1998 ANNUAL RESEARCH
PROGRESS REPORT

of

Performance and Management of New Dwarf Bermudagrasses

Submitted by:

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Texas Agricultural Experiment Station
Texas A&M University System

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Executive Summary

Principle Investigator	Dr. Richard H. White
Research Associate:	Mr. Mark Hall
Graduate Research Assistants:	Mr. Jason Gray and Mr. Jason Gaudreau
Research Period:	1 January 1998 through 1 November 1998

New dwarf bermudagrasses are, in general, more aggressive thatch producers than Tifdwarf. Judicious nitrogen fertilization will be required to slow the rate of thatch accumulation for many of the new bermudagrass cultivars. Nitrogen amounts greater than 10 pounds annually per 1000 square feet improved turf quality but contributed to increased thatch, decreased ball roll distance, and did not substantially increase shoot density. No differences in thatch accumulation have been observed among light, frequent and severe, infrequent vertical mowing and topdressing regimes. However, severe, infrequent vertical mowing reduced turf quality for long periods. Overseeded *Poa trivialis* establishment the first season was good for all grasses when light, frequent vertical mowing was applied during the growing season.

Several new-dwarf bermudagrasses provided good to excellent turf quality and were superior to Tifdwarf at 0.125 inch mowing heights. Mean turf quality of MiniVerde, TifEagle, Champion, Mobile, Floradwarf, MS Supreme, Lakewood, and TXDB67 was superior to Tifdwarf at a mowing height of 0.125 inch. Only MiniVerde and TifEagle produced higher quality than Tifdwarf at a mowing height of 0.187 inch. The results of this study indicate that several new bermudagrasses show promise for providing superior surfaces on golf greens.

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Richard H. White

I. INTRODUCTION

This program is a cooperative research project funded jointly by the Texas Agricultural Experiment Station (TAES) and the United States Golf Association (USGA). This project was initiated in April 1997. Annual progress reports are submitted 1 November each year and semi-annual progress reports are submitted in 1 May. This report constitutes the 1997 semi-annual progress report for the project and highlights activities between 15 April 1997 and 30 April 1998.

II. PROFESSIONAL AND TECHNICAL SUPPORT

Mr. Mark Hall, Research Associate, provides day-to-day oversight for the experimental protocol associated with this project. Mr. Hall holds a Master of Science Degree in Agronomy from Texas A&M University. He has been employed by the Soil and Crop Science Department about 10 years.

Mr. Jason Gray joined the project in August 1997. Mr. Gray is a graduate of Pennsylvania State University. He is currently pursuing a Master of Science Degree in Agronomy and this project will serve as his thesis project.

Mr. Jason Gaudreau, Agricultural Research Technician, II, and Graduate Research Assistant, is responsible for supervision of the day-to-day activities associated with this project, such as mowing and irrigation. He also assists with the overseeding aspects of the project. Mr. Gaudreau holds a Bachelor of Science Degree in Agronomy from Texas A&M University and is currently pursuing a Master of Science Degree in Agronomy.

III. Performance and Management of New Dwarf Bermudagrasses

INTRODUCTION

Grasses with a prostrate growth habit, such as bentgrass and bermudagrass, maintain a high residual leaf area at close mowing heights, and are the preferred grass types for putting greens. Bermudagrass, a C_4 grass, is the best adapted grass for use on golf greens in the hot, humid regions of the southern United States.

Tifgreen, released in 1956, was a tremendous advancement for the golf industry. It was a natural hybrid that maintained high density at the 0.25 inch mowing heights common to that time. This low growing, rapid spreading variety quickly became the most popular choice for southern golf greens.

Nine years after Tifgreen was released, Tifdwarf was released for use on golf greens in the southern United States. Tifdwarf is a vegetative mutant that occurred from Tifgreen , and resembles Tifgreen except that its leaves and internodes are significantly shorter, and is darker green. The dwarf growth characteristics of Tifdwarf gave it superior putting quality on greens as mowing heights were lowered to 0.187 inch.

Over the past three to four decades, Tifgreen and Tifdwarf have been the bermudagrass varieties of choice for use on golf greens in the southern United States. Both require daily mowing at heights of 0.1875 inch or less and high nitrogen for use on today's golf greens. Also, these hybrid bermudagrasses require regular cultivation practices such as vertical mowing, aeration, and topdressing to maintain high quality putting surfaces. Tifdwarf has been the primary bermudagrass for golf greens during the past two decades.

Increased demand by the golfing world for "bentgrass" putting quality and the potential disastrous results that could arise from dependence on a single variety has brought about an accelerated interest in developing new golf green bermudagrass varieties. The industry has responded in the 90's with a wave of new bermudagrass cultivars with dwarf characteristics. Researchers are studying several of these new dwarf hybrids that spread vigorously and have little vertical leaf growth. Champion, Floradwarf, and TifEagle bermudagrasses are already commercially available and are in place on many southern greens. A few others, such as MS Supreme and Mini-Verde, will soon be commercially available.

