Research Bulletin
Number 423
Reviewed March 2009

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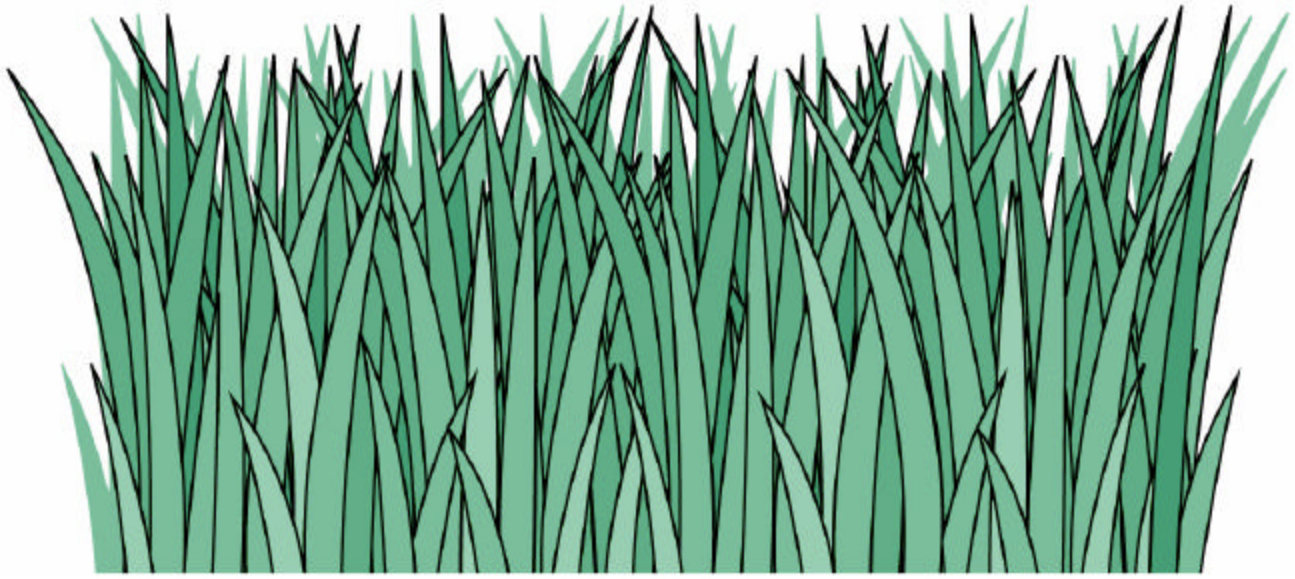

THE UNIVERSITY OF GEORGIA
COOPERATIVE EXTENSION
Colleges of Agricultural and Environmental Sciences & Family and Consumer Sciences

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ISSN 0435–4680

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Introduction

Tall fescue (Festuca arundinacea Schreb.) is grown on more than one million acres of land in north and central Georgia. Most of this is endophyte-infected and tolerant of overgrazing, low fertility, and pests. Unfortunately, the fungal endophyte produces a toxin which often results in lower cow conception rates, reduced calf weaning weights, and poor performance of growing steers and heifers. The problem can be reduced by growing clover or other grasses with the endophyte-infected tall fescue and completely overcome by planting endophyte-free cultivars of tall fescue. Endophyte-free tall fescue is less tolerant, however, of drought and other stresses than is infected grass, and so requires more careful grazing management to maintain stands and productivity.

A previous publication reported on cultivar trials with tall fescue and other cool season perennial grasses (Hoveland et al. 1990). A number of endophyte-free tall fescue cultivars were found to be well adapted to north Georgia. Orchardgrass (Dactylis glomerata L.) was short-lived and not recommended except in extreme north Georgia. Perennial ryegrass (Lolium perenne L.) was not recommended. Reed canarygrass (Phalaris arundinacea L.) grew well in mid-summer but made little growth in late winter or early spring and autumn. This report summarizes the results of eight forage yield trials evaluating cool-season perennial grass cultivars at four locations in north and central Georgia from 1988–93.

