

2004 Cool-Season Grass Grazing Tolerance Report

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Introduction

Cool-season grasses such as tall fescue and orchardgrass are the primary pasture grasses in Kentucky. Other species such as perennial ryegrass, festulolium, and prairie brome can be used in pasture systems. Little is known about the effect of variety on the grazing tolerance of these cool-season grass species.

The purpose of this report is to summarize current research on the grazing tolerance of varieties of tall fescue, orchardgrass, perennial ryegrass, and other species when they are subjected to continuous, heavy grazing pressure by cattle within the grazing season. The main focus will be on plant stand survival.

Description of the Tests

Grass variety tests for grazing tolerance were established in Lexington in the fall of 2000, 2001, 2002 and 2003 and in Princeton in the fall of 2002 and 2003. The soils at Lexington (Maury) and Princeton (Crider) are well-drained silt loams and are well suited to tall fescue, orchardgrass, and ryegrass production. Plots were 5 by 15 feet in a randomized complete block design with each variety replicated six times. In each test, 20 pounds of seed per acre (8 pounds/acre for timothy) were planted into a prepared seedbed using a disk drill. Grazing began in April and was continuous until late September. Plots were grazed down to below 4 inches quickly by feeder steers and kept at that height or below for the remainder of the grazing season. Supplemental hay or soybean hulls were fed during periods of slowest growth. Animals were removed from plots after all fall growth had been removed and when little regrowth was expected. Visual ratings of percent stand were made in the fall and spring after each grazing season. Grass plots were fertilized with 60 pounds of actual N per acre in the spring, and other fertilizer (lime, P, and K) was applied as needed.

Results and Discussion

Weather data for Lexington (2001, 2002, 2003, and 2004) and Princeton (2003 and 2004) are presented in Tables 1 and 2. Data on percent stand are presented in Tables 3 through 16. Statistical analyses were performed on all entries (including experimentals) to determine if the apparent differences are truly due to variety. Varieties not significantly different from the highest numerical value in a column are marked with one asterisk (*). To determine if two varieties are truly different, compare the difference between the two varieties to the 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 a given location. The Coefficient of Variation (CV), which is a measure of the variability of the data, is included for each column of means. Low variability is desirable, and increased variability within a study results in higher CVs and larger LSDs.

Kentucky 31 tall fescue with the endophyte (KY31+) is considered to be the most grazing-tolerant variety and was the grazing-tolerant check entry in all tall fescue trials. The central questions in grazing tolerance among tall fescues are: 1) Can endophyte-free varieties persist as well as KY31+; and 2) Will the new novel, or “friendly,” endophyte materials persist as well as other tolerant varieties? After three and four seasons, several fescue varieties were comparable to KY31+ in regards to grazing tolerance (Tables 3 and 4). The extreme drought of 2002 may have contributed to greater stand loss in lines without grazing tolerance.

Table 17 (fescue, perennial ryegrass, festulolium and prairie brome), Table 18 (orchardgrass, Kentucky bluegrass and prairie brome), and Table 19 (perennial ryegrass, festulolium and prairie brome) summarize information about distributors and persistence across locations and years for all varieties in these tests. Varieties are listed in alphabetical order with experimental varieties listed at the bottom. An open block indicates that the variety was not in that particular test (labeled at the top of the column), while an “x” in the block indicates the variety was in the test but plant survival was significantly less than the most persistent variety. A single asterisk (*) means that the variety was not significantly different from the most persistent variety in that study. It is best to choose a variety that has performed well over several years.

Summary

These studies indicate that there are varieties of cool-season grasses that can tolerate overgrazing for multiple seasons and still maintain reasonable stands. Some varieties of endophyte-free as well as novel, or “friendly,” endophyte tall fescue have been able to maintain equivalent stands to endophyte-infected KY31. There is no “KY31+” equivalent in orchardgrass; that is, no variety has historically been proven to be tolerant of overgrazing. Therefore, conclusions about orchardgrass grazing tolerance are limited. However, some varieties have exhibited good tolerance to grazing abuse even after three seasons.

This information should be used along with yield and other information (for example, relative maturity in spring) in selecting the best grass variety for each individual use. It is not recommended that tall fescue or orchardgrass be continuously overgrazed, as was done in these trials. While several varieties expressed tolerance to the level of grazing pressure used in these trials, overgrazing greatly reduces yield and therefore profitability of these varieties. This information should be an indication of those varieties that will better withstand the occasional overgrazing that sometimes becomes necessary in livestock operations.

Good management for maximum life from any grass would be to allow it to become completely established before grazing and to avoid overgrazing it during times of extreme stress, such as drought.