Several new dwarf bermudagrasses are currently receiving wide-spread use. Few studies have been conducted to determine the management requirements and relative performance of these grasses in replicated trials. The growth habits of these new grasses may create distinctly different management requirements from Tifdwarf and Tifgreen. The objectives of this study are to determine the effects of vertical mowing, topdressing, and nitrogen fertility on performance, thatch development, fall and spring overseeding transition, and turf quality of five dwarf bermudagrasses.

METHODS

Five bermudagrasses, including MiniVerde, Champion, Floradwarf, TifEagle, and Tifdwarf were planted at the rate of 12 bushels of sprigs per 1000 square feet to 50 feet by 20 feet main plots in a strip-split plot experimental design on April 15, 1997. Sub-plots are annual nitrogen

treatments of 6, 10, 14, and 18 lb of nitrogen per 1000 square feet. Nitrogen treatments were applied as bi-weekly treatments throughout the year. Sub-sub plots were vertical mowing treatments of *1)* light, bi-weekly treatments May through September, and *2)* severe vertical mowing once during spring transition in and once immediately prior to overseeding in October. Sub-sub-sub plots were topdressing treatments of *1)* 0.02 inches applied bi-weekly May through September followed by a 0.20 inch application at overseeding to total 0.35 inches, and *2)* 0.15 inches in June and 0.20 inches in October totaling 0.35 inches. All treatments were replicated three times and occured in all possible combinations. Nitrogen, vertical mowing, and topdressing treatments were initiated in August 1997 after all grasses were fully established. During grow-in the experimental area was topdressed and groomed to smooth the surface.

Irrigation and mowing were uniformly applied during the growing season. The experimental area was maintained at 0.125 inch by daily mowing. Pesticides were applied during 1998 on a curative basis for army worms, sod webworms, and mole crickets. No differences in insect pest activity were observed among treatments. Herbicides and fungicides were not applied.

The entire experiment was overseeded with *Poa trivialis* on October 28, 1997 to provide realistic golf green simulation. Monthly visual assessments of turfgrass quality and color were made. Bermudagrass quality was evaluated at least monthly on a 1 to 9 scale where 1 equals brown, seemingly dead turf and 9 equals darkest green, most dense, uniform, smooth and of finest texture. Putting surface quality was also assessed by determining ball roll distance twice during 1998 with a modified stimpmeter.

In June and August 1998, 2.5-cm diameter by 5-cm deep cores were collected from each plot. Shoots were counted and thatch and mat determined by measuring uncompressed depth of each with a digital caliper. Samples were ashed to determine weight of thatch and mat on ignition and confirmed depth measurements.

All data were subjected to an analysis of variance to determine differences among treatment means. When a significant *f*-ratio ($P \leq 0.05$) occurred for a treatment effect Tukey's Studentized Range Test was used for mean comparison.

RESULTS

Mean turf quality differed among bermudagrasses during 1998 (Table 1). Champion and MiniVerde had the highest, Floradwarf the lowest, and TifEagle and Tifdwarf were intermediate in turf quality for all of 1998. Mean turf quality for 1998 increased as nitrogen application rate increased. However, on specific dates within grasses, turf quality did not increase as nitrogen exceeded about 5 kg N are^{-1} (10 lb per 1000 square feet) annually. In September 1998, turf quality declined markedly for Champion and MiniVerde as nitrogen increased from about 5 to 9 kg are^{-1} (10 to 18 per 1000 square feet) annually. The decline in quality for Champion and MiniVerde as nitrogen increased was associated with more aggressive thatch accumulation (Figure 1), greater thatch and mat depth in September 1998 (Figure 2), and increased scalping as nitrogen rate increased within these bermudagrasses. In general, acceptable bermudagrass summer turf quality was produced in all grasses except Floradwarf at about 5 kg N are^{-1} (10 lb per 1000 square feet) annually (Figure 3). Exceeding 5 kg N are^{-1} (10 lb per 1000 square feet) annually, dramatically increased thatch (Figure 1),

decreased ball roll distance (Figure 4), and did not substantially increase shoot density (Figure 5). Cultivar and nitrogen were the primary factors influencing thatch accumulation in 1998.

Topdressing and vertical mowing did not have a consistent effect on thatch accumulation in 1998. However, vertical mowing treatments significantly affected turf quality (Table 2). In general, severe, infrequent vertical mowing had a negative impact on turf quality. There was a significant cultivar by vertical mowing interaction effect indicating that cultivars responded differently to vertical mowing treatments. Turf quality in January through May 1998 reflects quality of the bermudagrasses overseeded with *Poa trivialis*. Emergence of *P. trivalis* was primarily confined to verticut grooves in the infrequent vertical mowing treatment but was more uniform in emergence in the frequent vertical mowing treatment. The lower quality in the infrequent vertical mowing treatments reflects the less uniform emergence and development of *P. trivalis*.

