

# 2007 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. Tables 17, 18, and 19 show the summaries of all tall fescue, orchardgrass and perennial ryegrass varieties tested in Kentucky during the last 10 years. The UK Forage Extension Web site at <[www.uky.edu/Ag/Forage](http://www.uky.edu/Ag/Forage)> contain 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

Grass variety tests for grazing tolerance were established in Lexington in the fall of 2003, 2004, 2005 and 2006 and in Princeton in the fall of 2003. The soils at Lexington (Maury) and Princeton (Zanesville) 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. Plots were seeded at the recommended seeding rate per acre and were sown 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 or heifers and kept at 2-4 inches 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 several weeks after the cattle were removed to check stand survival after the grazing season and in the spring prior to grazing to check on winter survival and spring growth. Since trials were seeded in rows, persistence ratings were based on density within a row and not total ground cover. Grass plots were fertilized with 60 pounds of actual N per acre in the spring and 30-40 pounds of actual N in the fall. Other fertilizers (lime, P, and K) were applied as needed according to the University of Kentucky soil test recommendations.

One trial reported was rotationally grazed. For this trial, the cattle were allowed to graze the grass quickly to about 4 inches and then the cattle were removed. The grass was then allowed to regrow for four to five weeks and then grazed to about 4 inches and the cattle removed. This procedure was repeated throughout the season.

## Results and Discussion

Weather data for Lexington and Princeton are presented in Tables 1 and 2. Data on percent stand are presented in Tables 3 through 13. 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 2005 may have contributed to greater stand loss in lines without grazing tolerance.

Table 14 (fescue, perennial ryegrass, festulolium, and prairie brome), Table 15 (orchardgrass, Kentucky bluegrass, and prairie brome), and Table 16 (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.

Tables 17, 18, and 19 are summaries of stand persistence data from 1996-2007 of commercial tall fescue, orchardgrass, and perennial ryegrass varieties that have been entered in the Kentucky trials. In Table 17 the data is listed as a percentage of KY31+. In other words, in the tall fescue trials KY31+ is 100% - varieties with percentages over 100 persisted better than KY31+ and varieties with percentages less than 100 persisted less than KY31+. In Tables 18 and 19 the data is listed as a percentage of the mean of the commercial varieties entered in each specific trial. In other words, the mean for each trial is 100% - varieties with percentages over 100 persisted better than average and varieties with percentages less than 100 persisted less than average. Direct, statistical comparisons of varieties cannot be made using the summary Tables 17, 18, and 19, but these comparisons do help to identify varieties for further consideration. Varieties that have performed better than average over many years have very stable performance, while others may have performed very well in wet years or on particular soil types. These details may influence variety choice and the information can be found in the yearly reports. See footnote in Tables 17, 18, and 19 to determine which yearly report to refer to.

## 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. However, some varieties have exhibited good tolerance to grazing abuse even after three and four 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. Although 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, Kentucky in 2003, 2004, 2005, 2006 and 2007.**

	2003				2004				2005				2006				2007 <sup>2</sup>			
	Temp.		Rainfall		Temp.		Rainfall		Temp.		Rainfall		Temp.		Rainfall		Temp.		Rainfall	
	°F	DEP <sup>1</sup>	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP
JAN	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	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	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	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	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	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	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	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	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	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	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	36	0	3.26	-0.72	36	0	3.20	-0.78	32	-4	2.19	-1.79	42	+6	2.45	-1.53				
<b>Total</b>			<b>42.97</b>	<b>-1.58</b>			<b>52.18</b>	<b>+7.63</b>			<b>27.51</b>	<b>-17.04</b>			<b>45.02</b>	<b>+0.47</b>			<b>32.57</b>	<b>-8.00</b>

<sup>1</sup> DEP is departure from the long-term average.

<sup>2</sup> 2007 data is for 11 months through November.