Materials and Methods

Cultivar trials were planted at the following locations: Mountain Branch Station, Blairsville (2,000 feet elevation) on Bradson clay loam (clayey, oxidic mesic, Typic Hapludults); Northwest Branch Station, Calhoun (600 feet elevation) on Townley clay (clayey, mixed, Thermic Typic Hapludults); Plant Science Farm, Athens (800 feet elevation) on Cecil sandy clay loam (clayey, kaolinitic, thermic Typic Kanhapludults); and Central Georgia Branch Station, Eatonton (450 feet elevation) on Davidson loam (clayey, kaolinitic, Thermic Rhodic Kandiudults).

Seven orchardgrass, one reed canarygrass, and 23 tall fescue cultivars and breeding lines were included in the various trials (table 1). Tall fescue entries were all endophyte-free. The grasses were planted on prepared land (turned and disked) in six-inch rows using plots 4 by 20 feet with four replications in a randomized complete block design. Trials were planted in September. Phosphorus and potassium were applied according to soil test recommendations. Nitrogen was applied at 60 lbs/acre each year in September, February, and April.

Forage was harvested four to nine times each year with a flail-type harvester. Samples were obtained from each plot at each harvest, dried, and weighed to determine oven dry forage yields. Forage yields are reported as production by season as this is more important than the total yield.

Late winter or early spring production consisted of forage produced during February to mid-March at Athens and Eatonton, February through March at Calhoun, and March to mid-April at Blairsville. Autumn production consisted of forage produced during October to December at Athens, Calhoun, and Eatonton, and mid-September through November at Blairsville. Visual estimates of percentages of complete stands were made on each plot at the end of the experiments.

Results and Discussion

Cultivar Trials at Athens and Eatonton (1988—1990)

There was little difference in total yields of the tall fescue cultivars at either location (tables 2 and 3). Late winter production of 'AU Triumph', however, was substantially higher than all other tall fescue entries at both locations. Autumn production of all tall fescue entries was similar but orchardgrass cultivars were much lower. Reed canarygrass production was concentrated mainly in spring and summer. Stand persistence of all grasses was good at Athens after three years but at Eatonton the stands of orchardgrass and reed canarygrass were poor.

Cultivar Trials at Blairsville and Eatonton (1990—1992)

Higher yields of tall fescue were obtained at Blairsville than at Eatonton (tables 4 and 5). 'Stargrazer' and 'AU Triumph' had higher total yields than 'Cattle Club'. Seasonal growth distribution for 'AU Triumph' and 'Stargrazer' was similar but 'Cattle Club' was much lower in spring. Orchardgrass yields at Blairsville were lower than for tall fescue entries. Stands of all grasses at Blairsville remained good but at Eatonton the orchardgrass entries disappeared after the first growing season.

Tall Fescue Experimental Entries at Blairsville, Calhoun, Athens, and Eatonton (1991—1993)

A large number of new endophyte-free tall fescue experimental lines were tested in anticipation that some would be released as superior cultivars. None of them showed any advantage over 'AU Triumph' in respect to total yield, seasonal distribution of production, or stand persistence (tables 6, 7, 8, 9). 'AU Early' and 'AU Vigor' stands were weak at all locations because of poor seed supplied for testing. 'Shiloh' orchardgrass was generally lower yielding than the better tall fescue entries. Stand persistence of the orchardgrass after three years was similar to the tall fescue entries except at Eatonton where the stand was lost during the establishment year.

General Discussion

Endophyte-free tall fescue had higher total yields and better stand persistence than did orchardgrass at all locations. Orchardgrass production was good in early spring but very low in autumn. The short stand life of orchardgrass in central Georgia suggests that this grass should be planted only at higher elevations in the northern part of the State. Reed canarygrass had low spring and autumn production but summer production was no better than tall fescue.