Turf quality in June through September primarily reflects bermudagrass quality. The continued negative effects of severe, infrequent vertical mowing applied in October 1997 and May 1998 are represented by the substantially lower turf quality in June 1998 for all bermudagrasses except Tifdwarf. The negative effects of infrequent vertical mowing were also observed for Floradwarf and TifEagle in July. The damage caused by severe vertical mowing may be due to the mass of stolons produced by many of the new dwarf bermudagrasses and the greater abundance of stolons than rhizomes in new dwarf bermudagrasses compared to Tifdwarf. The concentration of nodes on stolons that are nearer the soil surface predisposes these tissues to mechanical, and abiotic, and biotic stresses compared with rhizomes. The more dramatic effects of vertical mowing on turf quality of the new bermudagrasses compared to Tifdwarf may be the result of growing point position within the upper turf profile.

SUMMARY

New dwarf bermudagrasses are, in general, more aggressive thatch producers than Tifdwarf. Judicious nitrogen fertilization will be required to slow the rate of thatch accumulation for many of the new bermudagrass cultivars. Nitrogen amounts greater than 10 pounds annually per 1000 square feet improved turf quality but contributed to increased thatch, decreased ball roll distance, and did not substantially increase shoot density. No differences in thatch accumulation have been observed among light, frequent and severe, infrequent vertical mowing and topdressing regimes. However, severe, infrequent vertical mowing reduced turf quality for long periods. Overseeded *Poa trivialis* establishment the first season was good for all grasses when light, frequent vertical mowing was applied during the growing season.

FUTURE

We will continue to monitor thatch accumulation, fall and spring overseeding transition, and bermudagrass performance during 1999. Overseeding was accomplished again on October 28, 1998. Overseeding emergence for 1998 appears to be similar to 1997. We plan to obtain ball roll distance measurements more frequently in 1999. Additional testing of low temperature tolerance is also planned for the winter of 1998 and 1999.

Table 1. Turf quality of bermudagrass cultivars as influenced by pounds of nitrogen per 1000 square feet at the Texas A&M University Turfgrass Field Laboratory in College Station, Texas during 1998.

Cultivar	Nitrogen	8 Jan	16 Feb	6 Mar	14 Apr	17 May	18 June	6 July	24 July	21 Aug	22 Sept	Mean
Champion	6	4.3	3.9	2.4	4.3	5.9	4.4	4.3	4.8	4.9	5.9	4.5
	10	5.3	5.1	4.3	6.0	6.8	4.8	5.5	5.4	6.0	6.8	5.6
	14	5.2	5.1	5.2	7.0	6.9	5.3	5.7	5.9	6.5	6.3	5.9
	18	5.4	5.7	6.5	7.3	7.5	5.8	7.0	6.9	7.0	5.3	6.4
Mean		5.1	4.9	4.6	6.1	6.8	5.1	5.6	5.8	6.1	6.1	5.6
Floradwarf	6	3.9	3.1	2.1	3.5	4.4	1.8	1.3	1.9	2.8	4.3	2.9
	10	4.6	4.3	3.7	5.8	5.5	3.1	3.3	3.4	5.2	5.1	4.4
	14	4.3	4.5	4.2	6.1	5.6	3.2	3.4	3.8	5.9	5.6	4.7
	18	4.5	5.0	4.8	6.0	5.7	3.7	4.3	4.7	6.1	5.5	5.0
Mean		4.3	4.2	3.7	5.3	5.3	2.9	3.1	3.5	5.0	5.1	4.2
MiniVerde	6	4.6	3.9	2.5	4.4	5.2	4.1	4.6	4.9	5.4	6.0	4.6
	10	5.2	5.0	4.4	5.6	5.8	4.7	5.7	5.8	6.4	7.0	5.6
	14	5.7	5.6	5.3	6.5	6.3	5.3	6.8	6.8	7.2	6.7	6.2
	18	5.7	6.0	6.7	6.8	7.1	6.4	7.0	7.1	7.8	5.8	6.6
Mean		5.3	5.1	4.7	5.8	6.1	5.1	6.0	6.1	6.7	6.4	5.7
TifEagle	6	4.3	3.5	2.7	4.6	5.3	3.5	3.3	3.8	5.1	5.6	4.2
	10	5.3	4.8	4.5	5.5	6.3	4.3	4.8	5.4	5.9	7.0	5.4
	14	4.8	4.7	4.4	5.6	5.8	4.4	5.0	5.5	6.7	7.0	5.4
	18	5.3	5.3	5.3	5.7	6.3	5.3	5.8	5.8	6.6	6.0	5.7
Mean		4.9	4.5	4.2	5.3	5.9	4.4	4.7	5.1	6.1	6.4	5.2
Tifdwarf	6	3.5	3.1	1.8	3.6	4.7	2.7	2.8	3.4	5.1	5.4	3.6
	10	4.4	4.2	3.8	5.3	5.8	3.8	4.7	5.3	6.3	6.7	5.0
	14	4.7	4.7	4.3	6.0	6.0	4.8	5.8	6.1	7.0	7.0	5.6
	18	4.8	4.8	4.9	6.3	6.2	5.3	6.5	6.3	7.0	7.0	5.9
Mean		4.4	4.2	3.7	5.3	5.6	4.1	4.9	5.3	6.4	6.5	5.0
$MSD_{0.05}C$[†]		0.5	0.6	0.7	0.7	0.2	0.2	0.3	0.2	0.4	0.6	0.2
$MSD_{0.05}N$[‡]		0.3	0.3	0.4	0.3	0.5	0.4	0.3	0.4	0.3	0.3	0.2

[†] Minimum significant difference based on Tukey's Studentized Range Test for comparison of cultivar means within dates.

