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2004 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 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 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, including 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 2001-2004.

Description of the Tests

Small (5 by 15 feet) plots of switchgrass, big bluestem, indiangrass, and eastern gamagrass were established in the spring 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 2001-2003 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.

Results

Weather data for Lexington for 2001-2004 are presented in Table 1. In 2002 Kentucky experienced the fourth driest and hottest summer on record. In 2004, rainfall in Lexington was 7.5 inches above long-term averages. 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 the LSD (Least Significant Difference) 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 and 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. Additionally, 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 and pasture 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 and hay 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

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Table 1. Temperature and rainfall at Lexington for 2001, 2002, 2003, and 2004.

	2001				2002				2003				2004			
	Temperature		Rainfall		Temperature		Rainfall		Temperature		Rainfall		Temperature		Rainfall	
	°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	-0.7	26	-5	0.96	-1.90	30	-1	3.14	+0.28
FEB	40	+5	3.20	-0.01	38	+3	1.28	-1.9	32	-3	3.59	+0.38	36	+1	1.32	-1.89
MAR	40	-4	2.73	-1.67	45	+1	7.93	+3.5	47	+3	2.09	-2.31	47	+3	3.43	-0.97
APR	59	+4	1.66	-2.22	58	+3	4.19	+0.3	57	+2	3.14	-0.74	55	0	3.06	-0.82
MAY	66	+2	4.85	+0.38	61	-3	4.36	-0.1	63	-1	6.68	+2.21	68	+4	9.79	+5.32
JUN	71	-1	2.04	-1.12	74	+2	2.45	-1.2	69	-3	4.85	+1.19	72	0	3.13	-0.53
JUL	75	-1	5.58	+0.58	78	+2	1.10	-3.9	74	-2	2.68	-2.32	73	-3	7.65	+2.65
AUG	76	+1	4.75	+0.82	77	+2	0.95	-3.0	75	0	5.26	+1.33	71	-4	2.91	-1.02
SEP	65	-3	2.99	-0.21	72	+4	4.90	+1.7	65	-3	4.22	+1.02	68	0	2.61	-0.59
OCT	56	-1	3.62	+1.05	55	-2	5.61	+3.0	56	-1	1.61	-0.96	58	+1	5.65	+3.08
NOV	51	+6	2.83	-0.56	43	-2	3.76	+0.4	50	+5	4.63	+1.24	49	+4	6.29	+2.90
DEC	41	+5	2.57	-1.41	36	0	4.11	+.13	36	0	3.26	-0.72	36	0	3.20	-0.78
Total			37.74	-6.81			42.76	-1.79			42.97	-1.58			52.18	+7.63

DEP is departure from the long-term average.

Table 2. Canopy height, dry matter yield (tons/acre), and maturity of big bluestem varieties transplanted July 18, 2000, at Lexington, Kentucky.

	2001				2002		2003		2004			
	Height[2]	Yield			Height	Yield	Height	Yield	Maturity[1]	Yield		
Variety		Jul 6	Aug 7	Total		Jul 16		Aug 6	Jul 28	Jul 28	Oct 11	Total
KYAG9601	41.8	3.05	1.32	4.37	42.0	4.55	53.8	3.46	50	6.00	1.22	7.21*
Rider Mills Farm	-	-	-	-	42.8	3.78	52.5	4.51	50	5.46	1.20	6.65*
Pawnee	46.0	3.43	1.40	4.83	43.0	3.37	59.3	3.82	62	5.31	1.04	6.35
Roundtree	47.8	3.27	1.40	4.67	40.3	2.77	56.8	1.79	62	4.16	1.03	5.19
Kaw	53.0	3.41	1.37	4.78	43.8	3.39	58.5	3.99	62	3.97	0.84	4.82
Mean	47.1	3.29	1.18	4.66	42.4	3.57	56.2	3.51	57.2	4.97	1.07	6.04
CV, %	1.5	14.78	20.99	10.18	6.1	13.05	4.4	8.25	0	10.05	16.14	8.86
LSD, 0.05	1.2	0.78	0.38	0.76	4.0	0.72	3.8	0.45	0	0.77	0.26	0.83

* Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.
[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] Canopy height measured in inches at harvest.

Table 3. Canopy height, dry matter yield (tons/acre), and maturity of Eastern gamagrass varieties transplanted July 18, 2000, at Lexington, Kentucky.