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Table 1. Temperature and rainfall at Lexington during the 2001, 2002, 2003, and 2004 growing seasons.

	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		0.92	-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
Total			35.17	-5.40			38.65	-1.92			39.71	-0.86			48.98	+8.41

DEP is departure from the long-term average for that location.

Table 2. Temperature and rainfall at Princeton, Kentucky in 2003 and 2004.

	2003				2004			
	Temperature		Rainfall		Temperature		Rainfall	
	°F	DEP	IN	DEP	°F	DEP	IN	DEP
JAN	31	-3	2.19	-1.61	36	+2	4.12	+0.32
FEB	35	-3	7.45	+3.02	39	+1	2.44	-1.99
MAR	50	+3	2.46	-2.48	53	+6	4.28	-0.66
APR	60	+1	6.99	+2.19	59	0	5.32	+0.52
MAY	67	0	4.81	-0.15	72	+5	7.34	+2.38
JUN	71	-4	5.05	+1.20	74	-1	3.40	-0.45
JUL	79	+1	4.75	+0.46	75	-3	4.87	+0.58
AUG	79	+2	2.05	-1.96	73	-4	3.02	-0.99
SEP	69	-2	6.17	+2.84	71	0	0.20	-3.13
OCT	60	+1	3.73	+0.68	64	+5	4.03	+0.98
NOV	53	+6	5.85	+1.22	53	+6	6.94	+2.31
Total			51.50	+5.41			45.96	-0.13

DEP is departure from the long-term average for that location.

Table 3. Percent stand and seedling vigor of tall fescue and timothy varieties sown September 19, 2000 in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Seedling Vigor ¹ Oct 31, 00	Percent Stand					
		Apr 2, 02	Oct 14, 02	Mar 26, 03	Oct 31, 03	Mar 26, 04	Aug 11, 04
Commercial Varieties—Available for Farm Use							
Select	4	69	65	66	60	85	73*
KY 31+ ²	5	76	74	73	64	90	72*
KY31- ²	5	77	66	67	63	88	72*
Cattleclub	4	68	74	68	53	83	67*
Hoedown	5	65	66	63	48	65	63*
Stargrazer	4	65	53	60	41	72	62*
Kokanee	5	54	48	53	54	63	31
Tuukka (timothy)	2	46	6	15	6	5	8
Experimental Varieties							
KYFA 9401	5	74	68	69	71	83	72*
KYFA 9402	5	76	71	67	65	81	70*
KYTF 2	4	69	63	68	59	68	60*
KYFA 9403	5	71	67	66	68	81	58
Q4508	5	70	71	65	26	66	58
KYFA 9301	5	75	70	66	68	79	57
KYFA 9304	5	73	73	69	70	79	55
AGRFA 110	4	68	70	58	53	78	52
R46633	4	53	43	48	31	43	26
Mean	4	67.5	61.7	61.2	52.8	71.0	56.1
CV, %	11	10.2	16.8	13.7	19.2	17.4	21.9
LSD, 0.05	0.5	7.9	11.9	9.6	11.7	14.2	14.1
* Not significantly different from the highest value in the column, based on the 0.05 LSD.							
¹ Vigor rating based on a score of 1 to 5 with 5 being the most vigorous seedling growth.							
² "+" indicates variety is endophyte infected; "-" indicates variety is endophyte free.							

Table 4. Percent stand and seedling vigor of tall fescue and festulolium (FL) varieties sown September 12, 2001 in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Seedling Vigor ¹ Nov 2, 01	Percent Stand					
		Apr 4, 02	Oct 15, 02	Mar 24, 03	Oct 27, 03	Mar 31, 04	Nov 8, 04
Commercial Varieties—Available for Farm Use							
Maximize	4	90	84	90	70	82	83*
Carmine	3	90	79	88	60	68	78*
Festival	4	90	84	90	68	73	77*
KY 31+ ²	5	90	88	90	74	81	75*
Spring Green (FL)	5	90	80	90	81	88	75*
KY 31- ²	5	90	85	90	71	81	73
Cattle Club	4	90	82	90	70	83	73
Felina (FL)	4	90	86	89	71	73	73
Select	3	90	83	90	69	63	73
Johnstone	5	90	79	89	68	61	68
Stargrazer	3	90	78	89	61	53	68
Resolute	4	14	16	47	17	33	45
Experimental Varieties							
HM4	4	90	78	88	69	73	78*
KYFA 9304	4	90	88	90	73	73	77*
KYFA9301	4	90	84	90	74	79	70
K5666V	3	90	65	88	63	60	62
PP10 (variety mixture)	4	90	59	85	60	63	58
Mean	4	85.5	76.4	86.7	65.8	69.7	71.1
CV, %	11	1.4	9.6	3.9	9.1	15.5	11.6
LSD, 0.05	0.5	1.4	8.4	3.8	6.9	12.4	9.5
* Not significantly different from the highest value in the column, based on the 0.05 LSD.							
¹ Vigor rating based on a score of 1 to 5 with 5 being the most vigorous seedling growth.							
² "+" indicates variety is endophyte infected; "-" indicates variety is endophyte free.							