[‡] Minimum significant difference based on Tukey's Studentized Range Test for comparison of nitrogen means within cultivars and dates.

Table 2. Turf quality of bermudagrass cultivars as influenced by vertical mowing treatments at the Texas A&M University Turfgrass Field Laboratory in College Station, Texas during 1998.

Cultivar	Vertical mowing	8 Jan	16 Feb	6 Mar	14 Apr	17 May	18 June	6 July	24 July	21 Aug	22 Sept	Mean
Champion	Frequent	5.7*	5.2*	5.1*	6.5*	7.2*	5.5*	5.8	5.8	6.2	5.9	5.9*
	Infrequent	4.5	4.7	4.0	5.8	6.4	4.7	5.4	5.8	6.0	6.3*	5.3
Floradwarf	Frequent	5.0*	4.4	4.1*	6.3*	5.8*	3.6*	3.5*	3.7*	5.0	5.1	4.7*
	Infrequent	3.7	4.0	3.3	4.4	4.8	2.3	2.7	3.2	5.0	5.1	3.8
MiniVerde	Frequent	5.7*	5.4*	5.3*	6.3*	6.5*	5.6*	6.1	6.3	6.9*	6.4	6.0*
	Infrequent	4.8	4.9	4.1	5.3	5.7	4.6	5.9	6.0	6.5	6.4	5.4
TifEagle	Frequent	6.0*	4.9*	4.9*	6.5*	7.0*	5.3*	5.3*	5.5*	6.3*	6.5	5.8*
	Infrequent	3.8	4.2	3.6	4.2	4.9	3.5	4.2	4.8	5.8	6.3	4.5
Tifdwarf	Frequent	4.3	4.0	3.9	5.9*	5.9*	4.5	5.1	5.2	6.3	6.5	5.2*
	Infrequent	4.4	4.4	3.5	4.7	5.4	3.8	4.8	5.4	6.4	6.5	4.9

*Significant at the 0.05 level of probability.

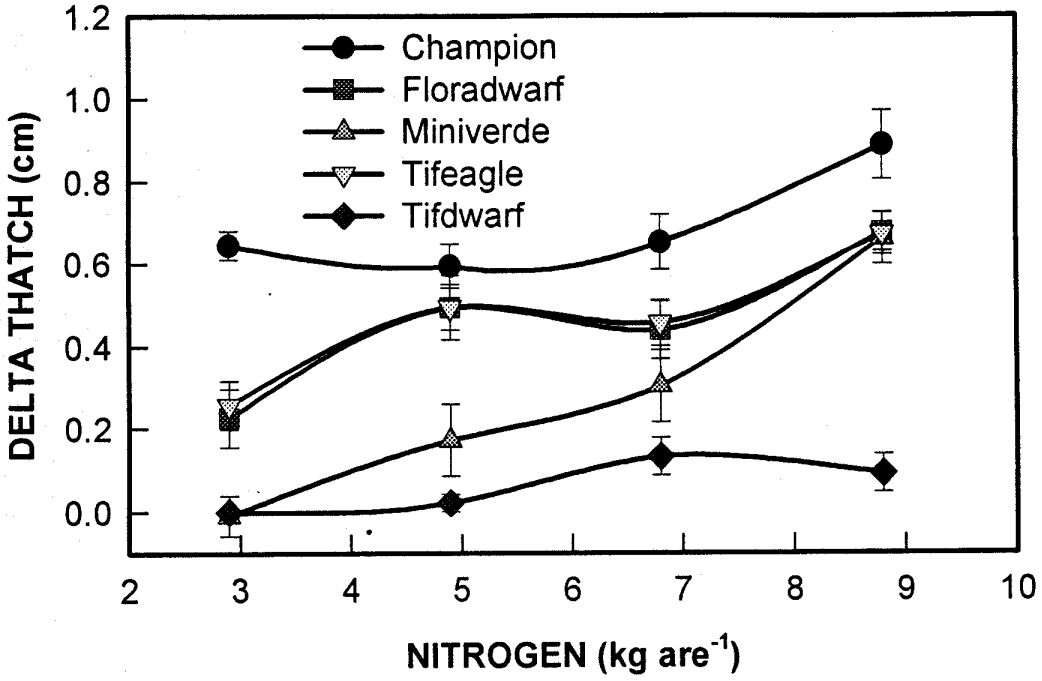

Figure 1. Change in thatch depth (delta thatch) between 18 May 1998 and 29 September 1998 for five bermudagrass cultivars as influenced by nitrogen fertilization.

