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Turf Performance of St. Augustinegrass Cultivars in North Mississippi

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H.W. Philley
Research Assistant II
Department of Plant and Soil Sciences

J.V. Krans
Agronomist
Department of Plant and Soil Sciences

C.E. Watson, Jr.
Agronomist
Department of Plant and Soil Sciences

J.M. Goatley, Jr.
Associate Agronomist
Department of Plant and Soil Sciences

V.L. Maddox
Research Assistant I
Department of Plant and Soil Sciences

M. Tomaso-Peterson
Research Assistant II
Department of Plant and Soil Sciences

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Introduction

St. Augustinegrass [*Stenotaphrum secundatum* (Walt.) Kuntze] is a popular perennial turfgrass in Mississippi. A southern tradition, this grass has been passed from neighbor to neighbor. St. Augustinegrass is easily established by plugs, sprigs, or sod and spreads rapidly by stolons, forming a low-growing, dense turf with coarse-textured leaves. St. Augustinegrass performs best in full sun but is one of the most shade-tolerant warm-season turfgrasses. On sites where sunlight is limited to 30 to 50 percent, this is the recommended warm-season turfgrass (Duble, 1989).

St. Augustinegrass can be devastated by insects and disease. The southern chinch bug (*Blissus insularis* Barber) is quite damaging to susceptible cultivars. Brownpatch (caused by *Rhizoctonia solani* Kuhn) and gray leaf spot (caused by *Piricularia grisea* (Cke.) Sacc.) are among the more important diseases of St. Augustinegrass. In some areas of Mississippi, the mechanically transmitted St. Augustine decline strain of Panicum mosaic virus (SAD) can be extremely devastating to susceptible cultivars.

Another limitation of St. Augustinegrass is its lack of cold tolerance. Being of tropical origin, this grass has no rhizomes. For the plant to survive, buds associated with nodes at or above the soil surface must remain alive through the winter. Urban or residential sites often provide some protection from cold; however, wide open sites required for sod production often experience severe winterkill. Presently, only limited quantities of St.

Augustinegrass sod are produced in Mississippi.

Plant breeding and selection have produced a number of improved cultivars of St. Augustinegrass. Genotypes have been selected for insect and disease resistance, shade tolerance, leaf texture, growth habit and rate, cold tolerance, and overall turf quality (Busey, 1995). Although diploid St. Augustinegrasses (2n=2x=18) are usually capable of producing fertile seed, cultivars are generally vegetatively propagated clones of a single genotype. Genotypes with 27 or more chromosomes are referred to as polyploids. It is among the polyploids that resistance to chinch bugs has been observed.

Two of the earlier selections out of 'Florida Common' St. Augustinegrass were 'Roselawn' and 'Bitterblue' (Hanson, 1972; Wise, 1961). Roselawn was selected in 1931 and informally released by the Everglades Experiment Station, Belle Glade, Florida as a forage grass in 1944. Bitterblue was selected by sod producers but was never officially released. The demand for St. Augustinegrass sod brought about widespread misuse of the name "Bitterblue." Roselawn and common types were also marketed under this name. Bitterblue is described as being lower growing and more shade tolerant than Florida Common. The first officially released St. Augustinegrass was 'Floratine,' released by the Florida Agricultural Experiment Station in 1959. With the Blue Tag certification program, the University of Florida attempted to control the use of the name "Bitterblue" and protect against misrepresentation in the market (Busey and White, 1993; Hanson, 1972).

'Floratam' (FA-110) St. Augustinegrass was jointly released from the Florida and Texas Agricultural Experiment Stations in 1973 because of its resistance to southern chinch bug and SAD (Reinert et al., 1981). By 1980, Floratam sod became the main turfgrass sold in Florida (Busey and White, 1993). Floratam is coarse textured and lacks cold tolerance. Floratam is an aneuploid with a somatic chromosome number of 2n=32 and low fertility (Reinert and Dudeck, 1974; Reinert et al., 1981; Busey et al., 1982). 'Floralawn' (FA-108) was released by the Florida Agricultural Experiment Station in 1985. Floralawn is a sibling of Floratam (Dudeck et al., 1986). Within 12 years after the release of Floratam, new biotypes of southern chinch bug were capable of seriously damaging both Floratam and Floralawn (Busey, 1990). Experimental cultivars, FX-2, FX-10, and FX-33, were found to be resistant to the new biotypes of chinch bug. 'FX-10' was released by the University of Florida in 1990 (Busey, 1993).

