

PURPOSE: Native warm-season grasses used in a rotational grazing system provide valuable summer forage when cool-season grasses are less productive. There are many cultivars, selected ecotypes, and source identified native warm-season grasses available today, here referred to collectively as “varieties.” To better utilize these grasses, better comparative forage production information is needed. The objective of this study is to determine the yield by harvest date and the total annual yield of warm-season grass varieties when grown in Maryland in a simulated rotational grazing system. Forage production information will help farmers to optimize production in a sustainable manner that will conserve natural resources.

Methods

The trial includes 36 varieties of 8 different species (eastern gamagrass, switchgrass, big bluestem, indiagrass, little bluestem, coastal little bluestem, Florida paspalum, and coastal panicgrass). The trial is being conducted on Galestown-Evesboro loamy sands, 0-8% slope, somewhat excessively drained (available water holding capacity in a 60-inch soil profile is about 3.7 inches) at the NRCS's Norman A. Berg National Plant Materials Center located at Beltsville, Maryland. With the exception of eastern gamagrass, varieties were seeded in six-row plots with a 5-inch row spacing using a cone-seeder. Eastern gamagrass varieties were seeded by hand in two 30-inch rows per plot. All varieties were seeded June 16, 2005. The trial was planted in a randomized complete block design with four replications. Plot size is 3 ft. x 20 ft. with yield measurements taken from the entire plot area. Nitrogen was applied at a rate of 100 pounds per acre at the beginning each growing season except the seeding year and 2011. Irrigation was only applied during establishment (2005 and 2006) and was not applied thereafter. The trial will continue through 2012 as a simulated grazing system.

Cuttings were made using a Carter flail-type harvester and cut to a height of 8 inches. Harvest material was weighed green in the field and samples were collected for dry matter determinations from 2 of the 4 replications.



Rotational grazing of switchgrass at the University of Maryland Wye Research and Education Center. Example of a managed grazing system (not part of this trial).



Plot establishment 8/16/06. The plots in the foreground from left to right are Florida paspalum, 'Cave in Rock' switchgrass, and 'Rumsey' indiagrass.

Yield

Varieties are grouped in the yield table according to species and are ranked according to average yield performance for seasons 2008 to 2011. Yields in 2008 to 2011 are more representative of yields from mature stands than in 2007 when plots were not fully established and also impacted by drought.

Yield data from plots with less than 50% stand were not included in the analysis. Varieties that were not included in the data analysis due to consistently poor stands of less than 50% include: Southlow Michigan Germplasm switchgrass, Suther Germplasm little bluestem, 'Kaw' big bluestem and Oz-70 Germplasm big bluestem. Oz-70 Germplasm big bluestem was eliminated due to impure stands resulting from contaminated seed.