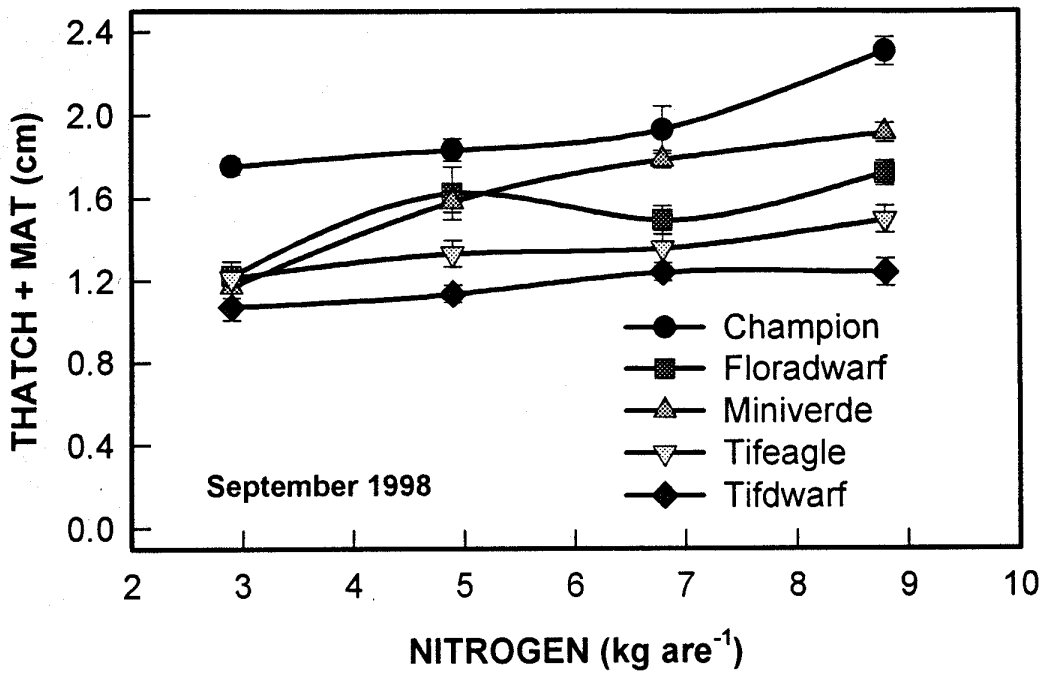

Figure 2. Thatch plus mat depth on 29 September 1998 for five bermudagrass cultivars as influenced by nitrogen fertilization.

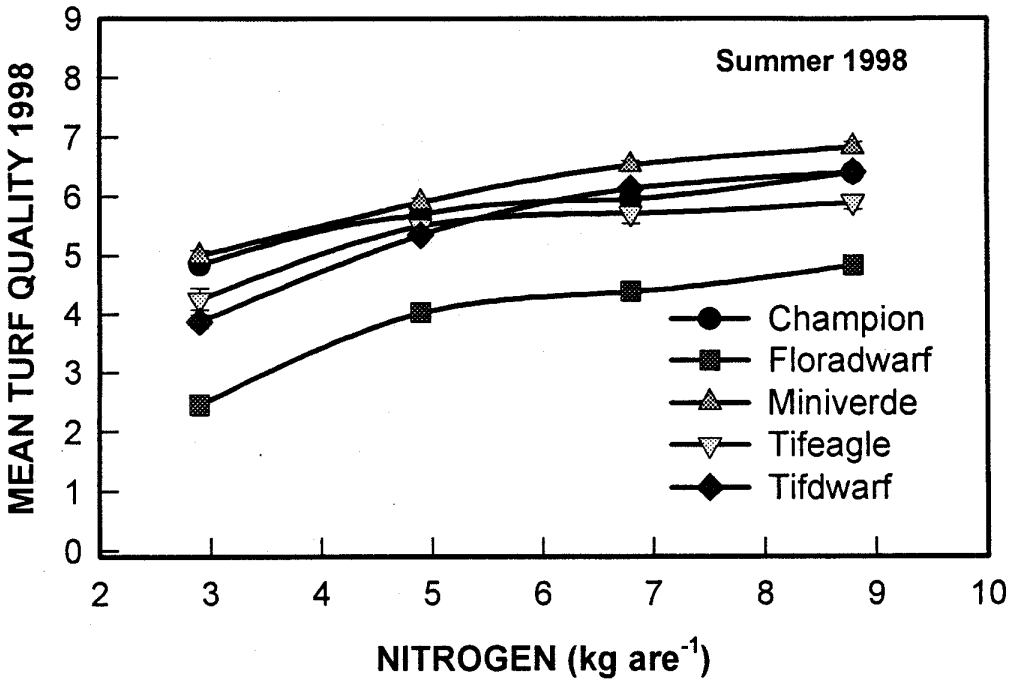

Figure 3. Mean turf quality during summer 1998 for five bermudagrass cultivars as influenced by nitrogen fertilization.