Table 5. Percent stand and seedling vigor of tall fescue, Kentucky bluegrass (BG), and perennial ryegrass (PRG) varieties sown September 19, 2002 in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Seedling Vigor ¹ Oct 31, 02	Percent Stand			
		Mar 24, 03	Oct 30, 03	Mar 26, 04	Nov 8, 04
Commercial Varieties—Available for Farm Use					
ArkPlus	3	89	81	94	88*
Festival	4	88	78	93	87*
Orygun	5	90	80	95	85*
Select	4	90	83	95	85*
KY31 ⁻²	5	90	83	95	85*
Jesup MaxQ	4	90	81	95	82*
KY31+ ²	5	90	81	95	78
Kenblue	2	89	69	86	53
Common (BG)	2	90	74	93	50
Experimental Varieties					
EC 411 (PRG)	5	90	84	95	90*
KYFA 9304	5	89	84	95	87*
KYFA9301	5	90	83	95	83*
HM 11	4	89	84	95	82*
Mean	4	89.6	80.3	93.9	79.6
CV, %	10	1.8	4.9	2.3	9.2
LSD, 0.05	0.5	1.9	4.6	2.5	8.5
* Not significantly different from the highest value in the column, based on the 0.05 LSD.					
¹ Vigor rating based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.					
² "+" indicates variety is endophyte infected; "-" indicates variety is endophyte free.					

Table 6. Percent stand and seedling vigor rating of tall fescue and festulolium (FL) varieties sown September 19, 2003 in a cattle grazing tolerance study at Lexington, Kentucky

Variety	Seedling Vigor ¹ Oct 31, 03	Percent Stand	
		Mar 26, 04	Nov 8, 04
Commercial Varieties—Available for Farm Use			
Arkplus	4	98	90*
Barianne	4	95	90*
Jesup MaxQ	4	99	90*
KY31+ ²	5	98	90*
KY 31 ⁻²	5	99	90*
Select	4	97	90*
Jesup EF	4	98	87
Experimental Varieties			
AGRFA 117	5	98	90*
AGRFA 120	4	98	90*
AGRFA 121	5	98	90*
AGRFA 2860	5	99	90*
AGRFA 2861	4	100	90*
KYFA 0006	5	99	90*
KYFA 9611	4	94	90*
KYFA 9819 (FL)	5	97	90*
AGRFA 111	5	97	88*
KYFA 9304	5	97	88*
KYFA 9602	4	98	88*
KYTF 2	5	98	88*
Mean	4.5	97.6	84.5
CV, %	15.1	2.9	2.5
LSD, 0.05	0.9	3.2	2.6
* Not significantly different from the highest value in the column, based on the 0.05 LSD.			
¹ Vigor rating based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.			
² "+" indicates variety is endophyte infected; "-" indicates variety is endophyte free.			

Table 7. Percent stand of tall fescue, perennial ryegrass (PRG) and Kentucky bluegrass (BG) varieties sown September 25, 2002 in a cattle grazing tolerance study at Princeton, Kentucky.

Variety	Percent Stand			
	Apr 3, 03	Dec 2, 03	Apr 1, 04	Dec 21, 04
Commercial Varieties—Available for Farm Use				
Festival	90	76	75	80*
Select	90	78	77	78*
KY31 ⁻¹	90	81	79	78*
Jesup MaxQ	90	79	83	77*
ArkPlus	88	70	64	75
KY31+ ¹	90	78	78	75
Calibra (PRG)	90	85	79	67
Certified Kenblue (BG)	90	23	25	25
Experimental Varieties				
AGRFA 114	90	78	78	85*
FA 2720	90	78	80	80*
FA 2845	90	80	84	80*
HM11	90	75	70	80*
KYFA 9301	90	79	78	80*
KYFA 9304	90	79	78	80*
AGRFA 104	90	78	80	77*
EC411 (PRG)	90	83	84	77*
FA 2458	90	75	77	77*
AGRFA 106	90	77	78	75
FA 2651	90	77	76	75
FABE 9301A	90	78	78	75
PBR	86	78	66	70
AGRFA 111	90	70	73	67
KYPP 9901 (BG)	86	12	26	28
HB95 (BG)	5	10	13	15
HB96 (BG)	6	13	5	10
Mean	82.8	68.5	67.3	67.4
CV, %	1.6	11.4	11.9	12.1
LSD, 0.05	1.5	8.8	9.1	9.3

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

¹ "+" indicates variety is endophyte infected; "-" indicates variety is endophyte free.

