PR-567

UK AGRICULTURAL EXPERIMENT STATION
UNIVERSITY OF KENTUCKY — COLLEGE OF AGRICULTURE

2007 Native Warm-Season Perennial Grasses Report

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Introduction

Kentucky's pasture and hay acres are largely seeded in cool-season species. This practice results in a natural decline in midsummer production and often limits livestock production. A high-yielding, native warm-season perennial grass would be a viable option for Kentucky livestock enterprises and the emerging biomass market, and would provide an additional benefit of wildlife habitat. Little is known about the performance of different varieties of the primary warm-season species in Kentucky. They include switchgrass (*Panicum virgatum L.*), big bluestem (*Andropogon gerardii Vitman*), indiangrass (*Sorghastrum nutans* [*L.*] Nash) and eastern gamagrass (*Tripsacum dactyloides L.*). This report provides current yield and plant characteristic data for 2001 to 2007.

The UK Forage Extension Web site at <www.uky.edu/Ag/Forage> contains electronic versions of all forage variety testing reports from Kentucky and surrounding states and from a large number of other forage publications.

Description of the Tests

Small (5 by 15 feet) plots of switchgrass, big bluestem, indiangrass, and eastern gamagrass were established in the summer of 2000 by transplanting small plants raised in greenhouse float trays from seed or sprigs. Plots were allowed to become established during the remainder of 2000. Transplants were set 1 foot apart using four rows per plot. The plots were arranged in a randomized complete block design, with four replications. The soil at Lexington is a well-drained Maury silt loam that is well suited for grass production. The grasses were harvested once or twice during the summer when approximately 50% of the plants were heading. Plots were harvested to 6 inches in 2001 to 2003 and in 2005 to 2007 using a mechanical sickle bar harvester. In 2004 the height of cut was 3 to 4 inches. Fresh weight samples were taken at each harvest to determine dry matter production. Plots were fertilized with 60 pounds of actual N per acre at spring greenup, and other fertilizers (lime, P, and K) were applied according to University of Kentucky recommendations.

Results

Weather data for Lexington for 2001 to 2007 are presented in Table 3. In 2004 rainfall in Lexington was 7.5 inches above long-term averages. In 2005 and 2007 rainfall in Lexington was well below the long-term average. Eastern gamagrass and switchgrass matured earlier than did big bluestem. Indiangrass showed the latest maturity of all species.

Statistical analyses were performed on all data to determine if the apparent differences were due to varietal differences or due to chance. In the tables, varieties not significantly different from the top variety in the column for that characteristic are marked with one asterisk (*). To determine if two varieties are truly different, compare the difference between them to Least Significant Difference (LSD) at the bottom of the column. If the difference is equal to or greater than the LSD, the varieties are truly different when grown under the conditions at the given locations. The Coefficient of Variation (CV) is a measure of the variability of the data and is included for each column of means. Low variability is desirable, and increased variability within a study results in higher CVs and larger LSDs.

Discussion

These results indicate that warm-season native grasses have potential in Kentucky for livestock producers, as biomass crops, and for wildlife habitat, but there are several limitations to widespread use. The establishment challenges (slow germination and emergence) make these grasses susceptible to weed competition during the seeding year. At the time of initiation of this project, no herbicides were labeled for the establishment of these grasses except those applied to suppress the existing vegetation, such as paraquat or glyphosate. This situation is changing, but it is likely that Kentucky farmers will never have many options for residual weed control with these grasses. Therefore, producers should plan to use cultural weed control options such as mowing or light grazing. In addition, these grasses must be rotationally grazed and allowed to rest in the fall to build up sufficient energy reserves for overwinter survival.

The yields of these species are high and come in mid- to late summer, when cool-season grasses are not productive. These grasses can play a role in Kentucky hay, pasture and biomass production systems if producers are prepared to manage them through the establishment phase and supply proper management to achieve persistence. Varieties of native grasses are limited, and the overall supply of seed varies annually. The commercial varieties shown here appear to be adapted to Kentucky but will vary in yield potential. Before buying seed of varieties not tested in Kentucky, review yield and survival information from adjacent states. When warm-season native grass varieties are moved more than 300 miles north or south from their point of origin, long-term survival suffers.

Summary

This study indicates that native grasses can contribute significantly to pasture, hay and biomass production systems in Kentucky.

For further information on native grasses in Kentucky, refer to the College of Agriculture publication *Native Warm-Season Perennial Grasses for Forage in Kentucky* (AGR-145), available at your county Extension office.

Acknowledgment

Funding for this research was provided by the Kentucky Fish and Wildlife Commission and The Nature Conservancy.

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Table 1. Dry matter yields and maturity of big bluestem varieties transplanted July 18, 2000 at Lexington, Kentucky.