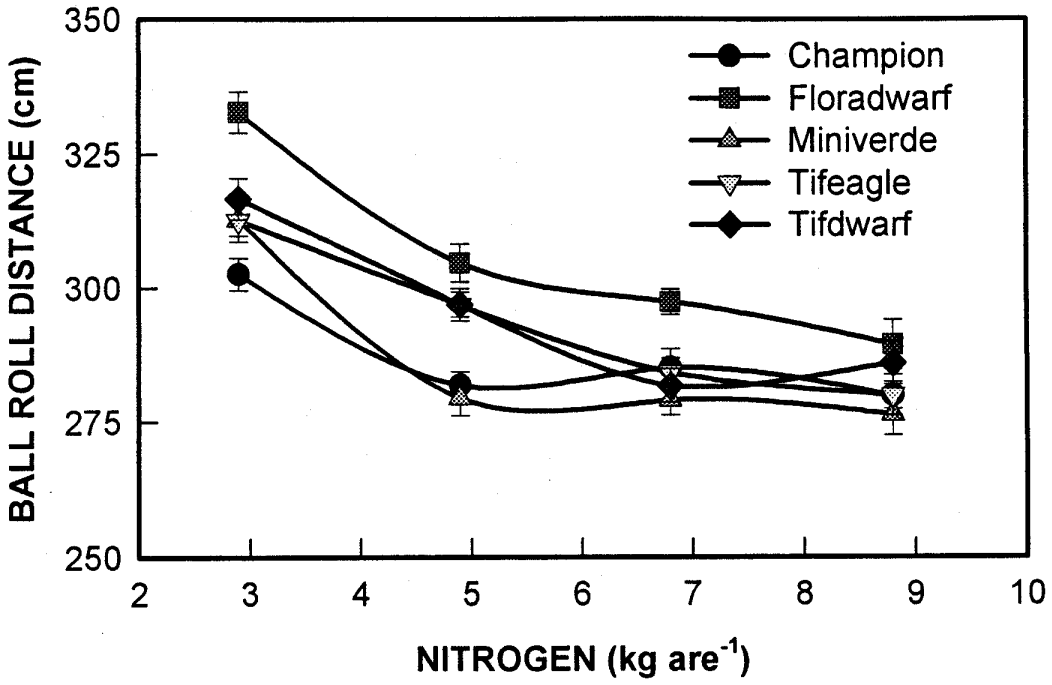

Figure 4. Mean ball roll distance for two dates in 1998 for five bermudagrass cultivars as influenced by nitrogen fertilization.

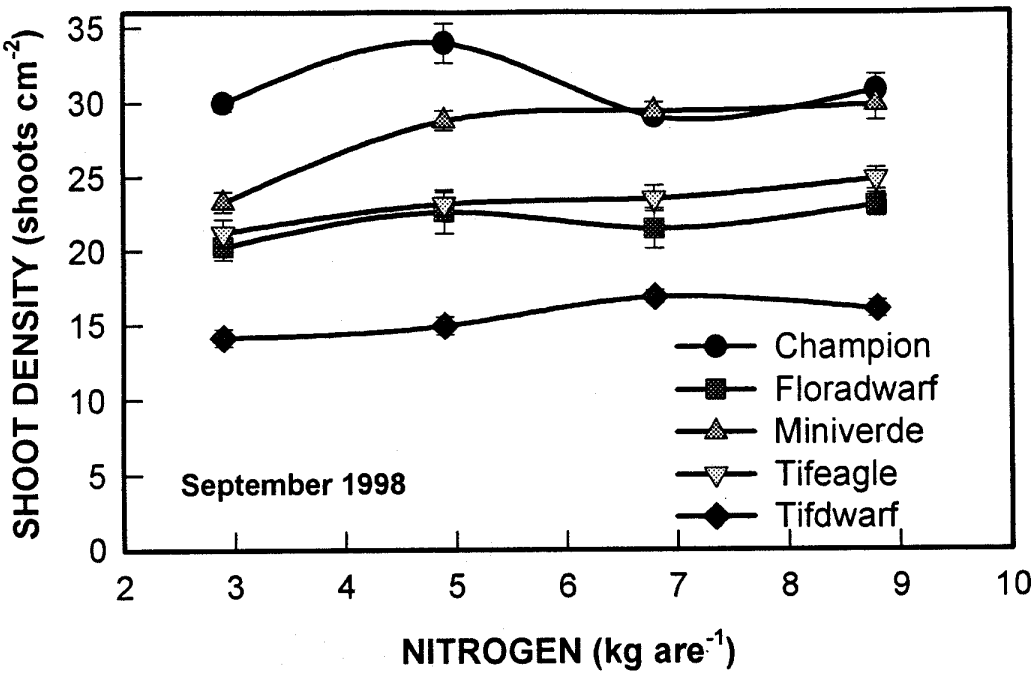

Figure 5. Shoot density on 29 September 1998 for five bermudagrass cultivars as influenced by nitrogen fertilization.