Most tall fescue pastures are infected with the fungal endophyte that causes fescue toxicosis in livestock. This infected grass is tolerant of environmental stresses such as drought, diseases, and insects and generally maintains good stands even under heavy, close grazing in summer. Although endophyte-free tall fescue has been shown to be less persistent under close summer grazing, all the endophyte-free tall fescue entries persisted well in the trials reported here. The system of harvesting used in these tests, cutting every five to six weeks, puts less stress on the plants than close grazing in summer. Close, continuous grazing of endophyte-free tall fescue cultivars in summer can be expected to deplete stands. For good stand persistence, maintain a stubble of three to four inches on endophyte-free tall fescue pastures during summer.

Seasonal distribution of forage production differed among tall fescue cultivars. In a previous report (Hoveland et al. 1990), late winter production of 'AU Triumph' was up to 100% higher and autumn growth up to 60% more than 'Kentucky 31' tall fescue in the lower Piedmont area. These advantages were much smaller at Calhoun and non-existent at Blairsville. In the present trials, 'Kentucky 31' was not included, so seasonal production was compared with late winter or autumn production of 'AU Triumph' (table 10). None of the tall fescue or orchardgrass cultivars planted at Athens and Eatonton had late winter production that equalled 'AU Triumph'. Several tall fescue cultivars, 'Phyter', 'Southern Cross', and 'Festorina', had autumn production similar to 'AU Triumph' but yields of orchardgrass cultivars were low. In the southern Piedmont area, 'AU Triumph' has the potential to provide more late winter forage than other cultivars and reduce the need for hay feeding at a critical time of year.

Summary and Conclusions

Seven orchardgrass, one reed canarygrass, and 23 endophyte-free tall fescue entries were compared in one or more of eight forage yield trials at Blairsville, Calhoun, Athens, and Eatonton. Tall fescue was superior in yield and stand persistence to orchardgrass at all locations except Blairsville where orchardgrass cultivars had similar stand persistence over three years. Stand persistence of all endophyte-free tall fescue entries was satisfactory under the four- to six-week cutting interval method used in these trials. Under close continuous summer grazing, persistence of these endophyte-free cultivars may be reduced, especially where warm season perennial grasses may offer serious competition.

The winter-productive tall fescue cultivar 'AU Triumph' had no advantage at Blairsville but had higher late winter production than other tall fescue and orchardgrass cultivars at Calhoun, Athens, and Eatonton. Late winter and autumn production of reed canarygrass was substantially lower than tall fescue cultivars.

None of the experimental entries had better yield than 'AU Triumph', indicating that new higher yielding tall fescue cultivars are unlikely to be available for some time. As noted earlier, however, the main problem with all currently available endophyte-free cultivars is lack of

persistence under close grazing during hot, dry summers. Although these current yield trials were not designed to show persistence differences under stressful conditions, in other research the experimental endophyte-free GA-Jesup Improved had better stand survival than 'AU Triumph' after a summer drought at Tifton, GA (Bouton et al. 1993). The survival of this experimental tall fescue indicates better persistence and is a possibility for future release as a cultivar.

'AU Triumph' remains the endophyte-free tall fescue cultivar of choice if higher late winter production is desired. Based on results of this research and in previous trials, other acceptable endophyte-free tall fescue cultivars with lower late winter production include 'Festorina', 'Forager', 'Fuego', 'Phyter', 'Southern Cross', and 'Stargrazer'. Acceptable orchardgrass cultivars include 'Benchmark', 'Hallmark', 'Shiloh', and 'Summergreen' for use in extreme northern Georgia.