	Maturity[1]				Yield (tons/acre)											
	2004	2005	2006	2007	2001			2002	2003	2004			2005	2006	2007	6-yr
Variety	Jul 28	Jul26	Jul18	Jul 23	Jul 6	Aug 7	Total	Jul 16	Aug 6	Jul 28	Oct 11	Total	Jul 26	Jul 18	Jul 23	Total[2]
KYAG9601	50	60	46	46	3.05	1.32	4.37*	4.55*	3.46	6.00	1.22	7.21*	3.15*	4.11*	4.57*	27.05*
Rider Mills Farm	50	45	45	45	–	–	–	3.78	4.51*	5.46	1.20	6.65*	2.63	3.32	3.96	24.86
Pawnee	62	62	53	55	3.43	1.40	4.83*	3.37	3.82	5.31	1.04	6.35	2.62	3.08	3.53	22.77
Kaw	62	62	55	56	3.41	1.37	4.78*	3.39	3.99	3.97	0.84	4.82	2.59	2.39	3.48	20.66
Roundtree	62	62	54	53	3.27	1.40	4.67*	2.77	1.79	4.16	1.03	5.19	2.02	2.76	3.23	17.77
Mean	57.2	58.2	50.5	51.0	3.29	1.18	4.66	3.57	3.51	4.97	1.07	6.04	2.61	3.13	3.75	22.62
CV,%	0	0	4	4.6	14.78	20.99	10.18	13.05	8.25	10.05	16.14	8.86	9.10	15.60	7.95	6.11
LSD,0.05	0	0	3	3.6	0.78	0.38	0.76	0.72	0.45	0.77	0.26	0.83	0.37	0.75	0.46	2.13

[1] Maturity rating scale: 37=flag leaf emergence, 45=boot swollen, 50=beginning of inflorescence emergence, 58=complete emergence of inflorescence, 62=beginning of pollen shed.

[2] 2001 yield data is not included in the multiyear total.

* Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

Table 2. Dry matter yields and maturity of Indiangrass varieties transplanted July 18, 2000 at Lexington, Kentucky.

	Maturity[1]					Yield (tons/acre)									
	2002	2004	2005	2006	2007	2001	2002	2003	2004			2005	2006	2007	6-yr
Variety	Jul 16	Jul 28	Aug 18	Aug 2	Aug 9	Aug 7	Jul 16	Aug 14	Jul 28	Oct 11	Total	Aug 18	Aug 2	Aug 9	Total[2]
Cheyenne	37.3	45	68.0	45.0	45.0	6.44	6.88*	6.95*	6.71	0.79	7.50*	3.41*	4.83*	5.52*	35.10*
Rumsey	36.5	45	56.5	46.3	45.0	6.25	5.67*	5.79*	5.70	0.77	6.47*	3.08*	5.20*	4.77*	30.97*
Nebraska 54	36.8	45	68.0	45.0	47.5	7.12	6.63*	6.31*	4.81	0.39	5.19	2.03	3.05	2.90	26.11
Osage	34.5	45	68.0	45.0	46.3	6.24	5.29	5.90*	4.96	0.45	5.41	2.44	3.46	3.09	25.60
Washington County	36.0	45	56.5	45.0	45.0	5.01	4.98	5.44*	4.87	0.54	5.41	1.92	3.13	3.34	24.23
Rider Mills Farm	34.5	45	50.8	42.0	45.0	–	2.84	4.33	4.67	0.59	5.26	1.86	2.97	3.35	20.61
Mean	35.9	45.0	61.3	44.7	45.6	6.21	5.38	5.79	5.29	0.59	5.87	2.46	3.77	3.83	27.10
CV,%	6.7	0.0	13.6	2.3	3.6	9.07	15.04	22.19	19.22	16.70	18.19	13.80	15.88	19.26	14.38
LSD,0.05	3.6	0.0	12.5	1.5	2.5	0.87	1.22	1.94	1.53	0.15	1.61	0.51	0.90	0.76	5.87

[1] Maturity rating scale: 37=flag leaf emergence, 45=boot swollen, 50=beginning of inflorescence emergence, 58=complete emergence of inflorescence, 62=beginning of pollen shed.

[2] 2001 yield data is not included in the multiyear total.

* Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

Table 3. Temperature and rainfall at Lexington, Kentucky in 2001, 2002, 2003, 2004, 2005, 2006 and 2007.

