September 1981

Warm Season Perennial Forage Grass Trials in Alabama

Department of Agronomy and Soils
Departmental Series No. 65
Alabama Agricultural Experiment Station
Auburn University
Auburn University, Alabama
Gale A. Buchanan, Director

WARM SEASON PERENNIAL FORAGE GRASS TRIALS IN ALABAMA

C. S. Hoveland, M. W. Alison, Jr., R. R. Harris, W. B. Webster, V. H. Calvert II, J. T. Eason, M. L. Ruf, L. L. Walker, H. C. Hoyle, E. L. Carden, N. R. McDaniel, and F. B. Selman[1]/

Improved warm season perennial grasses produce high forage yields when adequately fertilized. However, forage digestibility of these grasses is generally low, resulting in poor animal performance. Thus, warm season perennial grasses with higher digestibility are needed.

Several new improved warm season perennial grasses were planted at four locations in Alabama to evaluate their yield potential, persistence, and digestibility. Most of the entries in the tests were bermudagrasses (Cynodon dactylon), but also included were limpograsses (Hemarthria altissima) and paspalum (Paspalum sp.) Entries were:

(1) Coastal, a hybrid between Tift bermuda and a tall-growing introduction from South Africa, which was developed by Dr. G. W. Burton, USDA-ARS, Tifton, Georgia.

(2) Tifton 44, a hybrid between a high-quality bermudagrass selection from Kenya, East Africa, and a cold-hardy plant from Germany, which was developed by Dr. G. W. Burton, USDA-ARS, TIfton, Georgia.

(3) Tifton 26-6, 84, 3408, 35-3, 31-6, 21-6, 40-6, 37-5 x 49-4, 34-5 x 21-6, 34-4, 35-5 x 49-4, and Coastcross-3 and 34-5 are experimental bermuda hybrids selected for high digestibility and cold

---

1/ Respectively, Professor and Research Associate, Department of Agronomy and Soils; Professor, Department of Animal and Dairy Sciences; Superintendent and Assistant Superintendent, Tennessee Valley Substation; Superintendent and Associate Superintendent, Sand Mountain Substation; Superintendent and Assistant Superintendent, Plant Breeding Unit; and Superintendent, Associate Superintendent, and Assistant Superintendent, Gulf Coast Substation.

tolerance by Dr. G. W. Burton, USDA-ARS, Tifton, Georgia.

(4) Oklahoma 71 x 6-7 and Oklahoma LCB 7-25 bermuda hybrids were selected for improved nutritive quality, yield, and cold tolerance by Dr. C. M. Taliaferro, Agronomy Department, Oklahoma State University, Stillwater, Oklahoma.

(5) Pasto Rico is a giant, seed-producing bermudagrass selected in Arizona and marketed by Northrup, King and Co.

(6) Redalta, Greenalta, and Bigalta limpograss varieties are stoloniferous grasses collected by Dr. A. J. Oakes, USDA-ARS, in the eastern Transvaal, Republic of South Africa, as P.I.'s 299993, 299994, and 299995. They were cooperatively released as varieties in 1978 by the University of Florida and the Soil Conservation Service, USDA.

(7) Paspalum spp. P. I.'s 404368 and 404655 from southern Brazil were selected at Auburn University for leafiness and long growing season.

Plantings were made at four locations during April or early May 1978, 1979, and 1980. Vegetative material of all entries except Pasto Rico bermuda and paspalum 404368 and 404655 were planted in 4- x 20-foot plots replicated four times, with 6 feet between plots to prevent mixing of the varieties. Pasto Rico bermuda and the two paspalums were broadcast seeded.

Mineral fertilizers were applied according to soil test and 50 pounds of nitrogen per acre applied at planting followed by 50 pounds per acre 1 month later and 50 pounds per acre after each

harvest. In subsequent years, 100 pounds of nitrogen per acre was applied in April and after each harvest. Plots were harvested with a flail harvester at 4- to 8-week intervals, depending on growth. Grass ground cover was estimated in each plot during the spring to determine winter survival.

In vitro dry matter digestibility (IVDMD) of hand-harvested forage from each plot at each harvest was determined throughout the 1980 season at the Plant Breeding Unit.

RESULTS

Establishment

Good stands were obtained initially; however, persistence varied widely. Tifton 34-8 and 21-6 had especially rapid establishment with stolon (horizontal above-ground stems) growth of more than 4 feet just two months after planting. Limpograss establishment rate was similar to that for Coastal bermuda. Tifton 44 bermuda formed a complete ground cover slower than other varieties.