**Table 2. Temperature and rainfall at Princeton, Kentucky in 2003, 2004, 2005, 2006 and 2007.**

	2003				2004				2005				2006				2007 <sup>2</sup>			
	Temp.		Rainfall		Temp.		Rainfall		Temp.		Rainfall		Temp.		Rainfall		Temp.		Rainfall	
	°F	DEP <sup>1</sup>	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP
JAN	31	-3	2.19	-1.61	36	+2	4.12	+0.32	41	+7	5.30	+1.50	46	+12	5.38	+1.58	40	+6	4.89	+1.09
FEB	35	-3	7.45	+3.02	39	+1	2.44	-1.99	43	+5	2.30	-2.13	38	0	2.66	-1.77	34	-4	2.99	-1.44
MAR	50	+3	2.46	-2.48	53	+6	4.28	-0.66	47	0	4.11	-0.83	51	+4	4.22	-0.72	58	+11	1.85	-3.09
APR	60	+1	6.99	+2.19	59	0	5.32	+0.52	60	+1	4.61	-0.19	63	+4	4.02	-0.78	58	-1	3.95	-0.85
MAY	67	0	4.81	-0.15	72	+5	7.34	+2.38	65	-2	1.54	-3.42	66	-1	5.42	+0.46	71	+4	2.29	-2.67
JUN	71	-4	5.05	+1.20	74	-1	3.40	-0.45	76	+1	3.09	-0.76	75	0	3.39	-0.46	76	+1	4.32	+0.47
JUL	79	+1	4.75	+0.46	75	-3	4.87	+0.58	79	+1	2.39	-1.90	79	+1	3.79	-0.50	77	-1	1.77	-2.52
AUG	79	+2	2.05	-1.96	73	-4	3.02	-0.99	80	+3	11.54	+7.53	80	+3	2.58	-1.43	85	+8	0.87	-3.14
SEP	69	-2	6.17	+2.84	71	0	0.20	-3.13	74	+2	2.17	-1.16	67	-4	9.80	+6.47	75	+4	3.52	+0.19
OCT	60	+1	3.73	+0.68	64	+5	4.03	+0.98	60	+1	0.19	-2.86	57	-2	4.5	+1.45	65	+6	5.84	+2.79
NOV	53	+6	5.85	+1.22	53	+6	6.94	+2.31	50	+3	2.48	-2.15	49	+2	4.31	-0.32	49	+2	2.31	-2.32
DEC	40	+1	2.39	-2.65	37	-1	4.29	-0.75	35	-4	1.92	-3.12	44	+5	4.76	-0.28				
<b>Total</b>			<b>53.89</b>	<b>+2.76</b>			<b>50.25</b>	<b>-0.88</b>			<b>42.55</b>	<b>-8.58</b>			<b>54.82</b>	<b>+3.69</b>			<b>37.09</b>	<b>-9.00</b>

<sup>1</sup> DEP is departure from the long-term average.

<sup>2</sup> 2007 data is for 11 months through November.

**Table 3. Seedling vigor, grazing preference and stand persistence of tall fescue and festulolium (FL) varieties sown September 19, 2003 in a cattle grazing tolerance study at Lexington, Kentucky (continuous grazing).**

