifdwarf	4.5 (0.6)	6.5 (0.6)
Gulfshores	4.5 (1.0)	5.0 (0.8)
2352-OK	3.0 (0.8)	2.3 (0.5)
Tifgreen	5.3 (1.3)	6.5 (0.6)
TW72	5.8 (0.5)	6.0 (0.0)
Lakewood	4.8 (0.5)	5.3 (0.5)
2747-OK	3.3 (0.5)	3.5 (0.6)
T596	4.3 (0.5)	6.3 (0.5)
Mobile #9	5.0 (0.8)	5.5 (0.6)
Southern Turf	4.5 (0.6)	6.3 (1.0)
Texas	4.8 (0.5)	5.3 (0.5)

Numbers in parentheses represent standard deviation about the mean.

Future Plans

With the retirement of Dr. Ray Dickens, care of the bermudagrass project has been passed to Dr. Elizabeth Guertal, who has taken over Dr. Dickens' research appointment. Following the input of the USGA Green Section, who visited the research site on May 24 and 25, 1995, changes have been implemented or planned as discussed in the following paragraphs.

The green was not being completely maintained as a golf putting green. Beginning this September greens are now mowed every day, with the mowing pattern shifted at each

mowing. Greens are currently mowed at 3/16-inch. In an effort to eliminate extensive thatch buildup the green will be topdressed twice a month during the winter, followed by dethatching in the spring.

Because the green has some uneven spots, such will be filled with greens mixture this fall, and bermudagrass will be allowed to grow across the leveled spots. Dr. Guertal will contact southeastern members of the USGA Green Section staff so that they can offer advice and input as to the proper method for leveling the green.

A graduate student (at no cost to USGA) under the supervision of Dr. Guertal has been assigned to the project. This individual will collect all data on the green and maintain it throughout the two years of their program of study.

John Lawrence (Toro) has verbally agreed to the long-term loan of two Toro reel mowers for use at the Turfgrass Research Unit. This will enable us to maintain mowers at two cutting heights for the mowing height portion of this study. The Minolta Corp. has donated a field colorimeter and chlorophyll meter, both pieces of equipment that will enable us to maintain quantitative measurements of color and N content, providing information beyond qualitative visual ratings.

Beginning on 15 April, 1996, treatments will be superimposed over the main plots of bermudagrass cultivars. A plot plan of treatments is attached to this report. Each main plot will be split in mowing height (3/16-inch or 1/8-inch) and topdressing frequency (weekly, monthly or bi-monthly). Although topdress frequency varies, the quantity applied for the year for each plot will be the same.

All treatments will receive daily traffic. A traffic machine has been built and will be used to apply traffic to simulate daily golf traffic. Number of required passes of the traffic tool is not yet known. Traffic will be applied at increasing rates until a few plots show wear. Traffic will then be maintained at this level. Irrigation will be applied to maintain each green at or near field capacity.