Table 8. Percent stand of tall fescue varieties sown August 26, 2003 in a cattle grazing tolerance study at Princeton, Kentucky.

Variety	Percent Stand	
	Apr 1, 04	Dec 21, 04
Commercial Varieties—Available for Farm Use		
Jesup MaxQ	93	90*
Jesup EF	95	88*
Experimental Varieties		
AGRFA 120	93	90*
AGRFA 121	94	90*
AGRFA 2845	92	90*
AGRFA 2846	93	90*
AGRFA 2847	93	90*
AGRFA 2848	96	90*
AGRFA 2849	95	90*
AGRFA 2850	96	90*
AGRFA 2861	94	90*
AGRFA 117	88	88*
AGRFA 2860	97	88*

Mean 93.7 89.6

CV, % 3.7 2.2

LSD, 0.05 4.1 2.3

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

Variety	Seedling Vigor ¹ Oct 31, 00	Percent Stand					
		Apr 2, 02	Oct 14, 02	Mar 26, 03	Oct 30, 03	Mar 26, 04	Aug 11, 04
Commercial Varieties—Available for Farm Use							
Prairie	3	73	70	70	68	82	65*
Benchmark	3	73	69	68	52	69	60*
Boone	3	76	75	75	70	81	52*
Haymate	3	61	55	62	53	70	27
Experimental Varieties							
OG9705G	2	73	75	77	73	73	67*
KYO7G 23-335	2	69	66	69	66	64	58*
'CAS-LG31'	2	74	63	69	68	83	28
K5568K	3	33	21	24	23	33	27
K5632M (prairie brome)	5	52	18	57	11	21	20
K5633D (prairie brome)	5	47	29	53	9	19	20
Mean	3.1	63.1	54.1	62.3	49.3	59.5	42.3
CV, %	7.9	17.4	18.2	15.2	24.7	22.8	31.2
LSD, 0.05	0.3	12.8	11.5	11.0	14.1	15.8	15.4
* Not significantly different from the highest value in the column, based on the 0.05 LSD.							
¹ Vigor rating based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.							

Variety	Seedling Vigor ¹ Nov 2, 01	Percent Stand					
		Apr 2, 02	Oct 15, 02	Mar 24, 03	Oct 27, 03	Mar 31, 04	Nov 8, 04
Commercial Varieties—Available for Farm Use							
Athos	5	90	83	90	72	72	82*
Hallmark	5	90	86	90	70	78	82*
Prairie	5	90	85	90	73	78	80*
Benchmark	5	90	86	90	69	80	78*
Mammoth	4	90	83	90	68	73	75*
Albert	4	90	86	90	67	73	73
Haymate	5	90	85	90	72	73	73
Tekapo	5	90	88	90	73	53	73
Crown Royale	5	90	86	89	68	73	70
Takena	4	90	83	89	68	66	67
Megabite	4	90	83	89	58	51	55
Amba	4	90	76	87	53	45	50
Experimental Variety							
OG 9705G	3	90	86	90	70	64	85*
Mean	4	90.0	84.2	89.6	67.6	67.6	72.6
CV, %	13	0.0	6.4	1.4	8.5	12.9	13.4
LSD, 0.05	0.6	0.0	6.2	1.5	6.6	10.1	11.2
* Not significantly different from the highest value in the column, based on the 0.05 LSD.							
¹ Vigor rating based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.							

Table 11. Percent stand and seedling vigor of orchardgrass and Kentucky bluegrass (BG) varieties sown September 19, 2002 in a cattle grazing tolerance study at Lexington, Kentucky.					
Variety	Seedling Vigor ¹ Oct 31, 02	Percent Stand			
		Mar 25, 03	Oct 30, 03	Mar 26, 04	Nov 8, 04
Commercial Varieties—Available for Farm Use					
Benchmark Plus	5	90	78	95	67
Certified Potomac	5	90	76	94	65
Benchmark	4	87	68	91	60
Crown Royale Plus	5	89	75	95	58
Niva	4	82	67	93	58
Haymate	4	83	75	93	53
Uncertified Potomac	5	89	74	95	53
Prairie	5	85	65	94	52
Tekapo	3	75	67	88	52
Common (BG)	1	88	57	93	50
Abertop	2	63	36	79	23
Experimental Varieties					
DG9930b	4	84	79	93	80*
DG9911	4	85	80	95	73*
GA-OG1	5	88	71	93	60
Mean	3.9	84.0	68.7	92.1	57.5
CV, %	9.8	3.5	9.1	4.2	18.9
LSD, 0.05	0.4	3.5	7.5	2.0	12.5
* Not significantly different from the highest value in the column, based on the 0.05 LSD.					
¹ Vigor rating based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.					