Variety	Seedling Vigor <sup>1</sup> Oct 31, 2003	Grazing Preference <sup>2</sup>		Percent Stand							
		May 31 2005	May 29 2007	2004		2005		2006		2007	
				Mar 26	Nov 8	Mar 30	Oct 31	Apr 4	Oct 23	Mar 29	Oct 15
<b>Commercial varieties-Available for farm Use</b>											
KY 31+ <sup>3</sup>	4.8	37	53	98	90	90	100	85	99	98	96*
Select	3.8	20	35	97	90	90	99	99	98	98	96*
Jesup E- <sup>3</sup>	4.0	19	40	98	87	87	98	98	97	96	95*
Jesup MaxQ	4.2	25	43	99	90	87	99	100	98	97	93*
Bariane	4.2	73	58	95	90	88	97	96	96	86	85
<b>Experimental Varieties</b>											
KYFA 0006	4.6	58	63	99	90	90	99	99	99	98	96*
KYFA 9602	4.2	53	50	98	88	88	98	98	98	96	95*
AGRFA 121	4.8	32	35	98	90	75	97	99	97	96	94*
AGRFA 120	4.4	19	33	98	90	83	98	100	96	98	94*
KY 31- <sup>3</sup>	5.0	25	38	99	90	90	100	99	99	96	94*
KYTF 2	5.0	42	50	98	88	90	100	99	98	93	94*
AGRFA 2861	4.4	22	40	100	90	88	100	100	96	96	93*
KYFA 9304	4.6	37	47	97	88	90	99	100	98	96	93*
KYFA 9611	4.0	73	52	94	90	90	100	100	98	93	92*
AGRFA 2860	4.8	14	40	99	90	90	98	98	98	92	90*
AGRFA 117	4.6	26	42	98	90	80	98	99	98	97	90*
AGRFA 111	4.6	73	60	97	88	77	75	78	77	81	75
KYFA 9819 (FL)	4.8	97	87	97	90	83	85	71	58	65	21
Mean	4.5	41	48	98	90	87	97	95	94	93	88
CV,%	15.1	31	21	3	3	6	8	13	10	9	9
LSD,0.05	0.9	15	11	3	3	6	9	15	11	10	9

<sup>1</sup> Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.

<sup>2</sup> Percent of the forage in the plot that was grazed between April 20 and May 31, 2005 or between April 24 and May 29, 2007.

<sup>3</sup> "+" indicates variety is endophyte infected; "-" indicates variety is endophyte free.

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

**Table 4. Stand persistence of tall fescue varieties sown August 26, 2003 in a cattle grazing tolerance study at Princeton, Kentucky (continuous grazing).**

Variety	Percent Stand							
	2004		2005		2006		2007	
	Apr 1	Dec 21	Apr 15	Nov 3	Apr 5	Oct 30	Apr 3	Oct 18
<b>Commercial Varieties-Available for Farm Use</b>								
Jesup E- <sup>1</sup>	95	88	91	95	99	100	100	100*
Jesup MaxQ	93	90	89	94	98	100	100	100*
<b>Experimental Varieties</b>								
AGRFA 120	93	90	90	94	98	100	100	100*
AGRFA 2846	93	90	89	94	99	99	100	100*
AGRFA 2845	92	90	91	95	98	99	99	100*
AGRFA 2847	93	90	89	94	97	100	100	100*
AGRFA 2849	95	90	92	95	99	99	99	100*
AGRFA 2860	97	88	90	94	94	99	99	100*
AGRFA 2861	94	90	91	95	98	99	100	100*
AGRFA 117	88	88	90	95	97	99	100	99*
AGRFA 2850	96	90	90	95	98	99	99	99*
AGRFA 2848	96	90	90	95	98	100	100	99*
AGRFA 121	94	90	93	95	98	99	100	99*
Mean	94	90	90	95	98	100	100	100
CV,%	4	2	2	1	3	1	1	1
LSD,0.05	4	2	2	1	3	1	1	1

<sup>1</sup> "-" indicates the variety is endophyte free.

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

**Table 5. Seedling vigor and stand persistence of tall fescue varieties sown September 14, 2004 in a cattle grazing tolerance study at Lexington, Kentucky (continuous grazing).**

Variety	Seedling Vigor <sup>1</sup> Nov 8, 2004	Percent Stand					
		2005		2006		2007	
		Apr 8	Oct 31	Apr 4	Oct 23	Mar 29	Oct 25
<b>Commercial Varieties-Available for Farm Use</b>							
KY31+ <sup>2</sup>	2.3	87	97	99	98	99	96*
Stockman	3.5	97	99	100	98	99	88*
<b>Experimental Varieties</b>							
KYFA 9304	3.7	88	99	99	99	100	98*
KY31- <sup>2</sup>	4.0	95	99	100	98	98	97*
T F 0203G	4.0	97	98	100	98	98	97*
KYFA 9811	3.8	95	100	99	98	99	95*
PST-5NF	3.2	90	99	99	97	97	94*
Mean	3.5	93	99	100	98	99	95
CV,%	21.0	10	2	2	3	2	10
LSD,0.05	0.9	10	2	2	3	2	11

<sup>1</sup> Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.