	2001				2002				2003				2004				2005				2006				2007[2]			
	Temp.		Rainfall		Temp.		Rainfall		Temp.		Rainfall		Temp.		Rainfall		Temp.		Rainfall		Temp.		Rainfall		Temp.		Rainfall	
	°F	DEP[1]	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP
JAN	31	0	0.92	-1.94	38	+7	2.12	-0.74	26	-5	0.96	-1.90	30	-1	3.14	+0.28	37	+6	4.35	+1.49	42	+11	4.77	+1.91	37	+6	2.93	+0.07
FEB	40	+5	3.20	-0.01	38	+3	1.28	-1.93	32	-3	3.59	+0.38	36	+1	1.32	-1.89	39	+4	1.68	-1.53	36	+1	2.13	-1.08	27	-8	1.83	-1.38
MAR	40	-4	2.73	-1.67	45	+1	7.93	+3.53	47	+3	2.09	-2.31	47	+3	3.43	-0.97	41	-3	2.79	-1.61	44	0	3.05	-1.35	52	+8	1.97	-2.43
APR	59	+4	1.66	-2.22	58	+3	4.19	0.31	57	+2	3.14	-0.74	55	0	3.06	-0.82	56	+1	3.30	-0.58	59	+4	3.52	-0.36	53	-2	3.87	-0.01
MAY	66	+2	4.85	+0.38	61	-3	4.36	-0.11	63	-1	6.68	+2.21	68	+4	9.79	+5.32	61	-3	1.78	-2.69	62	-2	2.99	-1.48	68	+4	1.45	-3.02
JUN	71	-1	2.04	-1.12	74	+2	2.45	-1.21	69	-3	4.85	+1.19	72	0	3.13	-0.53	75	+3	1.33	-2.33	70	-2	1.82	-1.84	74	+2	1.77	-1.89
JUL	75	-1	5.58	+0.58	78	+2	1.10	-3.90	74	-2	2.68	-2.32	73	-3	7.65	+2.65	77	+1	3.30	-1.70	76	0	5.13	+0.13	74	-2	6.90	+1.90
AUG	76	+1	4.75	+0.82	77	+2	0.95	-2.98	75	0	5.26	+1.33	71	-4	2.91	-1.02	78	+3	3.34	-0.59	76	+1	3.23	-0.70	80	+5	2.56	-1.37
SEP	65	-3	2.99	-0.21	72	+4	4.90	1.70	65	-3	4.22	+1.02	68	0	2.61	-0.59	72	+4	0.59	-2.21	64	-4	9.27	+6.07	72	+4	1.15	-2.05
OCT	56	-1	3.62	+1.05	55	-2	5.61	3.04	56	-1	1.61	-0.96	58	+1	5.65	+3.08	58	+1	0.92	-1.65	54	-3	4.88	+2.31	63	+6	5.28	+2.71
NOV	51	+6	2.83	-0.56	43	-2	3.76	0.37	50	+5	4.63	+1.24	49	+4	6.29	+2.90	47	+2	1.54	-1.85	47	+2	1.78	-1.61	46	+1	2.86	-0.53
DEC	41	+5	2.57	-1.41	36	0	4.11	-1.13	36	0	3.26	-0.72	36	0	3.20	-0.78	32	-4	2.19	-1.79	42	+6	2.45	-1.53				
Total			**37.74**	**-6.81**			**42.73**	**-1.79**			**42.97**	**-1.58**			**52.18**	**+7.63**			**27.51**	**-17.04**			**45.02**	**+0.47**			**32.57**	**-8.00**

[1] DEP is departure from the long-term average.

[2] 2007 data is for eleven months through November.

Table 4. Dry matter yields and maturity of eastern gamagrass varieties transplanted July 18, 2000 at Lexington, Kentucky.