Winter Survival

In contrast to previous trials where Tifton 44 had superior winter survival as compared to Coastal bermuda, the varieties performed equally well in this respect except in the 1980 planting at the Tennessee Valley Substation where substantial winterkill of Coastal occurred, tables 1-7. All three limpograsses were winterkilled in northern Alabama. Redalta limpograss was severely injured in the central part of the State. At the Gulf Coast Substation, Redalta limpograss survived well and remained green much of the winter. Two new bermuda hybrids, Oklahoma LCB7-25, and Oklahoma 71 x 6-7, had excellent cold hardiness in northern Alabama, table 4. Five new

Tifton bermuda hybrids had adequate cold hardiness for central Alabama but not for northern Alabama, table 5.

Forage Yield

In the older tests at three locations, Tifton 44 and Coastal bermuda were the highest yielding entries, tables 1, 2, and 3. At the Gulf Coast Substation, Redalta limpograss yields were similar to Tifton 44 and Coastal bermuda. Both paspalum introductions were less productive than the top bermudagrass or limpograss.

In the bermuda-limpograss trials, Tifton 44 bermuda was the most productive grass in northern Alabama, table 4. In central Alabama, Coastal bermuda was most productive the second year, table 5. Several bermuda hybrids equalled the yield of Coastal and Tifton 44. Pasto Rico production was below Tifton 44 the second year in northern Alabama and much below other bermudagrasses in the central part of the State. Some leaf spot was found on Pasto Rico, a problem that might have been severe had there not been a severe drought in 1980. Limpograss yields were low the establishment year and only Redalta limpograss had any production the second year in central Alabama.

Establishment year production of new bermuda hybrids was low in 1980 as a result of the drought, tables 6 and 7. However, several showed potential for rapid establishment, growth, and winter survival.

Forage Quality

Redalta limpograss and Tifton 26-6, 44, and 84 bermudagrasses had consistently higher digestibility than Coastal bermuda, table 8. In another trial, Tifton 44 again was superior to Coastal in digestibility, table 9. Most remarkable in this test were digestibility

values for some hybrids that were considerably above that of either Coastal or Tifton 44 throughout the season. This offers hope that higher quality bermudagrass varieties will be released by breeders in the future. Several of these high digestibility hybrids also have considerable cold hardiness, table 10. Hybrids with high digestibility should result in higher animal performance than is now achieved on warm season perennial grasses.

SUMMARY

Warm season perennial forage grass trials were conducted at four locations during 1978, 1979, and 1980.

Results of those trials show that Tifton 44 had greater cold hardiness than Coastal. Where cold hardiness was a problem, forage yields of both varieties were equal or superior to other bermudagrasses.

Forage digestibility of Tifton 44 was superior to that of Coastal bermuda. Several new bermuda hybrids were considerably higher in digestibility than either Tifton 44 or Coastal.

Limpograsses were not cold hardy in central and northern Alabama. In the Gulf Coast area, Redalta limpograss was cold hardy and its yield over a 3-year period equalled that of Coastal and Tifton 44 bermudagrass. Forage digestibility of Redalta limpograss was superior to that of Coastal bermudagrass.

Pasto Rico bermudagrass forage yield sharply declined the second year and was below that of other bermudagrasses.

At present, Tifton 44 is an attractive variety due to good cold hardiness and somewhat higher digestibility than Coastal.

Table 1. Forage yield of summer perennial grasses at Sand Mountain Substation, Crossville, Alabama (planted April 12, 1978)

Entry	Percent ground cover May 1, 1979	Tons dry forage per acre		
		1978	1979	Average
Tifton 44 bermuda.....	60	1.6 b	4.4 a	3.0
Coastal bermuda.....	48	1.5 bc*	4.6 a	3.0
Tifton 84 bermuda.....	12	1.2 c	2.3 b	1.8
Tifton 26-6 bermuda.....	2	1.2 c	1.1 c	1.2
Redalta limpograss.....	0	2.5 a	0	1.2

*Any two yields within a column marked with the same letter are not significantly different at the 5 percent level.