Table 12. Percent stand and seedling vigor of orchardgrass varieties sown September 17, 2003 in a cattle grazing tolerance study at Lexington, Kentucky.			
Variety	Seedling Vigor ¹ Oct 31, 03	Percent Stand	
		Mar 26, 04	Nov 8, 04
Commercial Varieties—Available for Farm Use			
Haymate	4	96	90*
Intensiv	4	95	90*
Tekapo	5	97	90*
Hallmark	1	63	77
Experimental Varieties			
CIS-OG29	5	98	90*
KYDG 9303	5	98	90*
CIS-OG28	5	98	88*
KYDG 9801	5	83	88*
KYDG 9701	3	90	87*
Mean	4.1	90.8	87.8
CV, %	10.6	13.9	4.8
LSD, 0.05	0.5	14.7	5.0
* Not significantly different from the highest value in the column, based on the 0.05 LSD.			
¹ Vigor rating based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.			

Table 13. Percent stand of orchardgrass and Kentucky bluegrass (BG) varieties sown September 25, 2002 in a cattle grazing tolerance study at Princeton, Kentucky.				
Variety	Percent Stand			
	Apr 3, 03	Dec 2, 03	Apr 1, 04	Dec 21, 04
Commercial Varieties—Available for Farm Use				
Benchmark	90	73	39	27*
Benchmark Plus	90	76	36	27*
Certified Potomac	90	74	41	27*
Haymate	90	73	30	27*
Hallmark	84	68	34	25*
Prairie	90	71	41	25*
Tekapo	89	83	34	25*
Niva	90	79	38	22
Crown Royale Plus	90	76	37	20
Experimental Varieties				
KYPP 9901 (BG)	89	53	33	33*
GA-OG1	90	66	36	22
Mean	89.3	71.7	36.2	25.3
CV, %	1.2	6.8	30.0	31.4
LSD, 0.05	1.3	5.6	12.6	9.3
* Not significantly different from the highest value in the column, based on the 0.05 LSD.				

Table 14. Percent stand and seedling vigor of perennial ryegrass, festulolium and prairie brome (Bromus willdenovii) varieties sown September 19, 2000 in a cattle grazing tolerance study at Lexington, Kentucky.								
Variety	Species	Seedling Vigor ¹ Oct 31, 00	Percent Stand					
			Apr 2, 02	Oct 14, 02	Mar 26, 03	Oct 31, 03	Mar 26, 04	Aug 11, 04
Commercial Varieties—Available for Farm Use								
AGR LP 103	perennial ryegrass	4	73	73	73	63	70	57*
Duo	festulolium	4	71	61	70	66	68	52*
Linn	perennial ryegrass	3	75	58	72	48	55	50*
Citadel	perennial ryegrass	3	58	56	64	38	36	48*
Spring Green	festulolium	4	70	66	74	63	56	45*
Polly 2	perennial ryegrass	5	39	16	27	3	5	16
AGR BW 101	prairie brome	4	71	58	70	11	3	13
Grasslands Matua	prairie brome	4	67	35	53	5	3	10
Experimental Varieties								
AGR LH 101	perennial ryegrass	4	63	43	50	28	25	36
Mean		3.7	65.0	51.7	61.4	36.0	35.7	36.2
CV, %		14.1	10.3	21.3	13.1	29.9	30.5	36.3
LSD, 0.05		0.6	7.8	12.8	9.4	12.6	12.7	15.3
* Not significantly different from the highest value in the column, based on the 0.05 LSD.								
¹ Vigor rating based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.								

Table 15. Percent stand and seedling vigor of perennial ryegrass varieties sown September 2, 2001 in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Ploidy	Seedling Vigor ¹ Nov 2, 01	Percent Stand					
			Apr 4, 02	Oct 15, 02	Mar 28, 03	Oct 27, 03	Mar 31, 04	Nov 8, 04
Commercial Varieties—Available for Farm Use								
Aries	diploid	4	88	76	85	78	83	78*
Lasso	diploid	3	90	71	90	82	84	73*
Linn	diploid	3	90	80	88	80	85	72*
Grand Daddy	tetraploid	4	90	81	88	82	88	68*
Quartet	tetraploid	4	77	66	85	73	46	43
Polly 2	tetraploid	5	83	51	83	64	59	38
PP 11 (mixture)		5	54	26	66	45	31	28
Maverick Gold	diploid	5	34	16	58	28	31	20
Mean		4.1	75.8	58.3	80.4	66.4	63.2	52.7
CV, %		8.3	15.1	15.2	12.2	12.6	9.7	17.1
LSD, 0.05		0.4	13.4	10.4	11.5	9.8	7.2	10.6

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

¹ Vigor rating based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.