	Maturity[1]					Yield (tons/acre)																					
	2002	2004	2005	2006	2007	2001			2002			2003			2004			2005			2006			2007			6-yr
Variety	Jun 18	Jul 28	Jun 28	Jun 15	Jun 19	Jun 28	Aug 7	Total	Jun 18	Aug 21	Total	Jul 8	Sep 6	Total	Jul 28	Oct 11	Total	Jun 28	Aug 18	Total	Jun 15	Aug 19	Total	Jun 19	Aug 20	Total	Total[3]
Meade County	53.3	75	61.0	46.8	45.8	3.45	4.46	7.91	6.79	1.22	8.00*	6.38	5.92	12.30*	7.05	1.33	8.38*	3.51	1.13	4.64*	2.70	1.51	4.21*	2.02	1.54	3.56*	41.10*
Rider Mills Farm[2]	46.5	75	49.5	40.0	29.5	1.52	3.47	4.98	6.03	1.24	7.27	5.80	5.29	11.09*	6.36	1.30	7.65*	2.72	1.41	4.13*	2.67	1.55	4.22	2.05	1.72	3.78*	38.14*
Coffeeville[2]	50.8	75	61.0	49.3	49.5	–	2.91	–	6.11	1.05	7.16	5.46	5.28	10.74*	6.21	1.31	7.52*	2.28	1.10	3.38	2.13	1.79	3.91*	2.12	1.65	3.77*	36.49*
PMK 24	63.3	75	85.0	64.0	62.0	2.56	3.82	6.38	4.80	1.00	5.80	4.07	4.52	8.58	4.30	1.04	5.35	2.34	0.73	3.07	2.36	1.10	3.47	1.77	1.48	3.25*	29.52
Mean	53.4	75.0	64.1	50.0	46.7	2.51	3.66	6.42	5.93	1.13	7.06	5.43	5.25	10.68	5.98	1.25	7.23	2.71	1.09	3.80	2.46	1.49	3.95	1.99	1.60	3.59	36.31
CV,%	6.0	0.0	10.7	3.4	18.7	12.52	9.36	10.19	5.73	22.06	6.21	9.79	15.53	9.96	15.79	27.06	16.26	15.11	24.42	16.62	19.46	19.48	16.61	12.49	11.91	9.74	8.67
LSD,0.05	5.1	0.0	11.0	2.7	14.0	0.54	0.55	1.13	0.54	0.40	0.70	0.85	1.31	1.70	1.51	0.54	1.88	0.66	0.43	1.01	0.77	0.46	1.05	0.40	0.30	0.56	5.03

[1] Maturity rating scale: 37=flag leaf emergence, 45=boot swollen, 50=beginning of inflorescence emergence, 58=complete emergence of inflorescence, 62=beginning of pollen shed.

[2] Due to variation in transplant size and growth rate, these entries were not fully established until 2002.

[3] 2001 yield data is not included in the multiyear total.

* Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

Table 5. Dry matter yields and maturity of switchgrass varieties transplanted July 18, 2000 at Lexington, Kentucky.

	Maturity[1]					Yield (tons/acre)																	
	2002	2004	2005	2006	2007	2001			2002			2003			2004			2005	2006	2007			7-yr
Variety	Jun 18	Jul 28	Jul 26	Jul 18	Jun 19	Jul 6	Aug 7	Total	Jul 5	Aug 21	Total	Jul 8	Sep 6	Total	Jul 28	Oct 11	Total	Jul 26	Jul 18	Jun 19	Aug 20	Total	Total
Alamo	47.5	50	45.0	45.0	45.0	5.60	3.08	8.68*	7.54	0.46	8.00*	6.60	4.99	11.59*	3.44	1.41	4.85*	2.03	3.04	2.40	1.75	4.15	42.34*
Cave in Rock	55.8	75	75.0	62.0	45.0	4.89	2.37	7.26	5.45	0.19	5.64	4.21	3.23	7.44	4.36	1.88	6.24*	4.16*	4.65*	3.76	2.77	6.52*	41.93*
KYPV 9504	49.8	75	56.5	53.5	33.0	3.83	1.68	5.53	4.44	0.15	4.62	4.12	3.20	7.41	4.50	1.80	6.30*	3.19	3.97*	2.95	2.24	5.19	36.14
KYPV 9505	52.0	75	61.3	55.5	42.0	3.98	1.55	5.52	4.66	0.18	4.81	4.22	3.19	7.33	4.41	1.93	6.34*	3.09	3.85*	2.20	2.03	4.23	35.25
KYPV 9506	52.5	75	57.0	54.0	35.8	3.49	1.58	5.08	4.88	0.20	5.07	3.98	3.06	7.04	4.22	1.69	5.91*	3.28	3.61*	2.20	1.85	4.04	34.04
Trailblazer	51.0	75	71.8	56.5	45.0	3.84	0.56	4.41	4.13	0.16	4.28	3.82	1.93	5.75	3.74	1.03	4.77	2.38	2.26	1.14	1.11	2.25	26.10
Mean	51.4	71.0	61.1	54.4	41.0	4.27	1.81	6.08	5.18	0.22	5.41	4.49	3.27	7.76	4.11	1.62	5.73	3.02	3.56	2.44	1.96	4.40	35.37
CV,%	2.2	0.0	8.3	1.3	9.4	7.17	18.18	9.15	8.69	41.01	8.71	12.08	23.55	15.54	17.91	17.39	16.19	16.19	21.97	14.43	14.56	17.09	7.69
LSD,0.05	1.7	0.0	7.6	1.0	5.8	0.46	0.49	0.84	0.68	0.14	0.71	0.82	1.16	1.82	0.43	1.11	1.40	0.74	1.18	0.53	0.43	0.87	4.17

[1] Maturity rating scale: 37=flag leaf emergence, 45=boot swollen, 50=beginning of inflorescence emergence, 58=complete emergence of inflorescence, 62=beginning of pollen shed.

* Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

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12-2007