'Texas Common' St. Augustinegrass has been grown in Texas for more than 100 years. This strain of St. Augustinegrass is somewhat cold tolerant but is susceptible to SAD virus and chinch bug damage. Texas Common is a fertile diploid with 2n=2x=18 (Duble, 1989; Busey, 1991). 'Raleigh' (NCSA 21) was released by the North Carolina Agricultural Experiment Station in 1980 as a cold-tolerant, SAD-resistant St. Augustinegrass (Beard, 1980; Duble, 1989; Busey 1991).

'Seville' (U.S. Plant Patent No. 4097) St. Augustinegrass was released in 1980 by O.M. Scott and Sons Company. Seville was selected from open-pollinated progeny of a purple stigma, diploid parent because of its low growth habit and dark green color (Riordan et al., 1980). 'DelMar' (U.S. Plant Patent No. 6372), released by O.M. Scott and Sons Company in 1986, was selected for cold tolerance and SAD resistance. DelMar resulted from controlled pollination of Seville with a cold-tolerant selection obtained from Memphis, TN (Riordan et al., 1991). Other cultivars released from O.M. Scott and Sons Company, but not yet registered, are 'Jade' and 'Sunclipse' (Meier, 1992, personal communication).

Numerous St. Augustinegrass ecotypes have been collected in northern Mississippi and southern Tennessee for evaluation at Mississippi State University. The objective of this experiment was to evaluate commercial and experimental St. Augustinegrass cultivars for turf performance in north-central Mississippi.

Materials and Methods

Twenty-seven St. Augustinegrasses, including commercially available and experimental cultivars, were planted on June 14, 1990 at the Mississippi State University Plant Science Research Center in a randomized complete block design with three replications (Table 1). Six 7.6-cm (3-in) diameter vegetative plugs were planted within each 2.75-m x 2.75-m (9-ft x 9-ft) plot. The site was in full sunlight with approximately one

percent slope. The soil type was a Marietta fine sandy loam (fine-loamy, siliceous, Fluvaquentic Eutrochrept) with a pH of 6.8. Soil tests indicated medium levels of P and K. Nitrogen was applied in four equal applications for a total of 19.6 grams per square meter per year. Phosphorus and K were applied at 4.9 grams per square meter each spring with 13-13-13 fertilizer as the source. The trial was mowed weekly to a 6.4-cm (2.5-in) height throughout each growing season. Plot borders were maintained with monthly applications of glyphosate.

The experiment was rated for establishment October 25, 1990 by visually estimating the percent cover of each plot. From 1991 through 1994, the experiment was rated monthly during the growing season for turfgrass quality. Components influencing turfgrass quality included plot uniformity, shoot density, leaf texture, and color. A visual rating scale of 1 to 9 was used, with 9 indicating the highest turf quality and 1 the poorest.

Winter survival was evaluated in April of 1991 through 1995. Survival was assessed by assigning a score of 1 to 9, where 9 indicated complete survival and 1 indicated complete winterkill.

Seedhead density was evaluated in June of 1991, 1992, and 1993. A rating scale of 1 to 9 was used, with 1 indicating the highest seedhead frequency and 9 indicating no seedheads.

All data were subjected to analysis of variance using the ANOVA procedure of SAS (SAS Institute, 1988). Mean separation was by Fisher's protected least significant difference. Means were averaged across years, where applicable, to allow cultivar recommendations.

Results and Discussion

Estimated percent cover of St. Augustinegrass cultivars differed significantly on October 25, 1990 (Table 2). This measurement is a reflection of growth rate potential. Most commercially available cultivars displayed good establishment (greater than 70% cover). Commercial cultivars displaying slow establishment in this experiment included Bitterblue, Sunclipse, FX-10, and DelMar. An experimental cultivar, M1, displayed the poorest establishment (20% cover).