Table 16. Percent stand and seedling vigor of perennial ryegrass and prairie brome (*Bromus wildenovii*) varieties sown September 17, 2003 in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Species	Seedling Vigor ¹ Oct 31, 03	Percent Stand	
			Mar 26, 04	Nov 8, 04
Commercial Varieties—Available for Farm Use				
Linn	perennial ryegrass	4	99	90*
AGRBW 101	prairie brome	5	58	67
AGRRLP 103	perennial ryegrass	5	33	63
Grasslands Matua	prairie brome	5	33	50
Experimental Varieties				
AGRRLP 116	perennial ryegrass	4	52	90*
LPROM 99	perennial ryegrass	4	100	90*
AGRRLM 109	Italian ryegrass	5	61	85*
AGRRLP 108	perennial ryegrass	5	63	85*
AGRRLP 113	perennial ryegrass	5	36	82*
AGRRLM 108	Italian ryegrass	5	37	75*
AGRBP 101	prairie brome	3	48	45
AGRBW 102	prairie brome	5	13	18
Mean		4.4	52.7	70.0
CV, %		9.8	47.5	22.9
LSD, 0.05		0.5	28.9	18.6

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

¹ Vigor rating based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.

Table 17. Summary of persistence of tall fescue, perennial ryegrass (PRG), prairie brome (PB) (*Bromus willdenovii*), festulolium (FL), Kentucky bluegrass (BG) and timothy varieties under heavy grazing pressure across years and locations¹.

Variety	Proprietor/KY Distributor	Lexington											Princeton					
		2000 ²			2001				2002			2003		2002			2003	
		Oct ³ 03	Mar 04	Nov 04	Oct 02	Oct 03	Mar 04	Nov 04	Oct 03	Mar 04	Nov 04	Mar 04	Nov 04	Dec 03	Apr 04	Dec 04	Apr 04	Dec 04
Commercial Varieties—Available for Farm Use																		
ArkPlus	FFR/Southern States								*	*	*	*	*	X	X	X		
Barianne	Barenbrug USA											*	*					
Carmine	DLF-Jenks				X	X	X	*										
Calibra (PRG)	Donley Seed													*	*	X		
Cattle Club		X	*	*	*	X	*	X										
Felina (FL)	DLF -Jenks				*	X	X	X										
Festival	Pickseed West, Inc.				*	X	X	*	X	*	*			X	X	*		
Hoedown	Jenks Seed Connection	X	X	*														
Jesup EF	AgResearch (USA)											*	X				*	*
Jesup Max Q	Pennington Seed								*	*	*	*	*	*	*	*	*	*
Johnstone	Willamette Seed Co./Public				X	X	X	X										
Kenblue (BG)									X	X	X			X	X	X		
Common (BG)	Public								X	*	X							
Kokanee	Ampac Seed Company	X	X	X														
KY 31+ ⁴	KY Agric. Exp. Station	*	*	*	*	*	*	*	*	*	X	*	*	*	*	X		
KY 31- ⁴	KY Agric. Exp. Station	*	*	*	*	X	*	X	*	*	*	*	*	*	*	*	*	*
Maximize	Turf-Seed, Inc.				*	X	*	*										
Orygun									*	*	*							
Resolute	Ampac Seed Company				X	X	X	X										
Select	FFR/Southern States	*	*	*	*	X	X	X	*	*	*	*	*	*	*	*	*	*
Spring Green (FL)	Turf-Seed, Inc.				*	*	*	*										
Stargrazer	FFR/Southern States	X	X	*	X	X	X	X										
Tuukka (timothy)	Ampac Seed Company	X	X	X														
Experimental Varieties																		
AGRFA 104	AgResearch (USA)													*	*	*		
AGRFA 106	AgResearch (USA)													*	*	X		
AGRFA 110	AgResearch (USA)	X	*	X														
AGRFA 111	AgResearch (USA)											*	*	X	*	X		
AGRFA 114	AgResearch (USA)													*	*	*		
AGRFA 117	AgResearch (USA)											*	*				X	*
AGRFA 120	AgResearch (USA)											*	*				*	*
AGRFA 121	AgResearch (USA)											*	*				*	*
AGRFA 2845	AgResearch (USA)																X	*
AGRFA 2846	AgResearch (USA)																*	*
AGRFA 2847	AgResearch (USA)																*	*

Table 17. Summary of persistence of tall fescue, perennial ryegrass (PRG), prairie brome (PB) (*Bromus willdenovii*), festulolium (FL), Kentucky bluegrass (BG) and timothy varieties under heavy grazing pressure across years and locations¹.