References

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Table 1. Source of Cool-Season Entries in Cultivar Trials

Name	Origin
Orchardgrass	
Benchmark	FFR Coop., Battle Ground, Indiana
Hallmark	FFR Coop., Battle Ground, Indiana
Justus	Missouri Agri. Exp. Stn., Columbia, Missouri
Shiloh	Green Seed, Woodburn, Oregon
Summergreen	Jacklin Seed Co., Post Falls, Idaho
89–100	Green Seed, Woodburn, Oregon
89–103	Green Seed, Woodburn, Oregon
Red canarygrass	
Palaton	Vista Seeds, Webster City, Iowa
Tall fescue	
A–1 (experimental)	Jacklin Seed Co., Post Falls, Idaho
AU Triumph	International Seeds, Inc., Halsey, Oregon
AU Early (experimental)	Alabama Agric. Exp. Stn., Auburn, Alabama
AU Vigor (experimental)	Alabama Agric. Exp. Stn., Auburn, Alabama
Cattle Club	Green Seed, Woodburn, Oregon
Festorina	Van der Have, Albany, Oregon
Forager	FFR Coop., Battle Ground, Indiana
FTF 8872 (experimental)	International Seeds, Inc., Halsey, Oregon
Fuego	Van der Have, Albany, Oregon
GA–43FF (experimental)	Georgia Agric. Exp. Stn., Athens, Georgia
GA–110 EF (experimental)	Georgia Agric. Exp. Stn., Athens, Georgia
GA–196 EF (experimental)	Georgia Agric. Exp. Stn., Athens, Georgia
GA–Jesup EF (experimental)	Georgia Agric. Exp. Stn., Athens, Georgia
GA–Jesup Improved EF (experimental)	Georgia Agric. Exp. Stn., Athens, Georgia
MO HD I (experimental)	Missouri Agric. Exp. Stn., Columbia, Missouri
MO HD II (experimental)	Missouri Agric. Exp. Stn., Columbia, Missouri
DeSoto	Mississippi Agric. Exp. Stn., Mississippi State, MS
Phyter	FFR Coop., Battle Ground, Indiana
Southern Cross	Jacklin Seed Co., Post Falls, Idaho
Stargazer	FFR Coop., Battle Ground, Indiana
TF 89–1 (experimental)	Willamette Valley Plant Breeders, Inc., Brownsville, OR
TF 89–2 (experimental)	Willamette Valley Plant Breeders, Inc., Brownsville, OR
TF 9001 (experimental)	FFR Coop., Battle Ground, Indiana

Table 2. Performance of Cool-Season Perennial Grass Cultivars, Plant Science Farm, Athens, Georgia, Three-Year Average (1988—1990)

Cultivar	Dry forage yield				Stand, Nov. 1990
	Late winter	Spring and Summer	Autumn	Total	
	Lbs/acre				%
Tall Fescue					
AU Triumph	2320	7630	1570	11520	89
Fuego	1760	7420	1520	10700	85
Southern Cross	1570	7560	1560	10690	86
Festorina	1230	7550	1570	10350	95
Forager	1890	6550	1320	9760	88
A–1 (exp.)	1010	7020	1260	9290	98
Reed Canarygrass					
Palaton	1120	6800	720	8640	88
Orchardgrass					
Hallmark	1920	6110	500	8530	90
Benchmark	1820	5990	480	8290	82
Summergreen	1470	6080	480	8030	82
LSD (5%)	280	630	230	700	

Table 3. Performance of Cool-Season Perennial Grass Cultivars, Central Georgia Branch Station, Eatonton, Georgia, Three-Year Average (1988—1990)

Cultivar	Dry forage yield				Stand, Nov. 1990
	Late winter	Spring and Summer	Autumn	Total	
	Lbs/acre				%
Tall Fescue					
Phyter	1280	4740	720	6740	95
Southern Cross	1380	4370	700	6450	84
AU Triumph	1730	3940	770	6440	74
Festorina	1090	4550	760	6400	88
Fuego	1320	4390	600	6310	74
Forager	1430	4060	600	6090	85
A–1 (exp.)	870	4250	620	5740	98
Orchardgrass					
Hallmark	1520	3810	200	5530	17
Benchmark	1490	3760	110	5360	10
Summergreen	1190	3940	170	5300	10
Reed Canarygrass					
Palaton	420	3700	360	4480	46
LSD (5%)	270	460	130	630	