In each of 5 years, St. Augustinegrass cultivars differed significantly in winter survival (Table 3). This trait is key to adaptation in north Mississippi. In general, the diploid types, including MSA-10, S-71-770, DelMar, MSA-11, MSA-2, M1, MSA-20, Mercedes, Raleigh, and S-71-2090, displayed the highest winter survival. Polyploids, including Floralawn, Floratam, FX-33, and FX-10, displayed the poorest winter survival. The popular cultivars, Bitterblue and Seville, displayed intermediate winter survival. These results compared favorably with those of a laboratory study that predicted lethal low temperatures for selected St. Augustinegrass cultivars (Philley et al., 1995).

Average turfgrass quality ratings for each of 4 years are presented in Table 4. St. Augustinegrass cultivars differed significantly in turf quality within each year. Diploid cultivars, including S-71-770, MSA-10, Seville, Raleigh, Mercedes, MSA-11, MSA-2, MSA-20, and S-71-2090, displayed the highest average turf quality. Diploid cultivars were generally finer textured and displayed higher shoot density than polyploids. Coarser-textured polyploids, including FX-10, FX-33, Floralawn, and Floratam, as well as finer-textured diploids, TR 6-3 (DD-l) and FX-313, often lacked uniformity. This may partly be explained by winter injury.

St. Augustinegrass cultivars displayed significant differences in seedhead density in each of 3 years (Table 5). Polyploids, including FX-33, Floralawn, and Floratam, produced the fewest seedheads. Among diploids, Sunclipse and M1 produced the fewest seedheads, while Seville, Jade, and S-6-72-107 displayed the highest seedhead density. Seedheads are undesirable on a St. Augustinegrass lawn. They detract from turf quality and require removal by mowing. Fertile diploids also have the potential to produce contaminating off-types from seed.

Conclusions

Polyploid St. Augustinegrass cultivars, such as Floratam, Floralawn, and FX-10, have been selected for resistance to southern chinch bugs and SAD virus. These cultivars, especially Floratam, are widely used in areas where these pests are a problem and winter injury is not. Occurrence of SAD virus has not been reported in north Mississippi. In the absence of chinch bugs, diploid cultivars displayed higher turf quality because of higher uniformity, higher shoot density, and finer leaf texture. More importantly, cultivars such as Raleigh, DelMar, and experimentals MSA-10, S-71-770, MSA-11, and MSA-2 displayed superior cold tolerance, which is necessary for adaptation in north Mississippi. Before a cultivar can have widespread residential application in Mississippi, it must first be produced by sod farms on open sites with little protection from cold. Floratam, Floralawn, and FX-10 suffered significant winter injury each year. The popular cultivars, Bitterblue and Seville, displayed only intermediate winter survival. Diploid cultivars produced seedheads that required mowing to maintain turf quality.

Based upon winter survival and turf quality, the recommended commercially available cultivars for north Mississippi are Raleigh, DelMar, and Mercedes. DelMar, however, was slow to establish in this experiment. Experimental cultivars, S-71-770, MSA-10, MSA-11, and MSA-2, show promise for future release. Cultivars displaying cold tolerance have not been fully evaluated for chinch bug resistance.

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Table 1. Sources of St. Augustinegrass cultivars evaluated at Mississippi State University during 1990-1995.

Cultivar	Ploidy	Source
DALSA8401	diploid	Texas A & M University
FX-10	polyploid	University of Florida
FX-261	diploid	University of Florida
FX-313	diploid	University of Florida
FX-33	polyploid	University of Florida
FX-332	polyploid	University of Florida
M1	diploid	Milberger Turf Farms Company
MSA-2	diploid	Mississippi State University
MSA-11	diploid	Mississippi State University
MSA-20	diploid	Mississippi State University
S-6-71-138	diploid	O.M. Scott and Sons Company
S-6-72-107	diploid	O.M. Scott and Sons Company
S-71-2090	diploid	O.M. Scott and Sons Company
S-71-770	diploid	O.M. Scott and Sons Company
TR6-10 (DD-II)	diploid	Douget/Crenshaw Turfgrass
TR6-3 (DDI)	diploid	Douget/Crenshaw Turfgrass
Bitterblue	polyploid	University of Florida
DelMar	diploid	O.M. Scott and Sons Company
Floralawn	polyploid	University of Florida
Floratam	polyploid	University of Florida
Jade	diploid	Turfgrass Associates, Inc.
Mercedes	diploid	Patten Seed & Turfgrass Company
Raleigh	diploid	North Carolina State University
Seville	diploid	O.M. Scott and Sons Company