<sup>2</sup> "+-" indicates variety is endophyte infected; "-" indicates variety is endophyte free.

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

**Table 6. Seedling vigor, grazing preference and stand persistence of tall fescue and festulolium (FL) varieties sown September 8, 2005 in a cattle grazing tolerance study at Lexington, Kentucky (continuous grazing).**

Variety	Seedling Vigor <sup>1</sup> Nov 7, 2005	Grazing Preference <sup>2</sup> May 19, 2007	Percent Stand			
			2006		2007	
			Apr 17	Oct 20	Mar 30	Oct 16
<b>Commercial Varieties-Available for Farm Use</b>						
KY31+ <sup>3</sup>	3.5	3.0	96	96	98	97*
Spring Green (FL)	3.7	8.7	96	91	94	93*
Select	1.8	2.3	83	90	93	92*
Jesup MaxQ	2.3	2.3	87	91	95	91
Duo (FL)	3.8	8.2	97	84	90	88
Barolex	2.8	4.3	86	90	93	88
Barianne	1.3	5.2	57	68	73	74
<b>Experimental Varieties</b>						
KYFA 9821/AR542	3.2	2.7	94	95	97	96*
KYFA 9301/AR542	3.5	2.5	94	95	96	96*
KYFA 9301/AR584	3.8	2.5	94	96	97	95*
KY31- <sup>3</sup>	3.0	2.3	94	95	96	95*
AGRFA 148	2.8	2.5	94	95	97	95*
T F 0203G	2.3	1.8	92	93	95	95*
KYFA 9821EF	2.8	2.0	92	93	96	94*
KYFA 9301EF	2.7	1.8	88	93	94	94*
KYFA 9821/AR584	3.2	2.3	93	94	96	94*
AGRFA 144	2.8	2.2	89	92	95	93*
TF 0101	2.5	2.0	92	92	93	92*
IS-FTF 25	2.5	2.0	84	92	94	92*
KYFA 9304EF	2.7	2.5	87	89	91	89
BE9301a	2.7	4.5	85	88	91	89
TF 9801	2.0	2.7	81	84	88	88
IS-FTF 12	1.8	2.2	83	87	88	86
UMTF	0.8	5.3	13	17	26	24
Mean	2.7	3.2	85	87	90	89
CV,%	26.0	25.0	8	8	7	6
LSD,0.05	0.8	0.9	8	8	7	6

<sup>1</sup> Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.

<sup>2</sup> Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed.

<sup>3</sup> "+-" indicates variety is endophyte infected; "-" indicates variety is endophyte free.

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

**Table 7. Seedling vigor , grazing preference and stand persistence of tall fescue varieties sown September 8, 2006 in a cattle grazing tolerance study at Lexington, Kentucky (continuous grazing).**