	2001				2002				2003				2004			
	Height[2]	Yield			Maturity[1]	Yield			Height	Yield			Maturity	Yield		
Variety		Jun 28	Aug 7	Total	Jun 18	Jun 18	Aug 21	Total		Jul 8	Sep 6	Total	Jul 28	Jul 28	Oct 11	Total
Meade County	45.0	3.45	4.46	7.91	53.3	6.79	1.22	8.00	62.5	6.38	5.92	12.30	75	7.05	1.33	8.38*
Rider Mills Farm[3]	33.3	1.52	3.47	4.98	46.5	6.03	1.24	7.27	61.8	5.80	5.29	11.09	75	6.36	1.30	7.65*
Coffeeville	-	-	-	-	50.8	6.11	1.05	7.16	61.8	5.46	5.28	10.74	75	6.21	1.31	7.52*
PMK 24	40.5	2.56	3.82	6.38	63.3	4.80	1.00	5.80	56.5	4.07	4.52	8.58	75	4.30	1.04	5.35
Mean	39.6	2.51	3.66	6.42	53.4	5.93	1.13	7.06	60.6	5.43	5.25	10.68	75	5.98	1.25	7.23
CV, %	6.6	12.52	9.36	10.19	6.0	5.73	22.08	6.21	4.8	9.79	15.53	9.96	0	15.79	27.06	16.26
LSD, 0.05	4.5	0.54	0.55	1.13	5.1	0.54	0.4	0.7	4.7	0.85	1.31	1.7	0	1.51	0.54	1.88

* Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.
[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] Canopy height measured in inches at first harvest.
[3] Due to variation in transplant size and growth rate, this entry was not fully established until 2002.

Table 4. Canopy height, dry matter yield (tons/acre), and maturity of Indiangrass varieties transplanted July 18, 2000, at Lexington, Kentucky.

	2001		2002			2003	2004			
	Height[2]	Yield	Maturity[1]	Height	Yield	Yield	Maturity	Yield		
Variety		Aug 7	Jul 16		Jul 16	Aug 14	Jul 28	Jul 28	Oct 11	Total
Cheyenne	65.0	6.44	37.3	46.0	6.88	6.95	45	6.71	0.79	7.50*
Rumsey	63.5	6.25	36.5	45.0	5.67	5.79	45	5.70	0.77	6.47*
Osage	58.5	6.24	34.5	42.0	5.29	5.90	45	4.96	0.45	5.41
Washington County	56.0	5.01	36.0	42.3	4.98	5.44	45	4.87	0.54	5.41
Rider Mills Farm	-	-	34.5	43.3	2.84	4.33	45	4.67	0.59	5.26
NE54	59.3	7.12	36.8	44.3	6.63	6.31	45	4.81	0.39	5.19
Mean	60.5	6.21	35.9	43.8	5.38	5.79	45	5.29	0.59	5.87
CV, %	3.7	9.07	6.7	5.1	15.04	22.19	0	19.22	16.70	18.19
LSD, 0.05	3.5	0.87	3.6	3.4	1.22	1.94	0	1.53	0.15	1.61

* Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.
[1] Maturity rating scale: 37-flag leaf emergence, 45=boot swollen, 50=beginning of infloescence emergence, 58=complete emergence of inflorescence, 62=beginning of pollen shed.
[2] Canopy height measured in inches at harvest.

Table 5. Canopy height, dry matter yield (tons/acre), and maturity of switchgrass varieties transplanted July 18, 2000, at Lexington, Kentucky.

	2001				2002					2003				2004			
	Height[2]	Yields			Maturity[1]	Height	Yields			Height	Yields			Maturity	Yields		
Variety		Jul 6	Aug 7	Total	Jun 18		Jul 5	Aug 21	Total		Jul 8	Sept 6	Total	Jul 28	Jul 28	Oct 11	Total
KYPV9505	35.3	3.83	1.68	5.52	52.0	44.5	4.66	0.15	4.81	46.3	4.22	3.19	7.41	75	4.41	1.93	6.34*
KYPV9504	43.5	3.98	1.55	5.53	49.8	48.3	4.44	0.18	4.62	52.0	4.12	3.20	7.33	75	4.50	1.80	6.30*
Cave in Rock	46.0	4.89	2.37	7.26	55.8	55.8	5.45	0.19	5.64	59.8	4.21	3.23	7.44	75	4.36	1.88	6.24*
KYPV9506	35.0	3.49	1.58	5.08	52.5	43.0	4.88	0.20	5.07	44.8	3.98	3.06	7.04	75	4.22	1.69	5.91*
Alamo	51.0	5.60	3.08	8.68	47.5	56.5	7.54	0.46	8.00	59.8	6.60	4.99	11.59	50	3.44	1.41	4.85
Trailblazer	40.5	3.84	0.56	4.41	51.0	48.0	4.13	0.16	4.28	48.0	3.82	1.93	5.75	75	3.74	1.03	4.77
Mean	41.9	4.27	1.81	6.08	51.4	49.3	5.18	0.22	8.00	51.8	4.49	3.27	7.76	71	4.11	1.62	5.73
CV, %	4.8	7.17	18.18	9.15	2.2	4.4	8.69	41.01	8.71	5.0	12.08	23.55	15.54	0	17.91	17.39	16.19
LSD, 0.05	3.0	0.46	0.49	0.84	1.7	3.3	0.68	0.14	0.71	3.9	0.82	1.16	1.82	0	1.11	0.43	1.40

* Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.
[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] Canopy height measured in inches at first harvest. Shorter height switchgrass varieties are upland types. These are lower yielding, but tend to be "leafier" and therefore better suited for grazing or for high quality hay compared to the taller lowland types.

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