IV. Golf Green Bermudagrass Evaluation and Adaptation Trial

INTRODUCTION

Bermudagrass is the most highly adapted grass for use on golf greens in hot, humid regions. Tifgreen and Tifdwarf bermudagrasses have been used extensively in the southern United States for putting green use during the past three to four decades. Tifdwarf has been the dominant choice during the past decade. Increased demand for bermudagrasses with "bentgrass" putting characteristics, off-type occurrence in Tifdwarf, and the potential disastrous results that could arise from dependence on a single variety have accelerated interest in development of new bermudagrasses for golf greens. Currently we are evaluating 15 newly released and near release bermudagrasses for golf green use. Some of these grasses have been described as "vertical", "horizontal" and both vertical and horizontal dwarfs. The new dwarf bermudagrasses possess distinctly different growth characteristics than bermudagrass varieties, such as Tifdwarf and Tifgreen, previously used on golf greens. Performance of several of these varieties is well established based on replicated trials at many locations. However, some have limited testing in replicated performance trials. Much less information exists on the management requirements of these new dwarf bermudagrasses. For example, many superintendents report greater difficulty in fall overseeding and in spring transition with some of the new dwarf bermudagrasses. The intent of this study is to evaluate the performance and adaptation of recently released and near release bermudagrasses in South Central Texas. The objectives of this study are to determine 1) the performance, mowing tolerance, and pest resistance of 15 experimental and commercially available bermudagrasses and 1 zoysiagrass on a golf green and, 2) the the response of experimental and commercially available bermudagrasses and a zoysiagrass to fall overseeding and spring transition.

MATERIALS AND METHODS

Fifteen bermudagrasses were planted as 1 square inch plugs on 6 inch centers in 5 feet by 6 feet plots on 28 May 1997 to a USGA specification golf green. Diamond zoysiagrass was planted as sod. Individual grasses were replicated six times. Following planting through about 1 August 1997 0.5 to 0.75 lb of nitrogen per 1000 square feet was applied weekly. Phosphorus, potassium, and other nutrients were supplied as needed. Irrigation was applied uniformly. Mowing height was maintained at 0.188 inch during 1 June through July.

The experimental design is a split-block design with mowing height as main plots and cultivar as sub-plots. Mowing height treatments were imposed during early August and consisted of 0.125 and 0.188 inch bench bedknife settings. An additional split was applied on 28 October with treatments consisting of overseeding species. One-half of each plot received perennial ryegrass at 30 pounds of seed per 1000 square feet and the other half received rough bluegrass at 15 pounds of seed per 1000 square feet.

Monthly visual assessments of turfgrass quality, color, density, and seed head production were taken. Percentage of plot area covered was also assessed visually. All data were subjected to an analysis of variance.

RESULTS

Substantial differences in turf quality existed among cultivars and mowing heights during 1998 (Table 3). In general, turf quality was better at a mowing height of 0.187 than at 0.125 inch. However, cultivars such as MiniVerde, TifEagle, Mobile, Champion, Floradwarf, Lakewood, and MS Supreme performed well regardless of mowing height. Non-dwarf type grasses, such as Tifgreen and Tif 94-29, performed better at 0.187 than at the 0.125 inch mowing height. April turf quality evaluations reflect overseeding grass stand quality as well as bermudagrass contribution to the putting surface in spring but is primarily due to the overseeded grass. The newer dwarf culitvars, such as MiniVerde, TifEagle, MS Supreme, and Champion had good to excellent quality in early April. No cultivation of the area was used in preparation of overseeding. These data indicate that the more dense bermudagrass cultivars can be overseeded successfully.

Poa trivialis produced higher turf quality than perennial ryegrass in fall of 1997 and winter of 1998 (data not presented) and during spring of 1998 (Table 2). This occurred because of poorer penetration of the canopy by the larger ryegrass seed. However, during late-spring and early-summer, turf quality of the bermudagrasses was more negatively affected by *Poa trivialis* than by perennial ryegrass. This may have occurred because of more competition from *Poa trivialis* than from perennial ryegrass.

SUMMARY

Several new-dwarf bermudagrasses provided good to excellent turf quality at 0.125 inch mowing heights and were superior to Tifdwarf . Mean turf quality of MiniVerde, TifEagle, Champion, Mobile, Floradwarf, MS Supreme, Lakewood, and TXDB67 was superior to Tifdwarf at a mowing height of 0.125 inch. Only MiniVerde and TifEagle produced higher quality than Tifdwarf at a mowing height of 0.187 inch. The results of this study indicate that several cultivars show promise for providing superior surfaces on golf greens.

FUTURE

We will continue to monitor turf quality and performance of these cultivars in 1999. Ball roll distance measurements will be accomplished for all cultivars in 1999. Overseeding transition in fall and spring will be assessed.

Table 3. Turf quality of 15 bermudagrass genotypes and 1 zoysiagrass genotype at two mowing heights in College Station, Texas in 1998.