Variety	Seedling Vigor <sup>1</sup> Oct 25, 2006	Grazing Preference <sup>2</sup> May 19, 2007	Percent stand		
			2006 Oct 25	2007	
				Mar 30	Oct 15
<b>Commercial varieties-Available for Farm Use</b>					
Barolex	3.3	6.5	100	100	100*
Jesup MaxQ	2.7	3.2	99	100	100*
KY31+ <sup>3</sup>	3.8	5.3	100	100	100*
Select	3.3	2.7	100	100	100*
Tuscany II	2.8	4.8	99	100	100*
Bariane	2.5	8.5	96	100	99*
Verdant	3.2	6.0	99	99	98*
Advance MaxQ	3.2	7.8	99	98	98*
<b>Experimental Varieties</b>					
AGRFA 120	3.7	3.5	100	100	100*
AGRFA 121	3.5	3.8	100	100	100*
AGRFA 140	3.8	2.5	100	100	100*
AGRFA 148	3.7	2.2	100	100	100*
KFa402V542	3.0	6.2	99	100	100*
KY31 <sup>3</sup>	4.2	4.0	100	100	100*
KYFA 9301/AR542	4.2	4.3	100	100	100*
KYFA 9301/AR584	4.2	4.0	100	100	100*
KYFA 9301EF	3.7	4.0	99	100	100*
TF0202	3.2	6.2	99	100	100*
KYFA 9304	3.8	5.2	100	100	100*
KYFA 9821/AR584	4.0	2.8	100	100	100*
FA 2862	2.7	4.0	99	100	100*
FA 2863	3.3	5.2	99	100	100*
K4508Q542	3.3	5.7	99	100	100*
AGRFA 155	3.3	4.7	99	98	99*
K4508Q	2.5	6.8	98	100	99*
AGRFA 156	3.2	4.7	100	100	99*
FA 2864	3.2	6.2	99	99	99*
K5666VII	2.7	7.0	99	100	99*
K6560QII542	3.0	8.0	100	99	98*
FA 2865	3.7	6.0	99	100	98*
AGRFA 144	3.7	1.3	100	100	85
Mean	3.4	4.9	99	100	99
CV,%	20.4	28.6	1	1	7
LSD,0.05	0.8	1.6	1	1	8

<sup>1</sup> Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.

<sup>2</sup> Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed.

<sup>3</sup> "+" indicates variety is endophyte infected; "-" indicates variety is endophyte free.

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

**Table 8. Seedling vigor, grazing preference and stand persistence of orchardgrass varieties sown September 17, 2003 in a cattle grazing tolerance study at Lexington, Kentucky (continuous grazing).**

Variety	Seedling Vigor <sup>1</sup> Oct 31, 2003	Grazing Preference <sup>2</sup> May 29, 2007	Percent stand							
			2004		2005		2006		2007	
			Mar 26	Nov 8	Mar 30	Oct 31	Apr 4	Oct 23	Mar 29	Oct 15
<b>Commercial Varieties-Available for Farm Use</b>										
Haymate	4.2	8.8	96	90	88	99	98	95	85	76
Tekapo	4.5	8.7	97	90	78	98	98	95	83	76
Hallmark	1.3	5.3	63	77	77	91	90	86	77	73
Intensiv	4.3	8.3	95	90	88	95	94	87	42	33
<b>Experimental Varieties</b>										
CIS-OG28	5.0	6.8	98	88	88	99	100	98	95	93*
CIS-OG29	4.7	7.3	98	90	85	100	100	99	93	92*
KYDG 9801	5.0	6.3	83	88	90	97	97	96	93	86*
KYDG 9303	4.8	7.2	98	90	88	98	99	94	87	83*
KYDG 9701	2.8	6.7	90	87	83	98	98	91	82	82*
Mean	4.1	7.3	91	88	85	97	97	93	82	77
CV,%	10.6	13.9	14	5	5	2	3	4	12	17
LSD,0.05	0.5	1.2	15	5	5	3	3	4	12	16

<sup>1</sup> Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.

<sup>2</sup> Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed.

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

**Table 9. Seedling vigor and stand persistence of orchardgrass and prairie brome (PB) [*Bromus willdenovii*] varieties sown September 14, 2004 in a cattle grazing tolerance study at Lexington, Kentucky (continuous grazing).**

Variety	Seedling Vigor <sup>1</sup> Nov 8, 2004	Percent Stand					
		2005		2006		2007	
		Mar 30	Oct 31	Apr 4	Oct 23	Mar 29	Oct 25
<b>Commercial Varieties-Available for Farm Use</b>							
Certified Potomac	2.2	65	88	92	88	80	62
Command	2.0	58	82	83	75	69	42
AGRBW 101 (PB)	3.0	62	32	23	18	14	5
Grasslands Matua (PB)	2.7	28	16	10	11	8	4
<b>Experimental Varieties</b>							
KYDG 9303	3.5	90	96	98	93	94	83*
94-100	2.8	82	94	94	88	72	56
AGRBP 101 (PB)	4.2	58	27	28	16	13	5
AGRBW 102 (PB)	5.0	28	12	6	7	7	4
AGRBW 103 (PB)	3.7	33	12	9	9	4	3
Mean	3.2	56	51	49	45	40	29
CV,%	13.7	29	22	16	14	21	44
LSD,0.05	0.5	19	13	9	7	10	15

<sup>1</sup> Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.