Table 2. Forage yield of summer perennial grasses at the Plant Breeding Unit, Tallassee, Alabama (planted April 18, 1978)

Entry	Percent ground cover April 16, 1980	Tons dry forage per acre			
		1978	1979	1980	Average
Coastal bermuda.....	88	4.5 a*	8.8 a	6.7 a	6.7
Tifton 44 bermuda.....	100	3.0 b	8.1 a	5.6 ab	5.6
Tifton 26-6 bermuda.....	32	3.6 ab	7.0 b	2.6 c	4.4
Tifton 84 bermuda.....	82	2.0 c	6.2 c	4.5 b	4.2
Redalta limpograss.....	22	1.6 c	3.4 d	1.8 c	2.3

*Any two yields within a column marked with the same letter are not significantly different at the 5 percent level.

Table 3. Forage yield of summer perennial grasses at Gulf Coast Substation, Fairhope, Alabama (planted April 19, 1978)

Entry	Percent ground cover May 2, 1979	Tons dry forage per acre			
		1978	1979	1980	Average
Coastal bermuda.....	89	3.6 b*	8.6 a	8.6 c	6.9
Tifton 44 bermuda.....	98	3.9 ab	8.5 ab	8.3 ab	6.9
Redalta limpograss....	85	4.9 a	8.1 ab	7.2 abc	6.7
Tifton 26-6 bermuda...	77	3.7 b	8.4 ab	6.6 c	6.2
Tifton 84 bermuda.....	100	3.6 b	7.4 b	6.0 cd	5.7
Paspalum 404368.....	40	2.9 bc	5.8 c	6.9 bc	5.2
Paspalum.....	85	2.3 c	5.9 c	5.0 d	4.4

*Any two yields within a column marked with the same letter are not significantly different at the 5 percent level.

Table 4. Forage yield of bermuda and limpograsses at Tennessee Valley Substation, Belle Mina, Alabama (planted April 11, 1979)

Entry	Percent ground cover April 21, 1981	Tons dry forage per acre 1979	1980	Average
Tifton 44 bermuda	100	2.8 cde*	5.8 a	4.3
Tifton 21-6 bermuda	32	3.0 bcde	3.2 b	3.1
Oklahoma LCB 7-25 bermuda	93	2.4 de	3.0 b	2.7
Coastal bermuda	98	2.9 bcde	2.8 b	2.8
Pasto Rico bermuda	70	4.1 a	2.2 bc	3.2
Tifton 3408 bermuda	0	3.6 abc	1.4 c	2.5
Oklahoma 71 x 6-7 bermuda	100	3.0 bcde	1.0 c	2.0
Tifton 35-3 bermuda	0	3.2 bcde	0	-
Tifton 31-6 bermuda	0	3.8 ab	0	-
Tifton 40-6 bermuda	0	3.1 bcde	0	-
Greenalta limpograss	0	3.0 bcde	0	-
Redalta limpograss	0	2.3 de	0	-
Bigalta limpograss	0	2.1 d	0	-

*Any two yields within a column marked with the same letter are not significantly different at the 5 percent level.

Table 5. Forage yield of bermuda and limpograsses at Plant Breeding Unit, Tallassee, Alabama (planted April 6, 1979)

Entry	Percent ground cover May 13, 1981	Tons dry forage per acre 1979	1980	Average
Tifton 44 bermuda	100	5.7 a	7.4 ab	6.6
Coastal bermuda	100	4.7 ab*	7.5 a	6.1
Tifton 35-3 bermuda	100	5.5 a	6.6 abc	6.0
Tifton 44 bermuda	100	3.7 bc	6.2 bc	5.0
Tifton 31-6 bermuda	100	4.2 b	5.8 cd	5.0
Oklahoma 71 x 6-7 bermuda	100	3.5 c	4.9 de	4.2
Tifton 21-6 bermuda	90	4.0 b	4.1 e	4.0
Oklahoma LCB 7-25 bermuda	100	3.3 c	2.9 f	3.1
Tifton 40-6 bermuda	72	3.8 bc	2.8 fg	3.3
NK Pasto Rico bermuda	48	3.9 b	1.6 g	2.8
Redalta limpograss	27	1.8 d	1.6 g	1.7
Greenalta limpograss	0	2.2 d	0	-
Bigalta limpograss	0	1.5 d	0	-

*Any two yields within a column marked with the same letter are not significantly different at the 5 percent level.