Sunclipse	diploid	O.M. Scott and Sons Company
MSA-10	diploid	Mississippi State University
MSA-21	diploid	Mississippi State University

Table 2. Establishment of St. Augustinegrass cultivars evaluated at Mississippi State University on October 25, 1990.

Cultivar	% cover
FX-332	94.3
Seville	91.7
Raleigh	88.3
FX-261	86.7
Floratam	85.0
Floralawn	81.7
Mercedes	81.7
FX-313	80.0
TR 6-10 (DD-II)	78.3
Jade	45.0
MSA-21	75.0
MSA-10	75.0
FX-33	73.3
S-71-770	73.3
MSA-11	66.7
MSA-2	65.0
S-6-71-138	65.0
MSA-20	65.0
S-6-72-107	65.0
DALSA 8401	60.0
S-71-2090	58.3
TR 6-3 (DD-I)	58.3
Bitterblue	56.7
Sunclipse	56.7
FX-10	46.7
DelMar	46.7
M1	20.0
Mean	69.2
LSD (0.05)	26.0

Table 3. Winter survival ratings of St. Augustinegrass cultivars evaluated at Mississippi State University.

	Year					
Cultivar	1991	1992	1993	1994	1995	5-year average
MSA-10	5.7*	5.6	5.9	5.1	7.0	5.9
S-71-770	5.4	5.7	6.0	4.2	7.0	5.7
DelMar	4.8	6.0	6.4	3.7	7.0	5.6
MSA-11	4.8	5.7	5.8	3.6	7.0	5.4
MSA-2	4.8	5.4	5.9	3.9	6.7	5.3
M1	4.7	5.2	6.1	3.9	6.7	5.3
MSA-20	4.8	5.4	5.4	3.9	7.0	5.3
Mercedes	5.4	5.0	5.5	3.6	7.0	5.3
Raleigh	4.3	5.1	5.9	4.8	6.3	5.3
S-71-2090	4.4	5.9	6.1	3.3	6.0	5.2
S-6-71-138	4.6	5.3	5.6	2.4	7.0	5.0
MSA-21	4.9	5.1	4.8	3.4	6.0	4.8
DALSA8401	5.0	4.6	5.1	3.4	6.0	4.8
Jade (6-72-182)	6.1	4.4	4.9	2.3	6.0	4.8
S-6-72-107	4.8	4.4	5.6	2.3	6.0	4.6
TR 6-10 (DD-II)	4.6	4.9	5.1	2.2	6.3	4.6
Seville	3.6	4.1	4.9	2.7	4.7	4.0
Sunclipse (6-72-130)	4.3	3.7	4.1	1.6	4.3	3.6
Bitterblue	2.8	3.7	5.2	1.6	4.0	3.4
FX-313	4.0	3.7	4.6	1.2	3.3	3.4
TR 6-3 (DD-I)	3.7	3.3	3.8	1.2	4.3	3.3
FX-261	3.7	3.0	4.2	1.1	4.0	3.2
FX-332	2.9	3.2	3.6	1.2	4.3	3.0
Floralawn	2.4	3.0	4.1	1.0	3.0	2.7
Floratam	2.0	2.2	4.0	1.0	3.7	2.6
FX-33	2.0	2.0	4.1	1.1	3.3	2.5
FX-10	2.1	2.1	2.9	1.0	2.0	2.0
Mean	4.2	4.4	5.0	2.6	5.4	4.3
LSD (0.05)	1.3	0.8	1.2	1.4	0.9	0.9

*1 = complete winterkill, 9 = complete survival

Table 4. Turf quality of St. Augustinegrass cultivars evaluated at Mississippi State University.