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

**Table 11. Seedling vigor, grazing preference and stand persistence of orchardgrass varieties sown September 22, 2005 in a cattle grazing tolerance study at Lexington, Kentucky (rotational grazing).**

Variety	Seedling Vigor <sup>1</sup> Nov 7,2005	Grazing Preference <sup>2</sup> May 25 2007	Percent Stand			
			2006		2007	
			Apr 17	Oct 20	Mar 30	Oct 16
<b>Commercial Varieties-Available for Farm Use</b>						
Athos	3.0	5.7	94	98	94	94*
Persist	3.0	2.5	96	98	98	91*
Benchmark Plus	3.3	2.8	95	97	96	88*
Tekapo	3.0	5.3	92	95	86	87*
<b>Experimental Varieties</b>						
IS-OG28	2.7	3.0	94	97	98	93*
AGRDG101	3.3	8.5	67	85	28	38
Mean	3.1	4.6	90	95	83	82
CV,%	21.1	23.1	9	4	12	13
LSD,0.05	0.8	1.3	9	4	11	13

<sup>1</sup> Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.

<sup>2</sup> Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed.

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

**Table 10. Seedling vigor, grazing preference and stand persistence of orchardgrass varieties sown September 8, 2005 in a cattle grazing tolerance study at Lexington, Kentucky (continuous grazing).**

Variety	Seedling Vigor <sup>1</sup> Nov 7 2005	Grazing Preference <sup>2</sup> May 25, 2007	Percent Stand			
			2006		2007	
			Apr 17	Oct 20	Mar 30	Oct 16
<b>Commercial varieties-Available for Farm Use</b>						
Persist	2.8	3.5	95	95	99	96*
Athos	2.5	6.8	93	97	95	95*
Benchmark Plus	3.7	3.5	96	96	98	93*
Tekapo	3.0	7.3	94	97	80	88*
<b>Experimental Varieties</b>						
IS-OG 28	3.5	4.7	96	95	98	97*
AGR DG 101	3.3	8.8	75	81	33	29
Mean	3.1	5.8	91	93	84	83
CV,%	18.4	17.0	5	6	9	10
LSD,0.05	0.7	1.2	5	6	9	10

<sup>1</sup> Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.

<sup>2</sup> Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed.

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

**Table 12. Seedling vigor and stand persistence of perennial ryegrass, Italian ryegrass and prairie brome (*Bromus willdenovii*) varieties sown September 17, 2003 in a cattle grazing tolerance study at Lexington, Kentucky (continuous grazing).**

Variety	Species	Seedling Vigor <sup>1</sup> Oct 31, 2003	Percent Stand							
			2004		2005		2006		2007	
			Mar 26	Nov 8	Mar 30	Oct 31	Apr 4	Oct 23	Mar 29	Oct 15
<b>Commercial Varieties-Available for Farm Use</b>										
Remington	perennial ryegrass	3.5	100	90	87	93	94	92	98	91*
AGR1P 103	perennial ryegrass	4.5	33	63	23	52	56	53	58	52
Linn	perennial ryegrass	4.3	99	90	34	60	70	52	61	38
AGR1W 101	prairie brome	4.8	58	67	37	31	33	36	43	26
Grasslands Matua	prairie brome	4.5	33	50	20	18	13	14	14	5
<b>Experimental Varieties</b>										
AGR1P 116	perennial ryegrass	4.3	52	90	28	63	74	70	73	66
AGR1P 108	perennial ryegrass	4.5	63	85	22	63	70	71	72	58
AGR1P 113	perennial ryegrass	4.5	36	82	16	38	39	38	45	39
AGR1M 108	Italian ryegrass	5.0	37	75	11	2	5	4	8	9
AGR1P 101	prairie brome	2.5	48	45	32	34	35	18	13	4
AGR1M 109	Italian ryegrass	5.0	61	85	8	2	3	2	4	4
AGR1W102	prairie brome	5.0	13	18	6	3	2	2	3	0
Mean		4.4	53	70	27	38	41	38	41	33
CV,%		9.8	47	23	54	44	43	42	41	45
LSD,0.05		0.5	29	19	17	19	20	18	20	17

<sup>1</sup> Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.