Variety	Proprietor/KY Distributor	Lexington												Princeton				
		2000 ²			2001				2002			2003		2002			2003	
		Oct ³ 03	Mar 04	Nov 04	Oct 02	Oct 03	Mar 04	Nov 04	Oct 03	Mar 04	Nov 04	Mar 04	Nov 04	Dec 03	Apr 04	Dec 04	Apr 04	Dec 04
AGRFA 2848	AgResearch (USA)																*	*
AGRFA 2849	AgResearch (USA)																*	*
AGRFA 2850	AgResearch (USA)																*	*
AGRFA 2860	AgResearch (USA)											*	*				*	*
AGRFA 2861	AgResearch (USA)											*	*				*	*
EC 411 (PRG)	Emerald Commodities, Inc.								*	*	*			*	*	*		
FA 2458	AgResearch (USA)													*	*	*		
FA 2651	AgResearch (USA)													*	*	*		
FA 2720	AgResearch (USA)													*	*	*		
FA 2845	AgResearch (USA)													*	*	*		
FABE 9301A	Barenbrug USA													*	*	X		
HB 95 (BG)	DLF-Jenks													X	X	X		
HB 96 (BG)	DLF-Jenks													X	X	X		
HM 4	FFR/Southern States				X	X	X	*										
HM 11	FFR/Southern States								*	*	*			X	X	*		
K 5666V	Ampac Seed Company				X	X	X	X										
KYPP 9901 (BG)	KY Agric. Exp. Station													X	X	X		
PP 10	Ampac Seed Company				X	X	X	X										
KYFA 0006	KY Agric. Exp. Station											*	*					
KYFA 9301	KY Agric. Exp. Station	*	*	X	*	*	*	X	*	*	*			*	*	*		
KYFA 9304	KY Agric. Exp. Station	*	*	X	*	X	X	*	*	*	*	*	*	*	*	*		
KYFA 9401	KY Agric. Exp. Station	*	*	*														
KYFA 9402	KY Agric. Exp. Station	*	*	*														
KYFA 9403	KY Agric. Exp. Station	*	*	X														
KYFA 9602	KY Agric. Exp. Station											*	*					
KYFA 9611	KY Agric. Exp. Station											X	*					
KYFA 9819 (FL)	KY Agric. Exp. Station											*	*					
KYTF 2	KY Agric. Exp. Station	*	X	*								*	*					
PBR	Barenbrug USA													*	X	X		
Q 4508	Wrightson Seed Ltd	X	X	X														
R 4663	Wrightson Seed Ltd	X	X	X														

¹ For detailed stand ratings over years, see individual trial tables.

² Establishment year

³ Date of rating of percent stand

⁴ "+" indicates variety is endophyte infected, "-" indicates variety is endophyte free.

* Not significantly different from the most persistent variety in the test. An open block indicates the variety was not in the test, while an "x" in the block indicates the variety was in the test but plant survival was significantly less than the most persistent variety.

Table 18. Summary of persistence of orchardgrass, Kentucky bluegrass (BG) and Prairie brome (PB) (*Bromus willdenovii*) varieties under heavy grazing pressure across years and locations.