Table 4. Performance of Cool-Season Perennial Grass Cultivars, Georgia Mountain Station, Blairsville, Georgia, Three-Year Average (1990—1992)

Cultivar	Dry forage yield			
	Early spring	Late spring and summer	Autumn	Total
	Lbs/acre			
Tall Fescue				
Stargazer	2810	7590	1400	11800
TF 89–2 (exp.)	2830	7460	1450	11740
AU Triumph	2670	7520	1370	11560
TF 89–1 (exp.)	2670	6880	1330	10880
FTF 8872 (exp.)	2610	6880	1360	10850
GA–Jesup Improved EF	2520	6530	1160	10210
Cattle Club	1930	6880	1240	10050
Orchardgrass				
89–103 (exp.)	1980	5850	1090	8920
89–100 (exp.)	1760	6010	1050	8820
Justus	1710	5220	1040	7970
LSD (5%)	300	750	190	890

Table 5. Performance of Cool-Season Perennial Grass Cultivars, Central Georgia Branch Station, Eatonton, Georgia, Three-Year Average (1990—1992)

Cultivar	Dry forage yield			
	Early spring	Spring and summer	Autumn	Total
	Lbs/acre			
Tall Fescue				
TF 89–1 (exp.)	1440	5410	1110	7960
AU Triumph	1540	5320	1050	7910
TF 89–2 (exp.)	1430	5220	1090	7740
Stargazer	1200	5190	1200	7590
FTF 8872 (exp.)	1030	5460	1040	7530
GA–Jesup Improved EF	1110	4510	1070	6690
Cattle Club	330	5070	890	6290
Orchardgrass				
89–100 (exp.)	Total yields averaged 7790 lb/acre the first year with none the following two years because of stand loss.			
89–103 (exp.)				
Justus				
LSD (5%)				

Table 6. Performance of Cool-Season Perennial Grass Cultivars, Georgia Mountain Station, Blairsville, Georgia, Three-Year Average (1991—1993)

Cultivar	Dry forage yield				Stand, Dec. 1993
	Early spring	Late spring and summer	Autumn	Total	
	Lbs/acre				%
Tall Fescue					
TF 9001 (exp.)	2500	6500	1620	10620	94
GA–110 EF (exp.)	2000	6740	1560	10300	90
AU Triumph	2260	6270	1660	10190	90
MO HD II (exp.)	2040	6540	1460	10040	96
MO HD I (exp.)	1830	6780	1420	10030	90
GA–196 EF (exp.)	2110	6600	1310	10020	92
GA–Jesup EF (exp.)	1840	6550	1400	9790	96
GA–43 EF (exp.)	2050	6420	1270	9740	94
DeSoto	2080	6140	1260	9480	99
GA–Jesup Improved EF (exp.)	2110	5990	1320	9420	96
AU Vigor (exp.)	930	2660	700	4290	30
AU Early (exp.)	900	2180	580	3660	28
Orchardgrass					
Shiloh	1730	5590	920	8240	78
LSD (5%)	280	540	230	730	

Table 7. Performance of Cool-Season Perennial Grass Cultivars, Northwest Georgia Branch Station, Calhoun, Georgia, Three-Year Average (1991—1993)

Cultivar	Dry forage yield				Stand, Dec. 1993
	Early spring	Spring and summer	Autumn	Total	
	Lbs/acre				%
Tall Fescue					
AU Triumph	1680	5300	650	7630	79
GA–196 EF (exp.)	1270	5460	690	7420	91
MO HD I (exp.)	1190	5490	700	7380	55
TF 9001 (exp.)	1750	4980	600	7330	91
GA–110 EF (exp.)	1280	5220	670	7170	88
GA–Jesup Improved EF (exp.)	1380	5040	660	7080	88
DeSoto	1160	5140	660	6960	79
GA–43 EF (exp.)	1300	5040	590	6930	92
GA–Jesup EF (exp.)	1020	5200	650	6870	89
MO HD II (exp.)	1000	5180	560	6740	58
AU Vigor (exp.)	1360	4250	640	6250	69
AU Early (exp.)	1250	4250	630	6130	84
Orchardgrass					
Shiloh	1230	4820	540	6590	89
LSD (5%)	330	560	140	630	