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

**Table 13. Seedling vigor, grazing preference and stand persistence of perennial ryegrass varieties sown September 8, 2005 in a cattle grazing tolerance study at Lexington, Kentucky (continuous grazing).**

Variety	Seedling Vigor <sup>1</sup> Nov 7, 2005	Grazing Preference <sup>2</sup> May 25, 2007	Percent Stand			
			2006		2007	
			Apr 17	Oct 20	Mar 30	Oct 16
<b>Commercial Varieties-Available for Farm Use</b>						
BG34	3.2	6	96	97	97	93*
Tonga	3.5	8	97	96	97	91*
Quartet	4.7	9	93	94	63	58
<b>Experimental Varieties</b>						
SW ER3508FRI	2.8	8	94	97	98	94*
SW ER3575	3.3	8	95	96	97	94*
SW ER3579	3.7	8	97	96	97	93*
Mean	3.5	7.8	95	96	92	87
CV,%	14.3	0	2	2	6	4
LSD,0.05	0.6	0	2	3	7	5

<sup>1</sup> Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.

<sup>2</sup> Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed.

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

Table 14. Summary of persistence of tall fescue and festulolium (FL) varieties under heavy grazing pressure across years and locations.<sup>1</sup>

Variety	Proprietor/KY distributor	Lexington												Princeton													
		2003 <sup>2</sup>						2004						2005						2006							
		Mar 04	Nov 04	Mar 05	Oct 05	Apr 06	Oct 06	Mar 07	Oct 07	Apr 08	Oct 08	Mar 09	Oct 09	Mar 10	Oct 10	Apr 11	Oct 11	Mar 12	Oct 12	Apr 13	Oct 13	Mar 14	Oct 14	Apr 15	Oct 15		
<b>Commercial Varieties-Available for Farm Use</b>																											
Advance MaxQ	Pennington Seed																										
Barlane	Barenbrug USA	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Barolex	Barenbrug USA																										
Duo (FL)	Ampac Seed Company																										
Jesup E-4	AgResearch (USA)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Jesup MaxQ	Pennington Seed	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
KY 31 <sup>4</sup>	KY Agric. Exp. Station	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Select	FFR/Southern States	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Spring Green (FL)	Turf-Seed, Inc.																										
Stockman	Seed Research of Oregon																										
Tuscany II	Seed Research of Oregon																										
Verdant	Amer. Grass Seed Prod.																										
<b>Experimental Varieties</b>																											
AGRFA 111	AgResearch (USA)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
AGRFA 117	AgResearch (USA)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
AGRFA 120	AgResearch (USA)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
AGRFA 121	AgResearch (USA)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
AGRFA 140	AgResearch (USA)																										
AGRFA 144	Noble Foundation/AgResearch (USA)																										
AGRFA 148	Noble Foundation/AgResearch (USA)																										
AGRFA 155	AgResearch (USA)																										
AGRFA 156	AgResearch (USA)																										
AGRFA 2845	AgResearch (USA)																										
AGRFA 2846	AgResearch (USA)																										
AGRFA 2847	AgResearch (USA)																										
AGRFA 2848	AgResearch (USA)																										
AGRFA 2849	AgResearch (USA)																										
AGRFA 2850	AgResearch (USA)																										
AGRFA 2860	AgResearch (USA)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
AGRFA 2861	AgResearch (USA)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
FA 2862	AgResearch (USA)																										
FA 2863	AgResearch (USA)																										
FA 2864	AgResearch (USA)																										
FA 2865	AgResearch (USA)																										
FABE 9301A	Barenbrug USA																										
IS-FTF12	DLF International Seeds																										
IS-FTF25	DLF International Seeds																										
K4508Q	AgResearch (USA)																										
K4508Q542	AgResearch (USA)																										
K5666VII	AgResearch (USA)																										
K6560QII542	AgResearch (USA)																										
KFa402V542	AgResearch (USA)																										
KY 31-4	KY Agric. Exp. Station	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
KYFA 0006	KY Agric. Exp. Station	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
KYFA 9301	KY Agric. Exp. Station																										