	Year				

Cultivar	1991	1992	1993	1994	4-year average
S-71-770	6.7*	6.7	6.7	6.5	6.6
MSA-10	6.4	6.7	6.3	6.8	6.6
Seville	6.7	6.2	6.6	6.5	6.5
Raleigh	6.6	6.4	6.6	6.3	6.5
Mercedes	6.7	6.5	6.3	6.3	6.4
MSA-11	6.2	6.7	6.2	6.5	6.4
MSA-2	6.1	6.6	6.3	6.6	6.4
MSA-20	6.3	6.5	6.2	6.6	6.4
S-71-2090	5.9	6.5	6.7	6.4	6.4
FX-332	6.5	6.1	6.5	6.0	6.3
FX-261	6.9	6.2	6.2	5.7	6.2
DelMar	5.4	6.6	6.3	6.2	6.1
MSA-21	6.5	6.5	6.0	5.3	6.1
DALSA8401	6.1	6.3	5.7	6.0	6.0
Jade	6.7	6.3	5.9	5.2	6.0
S-6-71-138	6.0	6.6	5.9	5.6	6.0
TR-610 (DD-II)	6.6	6.2	6.0	5.1	6.0
S-6-72-107	6.1	6.0	6.2	5.3	5.9
Sunclipse	6.2	6.2	6.2	4.4	5.8
Bitterblue	5.2	5.6	5.9	5.4	5.5
M1	4.8	5.7	5.8	5.6	5.5
Floratam	5.8	5.2	5.7	4.3	5.2
Floralawn	5.5	5.3	5.6	4.3	5.2
FX-313	6.4	5.6	5.6	2.9	5.1
TR 6-3 (DD-I)	5.8	5.5	5.8	3.3	5.1
FX-33	5.2	5.3	5.8	3.9	5.0
FX-10	4.3	4.7	5.4	4.2	4.7
Mean	6.1	6.1	6.1	5.4	5.9
LSD (0.05)	0.9	0.4	0.7	0.4	0.6

* Quality ratings 1 - 9; 9 = best.

Table 5. Seedhead density of St. Augustinegrass cultivars evaluated at Mississippi State University.

	Year			
Cultivar	**1991**	**1992**	**1993**	**Average**
FX-33	7.3*	7.7	7.7	7.6
Floralawn	6.3	7.3	6.3	6.7
Sunclipse	8.0	7.7	4.0	6.6

Floratam	6.7	7.0	5.7	6.4
M1	6.7	7.7	5.0	6.4
FX-332	6.3	7.0	4.7	6.0
FX-261	5.7	7.3	4.7	5.9
FX-313	5.7	6.7	4.7	5.7
S-71-2090	6.7	5.3	5.0	5.7
TR6-3 (DD-I)	5.3	7.0	4.3	5.6
Bitterblue	5.3	5.0	6.3	5.6
S-71-770	6.3	6.0	4.0	5.4
S-6-71-138	6.3	5.3	4.7	5.4
FX-10	3.7	6.7	5.7	5.3
MSA-11	5.3	5.7	4.3	5.1
Mercedes	5.0	5.3	4.0	4.8
MSA-2	4.3	4.7	5.0	4.7
MSA-20	5.0	4.7	4.3	4.7
TR6-10 (DD-II)	6.0	4.3	3.7	4.7
MSA-21	5.7	3.7	4.3	4.6
DelMar	4.7	4.3	4.3	4.4
DALSA8401	5.0	4.0	4.0	4.3
Raleigh	4.7	4.0	4.3	4.3
MSA-10	4.3	4.0	4.3	4.2
S-6-72-107	3.7	3.8	4.3	3.9
Jade	3.3	3.7	4.3	3.9
Seville	2.0	5.0	3.7	3.6
Mean	5.4	5.6	4.7	5.2
LSD	1.8	1.2	1.2	1.1

9 = no seed heads, 1 = highest density