Table 6. Forage yield of bermudagrass hybrids at Tennessee Valley Substation, Belle Mina, Alabama (planted May 8, 1980)

Entry	Percent ground cover April 2, 1981	Tons dry forage per acre 1980
Tifton 37-5 x 21-6	12	3.2 a*
Tifton 34-5 x 21-6 (79-16)	0	2.8 a
Tifton 34-4 (T-44 x Callie)	11	2.4 ab
Tifton 35-3 x 49-4	9	2.4 ab
Tifton Coastcross -3	10	2.3 ab
Tifton 34-5 x 21-6 (79-17)	70	1.7 bc
Tifton 44	95	1.6 c
Coastal	15	1.4 cd
Tifton 34-5 (T44 x Callie)	12	0.7 d

*Any two yields marked with the same letter are not significantly different at the 5 percent level.

Table 7. Forage yield of bermudagrass hybrids at Plant Breeding Unit, Tallassee, Alabama (planted April 25, 1980)

Entry	Percent ground cover May 13, 1981	Tons dry forage per acre 1980
Tifton 37-5 x 21-6	100	2.3 a*
Tifton Coastcross -3	80	2.0 ab
Tifton 34-5 x 21-6 (79-17)	84	1.6 bc
Tifton 34-4 (T-44 x Callie)	72	1.5 cd
Tifton 35-3 x 49-4	51	1.3 cd
Coastal	100	1.0 cde
Tifton 34-5 x 21-6 (79-16)	0	0.9 de
Tifton 44	100	0.6 e
Tifton 34-5 (T-44 x Callie)	60	0

*Any two yields within a column marked with the same letter are not significantly different at the 5 percent level.

Table 8. In vitro dry matter digestibility (IVDMD) of summer perennial grasses at Plant Breeding Unit, Tallassee, Alabama, 1980 (planted April 18, 1980)

Entry	Percent IVDMD of dry forage					
	May 27	June 20	July 28	Sept. 2	Oct. 16	Mean
Redalta limpograss.....	56.3	53.6	53.0	-	-	
Tifton 26-6 bermudagrass....	54.8	55.4	58.0	50.2	50.7	53.8
Tifton 84 bermudagrass.....	55.7	55.6	56.3	51.8	49.6	53.8
Tifton 44 bermudagrass.....	49.8	55.3	54.3	49.2	47.0	51.1
Coastal bermudagrass.....	48.1	48.1	51.5	45.6	46.6	47.9

Table 9. In vitro dry matter digestibility (IVDMD) of bermuda and limpograsses at Plant Breeding Unit, Tallassee, Alabama, 1980 (planted April 16, 1979)

Entry	Percent IVDMD of dry forage						
	May 27	June 30	July 28	Aug. 28	Sept. 2	Oct. 16	Mean
Tifton 40-6 bermuda.....	-	59.1	64.4	61.5	55.5	55.5	59.2
Tifton 21-6 bermuda.....	52.3	61.0	64.0	61.9	58.5	55.4	58.9
Tifton 31-6 bermuda	55.1	55.4	60.2	60.7	56.3	53.2	56.8
Oklahoma LCB 7-25 bermuda..	49.7	55.1	59.6	63.3	58.2	53.4	56.6
Redalta limpograss.....	-	46.5	59.2	62.0	-	-	55.9
Tifton 35-3 bermuda	51.4	56.4	56.5	61.6	55.3	52.3	55.8
Tifton 44 bermuda.....	54.8	52.4	56.1	-	54.4	51.4	53.8
Tifton 34-8 bermuda.....	47.4	53.6	57.5	-	52.5	53.7	52.9
NK Pasto Rico bermuda.....	52.0	53.2	-	-	-	-	52.6
Oklahoma 71 X 6-7 bermuda..	49.3	51.9	55.1	-	54.1	50.9	52.3
Coastal bermuda.....	51.4	51.2	54.5	-	53.1	50.2	52.1

Each value is an average of four replications. On several dates samples were missing so the mean is not comparable for all entries in the test.

Table 10. In vitro dry matter digestibility (IVDMD) of new bermudagrass hybrids at Plant Breeding Unit, Tallassee, Alabama, 1980 (planted April 25, 1980)

Entry	Percent IVDMD of dry forage harvested October 16
Tifton 34-5 x 21-6 (79-16).....	63.9
Tifton 35-3 x 49-4	62.4
Tifton Coastcross -3	61.4
Tifton 34-4 (T-44 x Callie).....	61.3
Tifton 3705 x 21-6	60.6
Tifton 34-5 x 21-6 (79-17)	59.8
Tifton 44	56.8
Coastal	56.6

Information contained herein is available to all
regardless of race, color, sex, or national origin