Genotype	9 Apr	30 Apr	20 May	12 June	2 July	22 July	20 Aug	28 Sept	Mean
	0.187 inch								
Miniverde	7.8†	5.5	6.2	6.2	6.9	6.1	7.3	6.3	6.5
Tifeagle	6.7	5.3	6.0	6.2	5.9	5.8	6.7	6.2	6.1
Mobile	7.2	5.1	5.3	5.3	5.3	5.2	7.2	6.2	5.8
MS Supreme	5.8	4.7	5.3	6.0	6.1	5.8	7.4	5.3	5.8
Champion	6.5	4.8	5.3	5.4	5.3	5.3	6.7	6.2	5.7
Lakewood	6.7	5.0	4.8	5.4	5.7	4.8	7.3	4.8	5.6
Tif 94-18	6.3	4.8	6.1	5.9	5.3	6.1	4.5	3.8	5.4
Floradwarf	5.5	4.3	5.3	5.3	5.3	5.2	6.2	5.8	5.3
TXDB67	5.2	4.2	5.1	5.8	6.3	5.2	6.2	4.5	5.3
Tifdwarf	5.5	4.8	4.3	5.3	5.8	5.3	6.3	4.3	5.2
Tifgreen	5.3	5.0	4.8	4.8	5.4	5.6	5.7	4.0	5.1
Tif 94-29	6.7	5.2	4.4	4.6	5.6	6.3	4.2	3.2	5.0
Tif 94-21	4.7	4.6	4.2	5.1	5.6	6.5	4.5	3.7	4.8
Baby	4.5	4.3	3.5	4.5	4.9	5.8	5.0	3.8	4.5
Diamond	3.8	3.4	3.7	4.0	4.0	5.3	5.3	6.0	4.4
Tif 94-16	4.7	3.8	3.5	4.5	4.4	5.8	4.0	3.0	4.2
$FLSD_{0.05}G$‡	1.1	0.9	1.0	0.7	1.0	0.9	1.3	0.7	0.6
	0.125 inch								
Miniverde	6.3	5.1	6.7	6.0	6.2	6.4	7.8	6.2	6.3
Tifeagle	5.8	5.0	5.6	5.7	5.9	5.9	7.2	6.5	5.9
Champion	6.4	5.5	5.7	5.4	5.8	5.3	6.4	5.7	5.8
Mobile	7.0	5.3	5.4	5.4	5.4	4.2	6.3	5.0	5.5
Floradwarf	5.8	4.6	5.3	5.4	5.3	5.3	5.6	6.0	5.4
MS Supreme	5.4	4.6	5.5	5.3	5.5	5.3	6.8	4.8	5.4
Lakewood	6.3	4.7	5.0	5.0	5.4	4.8	5.1	4.5	5.1
TXDB 67	5.6	4.6	5.3	5.6	5.7	4.2	5.2	4.5	5.1
Tif 94-18	5.8	4.7	6.3	5.8	5.6	2.8	4.3	4.2	4.9
Tifdwarf	5.0	4.9	4.4	5.1	5.0	3.7	4.1	3.8	4.5
Tif 94-21	4.3	4.4	4.3	5.0	5.2	2.5	4.0	4.0	4.2
Tif 94-29	5.2	4.5	4.3	4.3	4.8	2.7	3.8	3.8	4.2
Tifgreen	4.5	4.5	4.7	4.7	4.7	3.3	3.7	3.7	4.2
Baby	3.9	4.1	3.9	4.5	4.8	3.3	3.3	3.3	3.9
Tif 94-16	4.2	4.3	3.8	4.2	4.6	3.2	3.4	3.5	3.9
Diamond	3.5	3.3	3.3	3.2	3.1	3.8	4.2	4.8	3.7
$FLSD_{0.05}G$	1.4	0.9	0.7	0.5	0.6	0.8	1.0	0.7	0.4

†Visual turfgrass quality ratings based on 1=poorest and 9=best.

‡$FLSD_{0.05}G$, Fisher's Protected Least Significant Difference for comparison of turfgrass means within columns.

Table 4. Visual quality ratings of 15 bermudagrass genotypes and 1 zoysiagrass genotype overseeded with roughstalk bluegrass or perennial ryegrass in College Station, Texas in 1998.

Genotype	9 Apr	30 Apr	20 May	12 June	2 July	22 July	20 Aug	28 Sept	Mean
Ryegrass	5.3†	4.1	5.4	6.1	5.9	5.1	5.3	4.7	5.2
Bluegrass	5.8	5.2	4.4	4.2	4.8	4.7	5.7	4.7	4.9
$FLSD_{0.05}G$‡	0.4	0.6	0.3	0.1	0.3	ns§	0.1	ns	0.2

†Visual turfgrass quality ratings based on 1=poorest and 9=best.

‡$FLSD_{0.05}G$, Fisher's Protected Least Significant Difference for comparison of turfgrass quality ratings within columns.

§ ns, No significant difference.