Table 8. Performance of Cool-Season Perennial Grass Cultivars, Plant Science Farm, Athens, Georgia, Three-Year Average (1991—1993)

Cultivar	Dry forage yield				Stand, Dec. 1993
	Early spring	Spring and summer	Autumn	Total	
	Lbs/acre				%
Tall Fescue					
AU Triumph	910	3240	1780	5930	78
GA–196 EF (exp.)	580	3380	1740	5700	84
TF 9001 (exp.)	740	3360	1530	5630	85
DeSoto	500	3460	1540	5500	86
GA–110 EF (exp.)	360	3410	1700	5470	85
GA–Jesup EF (exp.)	460	3170	1690	5320	88
GA–Jesup Improved EF (exp.)	580	3200	1490	5270	89
MO HD II (exp.)	450	3120	1700	5270	84
GA–43 EF (exp.)	530	3120	1600	5250	85
MO HD I (exp.)	400	3150	1700	5250	85
AU Early (exp.)	870	2240	1530	4640	76
AU Vigor (exp.)	790	2400	1310	4500	83
Orchardgrass					
Shiloh	570	3250	950	4770	74
LSD (5%)	170	330	170	430	

Table 9. Performance of Cool-Season Perennial Grass Cultivars, Central Georgia Branch Station, Eatonton, Georgia, Three-Year Average (1991—1993)

Cultivar	Dry forage yield: Early spring	Spring and summer	Autumn	Total	Stand, Dec. 1993
	Lbs/acre				%
Tall Fescue					
AU Triumph	990	3110	1420	5520	69
TF 9001 (exp.)	800	3070	1330	5200	73
GA–43 EF (exp.)	430	3100	1360	4890	73
GA–110 EF (exp.)	500	2910	1320	4730	70
MO HD II (exp.)	440	2960	1310	4710	63
GA–196 EF (exp.)	540	2670	1310	4520	75
MO HD I (exp.)	300	2850	1280	4430	63
DeSoto	460	2610	1190	4260	72
GA–Jesup EF (exp.)	350	2680	1190	4220	72
GA–Jesup Improved (exp.)	340	2420	1160	3920	73
AU Early (exp.)	1080	1700	970	3750	54
AU Vigor (exp.)	890	1790	1010	3690	46
Orchardgrass					
Shiloh	{Stand was lost during establishment year.				0
LSD (5%)	200	480	190	660	

Note: Test was planted in Sept. 1990 but not harvested for yield in 1991 because of annual ryegrass infestation.

Table 10. Relative Seasonal Forage Yields (Expressed as Percent of AU Triumph) of Tall Fescue and Orchardgrass Cultivars at Two Georgia Locations, Three-Year Average

		Dry forage yield as percent of AU Triumph			
Location	Cultivar	Late winter	Spring and summer	Autumn	Total
Athens	Tall Fescue				
	Fuego	76	97	97	93
	Southern Cross	68	99	99	93
	Festorina	53	99	100	90
	Forager	81	86	84	85
	Orchardgrass				
	Hallmark	83	80	32	74
	Benchmark	78	78	30	72
	Summergreen	63	80	30	70
Eatonton	Tall Fescue				
	Phyter	74	120	94	105
	Southern Cross	80	111	91	100
	Festorina	63	115	99	99
	Fuego	76	111	78	98
	Forager	83	103	78	94
	Orchardgrass				
	Hallmark	88	97	26	86
	Benchmark	86	95	14	83
	Summergreen	69	100	22	82