Variety	Proprietor/KY Distributor	Lexington														Princeton		
		2000 ¹					2001				2002			2003		2002		
		Oct ² 01	Oct 02	Oct 03	Mar 04	Aug 04	Oct 02	Oct 03	Mar 04	Nov 04	Oct 03	Mar 04	Nov 04	Mar 04	Nov 04	Dec 03	Apr 04	Dec 04
Commercial Varieties—Available for Farm Use																		
Abertop	Pennington Seed, Inc.																	
Albert	University of Wisconsin						*	x	*	x								
Amba	DLF-Jenks						x	x	x	x								
Athos	DLF-Jenks						*	*	*	*								
Benchmark	FFR/Southern States	*	*	x	*	*	*	*	*	*	x	x	x			*	*	*
Benchmark Plus	FFR/Southern States										*	*	x			x	*	*
Boone	KY Agric. Exp. Station	*	*	*	*	*												
Common (BG)	Public										x	*	x					
Crown Royale	Grassland Oregon						*	*	*	x								
Crown Royale Plus	Donley Seed Co.										*	*	x			x	x	x
Hallmark 1996 ³	James VanLeeuwen						*	*	*	*					x	x	x	*
Hallmark 2002 ³	James VanLeeuwen														x	x	x	*
Haymate	FFR/Southern States	x	x	x	*	x	*	*	*	x	*	*	x	*	*	x	*	*
Intensiv	Barenbrug USA														*	*		
Mammoth	DLF-Jenks						*	*	*	*								
Megabite	Turf-Seed Inc.						*	x	x	x								
Niva	DLF-Jenks										x	*	x			*	x	x
Potomac certified	Public										*	*	x			x	*	*
Potomac uncertified	Public										*	*	x					
Prairie	Turner Seed Company	*	*	*	*	*	*	*	*	*	x	*	x			x	*	*
Takena	Smith Seed Services						*	*	x	x								
Tekapo	Modern Forage Systems						*	*	x	x	x	x	x	*	*	*	*	*
	Oldfields Seed																	
Experimental Varieties																		
'CAS-LG31'	DLF-Jenks	*	x	*	*	x												
CIS-OG28	Cebeco Int'l Seeds														*	*		
CIS-OG29	Cebeco Int'l Seeds														*	*		
DG 9911	Pennington Seed, Inc.										*	*	*					
DG 9930b	Pennington Seed, Inc.										*	*	*					
GA-OG1	Pennington Seed, Inc.										x	*	x			x	*	x
K 5568K	Ampac Seeds	*	x	x	x	x												
K 5632M (PB)	Ampac Seeds	x	x	x	x	x												
K 5633D (PB)	Ampac Seeds	x	x	x	x	x												
KY07G 23-335	KY Agric. Exp. Station	*	*	*	x	*												
KYDG 9303	KY Agric. Exp. Station														*	*		
KYDG 9701	KY Agric. Exp. Station														*	*		
KYDG 9801	KY Agric. Exp. Station														*	*		
KYPP 9901 (BG)	KY Agric. Exp. Station															x	x	*
OG 9705G	FFR/Southern States	*	*	*	*	*	*	*	x	*								

¹ Establishment year.

² Date of visual rating of percent stand.

* Not significantly different from the most persistent variety. Open blocks indicate the variety was not in the test, while an "x" in the block indicate the variety was in the test but stand survival was significantly less than the most persistent variety.

³ Seed for this test came from fields planted on dates indicated.

Table 19. Summary of persistence of perennial ryegrass, festulolium (FL), and prairie brome (PB) (*Bromus willdenovii*) varieties under heavy grazing pressure across years at Lexington.

Variety	Proprietor/KY Distributor	2000 ¹					2001				2003	
		Oct ² 01	Oct 02	Oct 03	Mar 04	Nov 04	Oct 02	Oct 03	Mar 04	Nov 04	Mar 04	Nov 04
Commercial Varieties—Available for Farm Use												
AGRBW 101 (PB)	AgResearch USA	x	x	x	x	x					x	x
AGRLP 103	AgResearch USA	*	*	*	*	*					x	x
Aries	Ampac Seed Co.						*	*	*	*		
Duo (FL)	Ampac Seed Co.	*	*	*	*	*						
Citadel	Donley Seed	x	x	x	x	*						
Grand Daddy	Smith Seed Services						*	*	*	*		
Grasslands Matua	AgResearch USA	x	x	x	x	x					x	x
Linn	Public	*	x	x	x	*	*	*	*	*	*	*
Lasso	DLF-Jenks						*	*	*	*		
Maverick Gold	Ampac Seed Co.						x	x	x	x		
Polly 2	FFR/Southern States	x	x	x	x	x	x	x	x	x		
Quartet	Ampac Seed Co.						x	*	*	*		
Spring Green (FL)	Turf-Seed, Inc.	*	*	*	*	*						
Experimental Varieties												
AGRBP 101 (PB)	AgResearch USA										x	x
AGRBW 102 (PB)	AgResearch USA										x	x
AGRLH 101	AgResearch USA	x	x	x	x	x						
AGRLM 108	AgResearch USA										x	*
AGRLM 109	AgResearch USA										x	*
AGRLP 108	AgResearch USA										x	*
AGRLP 113	AgResearch USA										x	*
AGRLP116	AgResearch USA										x	*
LPTROM 99	Barenbrug USA										*	*
PP 11(variety mixture)	Ampac Seed Co.						x	x	x	x		

¹ Establishment year.

² Date of visual rating of percent stand.

* Not significantly different from the most persistent variety. An open block indicates the variety was not in the test, while an "x" in the block indicates the variety was in the test but plant survival was significantly less than the most persistent variety.



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