Dry Matter Yield Data

Species/Variety	Stand Jul-08	Forage Yield (lb/acre)								
		2007 Total	2008 Total	2009 Total	2010 Total	2011 Total		'08-'11 Average		
Eastern Gamagrass										
Meadowcrest	99	2,873	11,090	9,336	16,737	6,291	1,668	7,959	11,280	
Highlander	91	3,442	12,120	10,582	14,009	5,281	1,514	6,795	10,876	
Pete	89	2,377	9,861	10,311	14,433	4,510	1,889	6,399	10,251	
Verl'	86	2,864	11,015	8,957	12,757	4,573	1,450	6,022	9,688	
Switchgrass										
Carthage	100	9,790	9,764	9,251	13,632	4,239	3,098	7,336	9,996	
'Kanlow'	80	8,303	8,632	8,362	12,180	4,609	2,103	6,713	8,972	
Cave in Rock	86	6,963	9,019	7,757	10,291	5,413	2,537	7,949	8,754	
Blackwell	95	5,879	9,313	7,020	9,574	4,355	1,725	6,079	7,997	
Shelter	87	3,608	7,796	8,153	8,891	4,645	2,019	6,664	7,876	
Shawnee	96	6,666	9,523	7,938	8,387	4,096	1,358	5,454	7,826	
Hightide Germplasm	68	3,293	5,428	4,195	5,014	2,059	1,034	3,093	4,432	
Coastal Panicgrass										
Atlantic	79	9,934	8,849	8,477	11,306	4,030	2,999	7,028	8,915	
Big Bluestem										
Niagara	95	1,149	6,899	7,029	7,531	1,591	498	2,088	5,887	
Suther Germplasm	86	2,089	6,594	5,994	8,932	877	1,075	1,952	5,868	
Rountree	98	1,737	6,295	6,174	6,413	1,459	825	2,284	5,292	
Southlow Michigan Germplasm	85	849	5,864	5,178	6,585	1,293	615	1,908	4,884	
Indiagrass										
NY unreleased	94	1,995	7,083	6,477	7,795	662	961	1,624	5,745	
Osage	93	4,503	7,108	5,158	7,918	672	1,312	1,985	5,542	
Americus	91	4,525	7,065	5,540	6,802	656	1,348	2,004	5,353	
Suther Germplasm	99	3,906	6,416	5,803	5,606	1,384	964	2,348	5,043	
Southlow Michigan Germplasm	86	1,412	6,586	4,911	5,379	239	509	748	4,406	
MD unreleased	90	1,776	5,140	4,867	5,635	200	994	1,194	4,209	
Rumsey	85	2,869	5,590	5,049	4,866	534	703	1,237	4,185	
NE-54	96	2,386	5,955	5,646	4,045	439	357	796	4,111	
Holt	90	1,085	4,821	3,527	3,215	346	557	903	3,117	
Florida Paspalum										
Mid-Atlantic Germplasm	93	5,672	9,053	6,193	2,603	523	65	588	4,609	
Little Bluestem										
Aldous	86	2,410	5,374	2,169	2,844	21	601	621	2,752	
Cimarron	76	4,587	4,640	1,551	3,742	0	293	293	2,556	
Camper	80	2,564	4,556	1,315	2,687	247	430	677	2,309	
Southlow Michigan Germplasm	87	1,068	4,234	2,072	2,716	115	78	193	2,304	
Blaze	83	1,268	3,562	916	3,059	0	0	0	1,884	
Coastal little blue	95	1,060	3,583	1,312	778	103	458	561	1,558	
Mean	89	3,591	7,151	5,851	6,992	2,046	1,126	3,172	5,741	
LSD ^{1/} (0.05)	15	1,705	2,033	2,321	4,025	1,242	885	1,807	1,977	
% CV ^{2/}	12	34	20	28	41	43	56	41	25	

^{1/} = least significant difference test at 5% level of probability; ^{2/} = coefficient of variation

Results

The eastern gamagrass varieties and 'Carthage' switchgrass were consistently among the highest yielding varieties each year, leading to the highest 4-year average yields. 'Meadowcrest' gamagrass was the highest yielding of all varieties but not significantly greater yielding than the other gamagrass varieties and the highest yielding switchgrass varieties. The gamagrass plots have continued to improve as the individual clumps grew larger and further filled the plot areas. Eastern gamagrass varieties began growth earlier and produced greater yields at the first harvest than other varieties. This early season growth was the major contributor to greater season total yield.

The Florida paspalum exhibited excellent stand establishment and yielded remarkably well in 2008 considering it is an unimproved collection. However, it did not yield as well in 2009 and continued to decline in 2010 and 2011, indicating poor persistence.

Yields were lower in 2011 than 2010 as expected due to no applied nitrogen and very dry weather in May, June and July. Interestingly the yields of switchgrass and coastal panicgrass varieties did not drop as much as the gamagrass varieties. Under these dry lower fertility conditions the yields of gamagrass were comparable to the switchgrass and coastal panicgrass varieties that did not have yields as affected by the dry and low fertility conditions. Yields were high in 2010 despite fewer harvests and adverse hot-dry weather, indicating that two harvests may be better than three, but more data would be required before making this conclusion. In the 2009 season, yields were on average slightly lower than in 2008. These lower yields may be due to well below average rainfall in July of 2009.



Conclusions

Based on the initial results from this trial, the eastern gamagrass varieties 'Highlander,' 'Meadowcrest,' 'Pete' and 'Verl' are recommended for high yields when grown in Maryland in a managed grazing system. These varieties also can be grazed earlier and later in the season than other varieties, but require a longer establishment period.

Varieties with high yields and have the potential to come into production quickly and to continue to produce under dry conditions include 'Carthage' switchgrass, 'Atlantic' coastal panicgrass and 'Kanlow' switchgrass. These varieties do need to be managed carefully to avoid palatability issues when over mature.

Florida paspalum initially exhibited good vigor, ease of establishment and high yield potential. However due to persistence problems observed in this trial, Florida paspalum may be best seeded as a companion to slower establishing grasses such as gamagrass to increase initial yields rather than seeded in pure stands.