**Table 15. Summary of persistence of orchardgrass and Prairie brome (PB) [*Bromus wildenovii*] varieties under heavy grazing pressure across years at Lexington, Kentucky.**

Variety	Proprietor/KY distributor	Lexington																	
		2003 <sup>1</sup>								2004				2005					
		Mar 04 <sup>2</sup>	Nov 04	Mar 05	Oct 05	Apr 06	Oct 06	Mar 07	Oct 07	Mar 05	Oct 05	Apr 06	Oct 06	Mar 07	Oct 07	Apr 06	Oct 06	Mar 07	Oct 07
<b>Commercial Varieties-Available for Farm Use</b>																			
AGRWBW101 (PB)	AG Research USA									x <sup>3</sup>	x	x	x	x	x				
Athos	DLF-Jenks															*	*	*	*
Benchmark Plus	FFR/Southern States															*	*	*	*
Command	Seed Research of Oregon									x	x	*	x	x	x				
Grasslands Matua (PB)	AG Research USA									x	x	x	x	x	x				
Hallmark	James VanLeeuwen	x	x	x	x	x	x	x	x										
Haymate	FFR/Southern States	*	*	*	*	*	x	*	x										
Intensiv	Barenbrug USA	*	*	*	x	x	x	x	x										
Persist	Smith Seed Services															*	*	*	*
Potomac certified	Public									x	*	*	*	x	x				
Tekapo	Ampac Seed Co.	*	*	x	*	*	x	*	x							*	*	x	*
<b>Experimental Varieties</b>																			
94-100	Ag Food of Canada									*	*	*	*	x	x				
AGRBP 101 (PB)	AG Research USA									x	x	x	x	x	x				
AGRWBW 102 (PB)	AG Research USA									x	x	x	x	x	x				
AGRWBW 103 (PB)	AG Research USA									x	x	x	x	x	x				
AGRDLG101	AG Research USA															x	x	x	x
CIS-OG28	Cebeco Int'l Seeds	*	*	*	*	*	*	*	*										
CIS-OG29	Cebeco Int'l Seeds	*	*	*	*	*	*	*	*										
IS-OG28	DLF International															*	*	*	*
KYDG 9303	KY Agric. Exp. Station	*	*	*	*	*	x	*	*	*	*	*	*	*	*				
KYDG 9701	KY Agric. Exp. Station	*	*	x	*	*	x	x	*										
KYDG 9801	KY Agric. Exp. Station	*	*	*	x	*	*	*	*										

<sup>1</sup> Establishment year.

<sup>2</sup> Date of visual rating of percent stand.

<sup>3</sup> x in the block indicate the variety was in the test but stand survival was significantly less than the most persistent variety. Open blocks indicate the variety was not in the test.

\* Not significantly different from the most persistent variety.

**Table 16. Summary of persistence of perennial ryegrass and prairie brome (PB) [*Bromus wildenovii*] varieties under heavy grazing pressure across years at Lexington, Kentucky.**

Variety	Proprietor/KY Distributor	2003 <sup>1</sup>										2005			
		Mar <sup>2</sup> 04	Nov 04	Mar 05	Oct 05	Apr 06	Oct 06	Mar 07	Oct 07	Apr 06	Oct 06	Mar 07	Oct 07		
<b>Commercial Varieties-Available for Farm Use</b>															
AGRWBW 101 (PB)	AgResearch USA	x <sup>3</sup>	x	x	x	x	x	x	x	x					
AGRRLP 103	AgResearch USA	x	x	x	x	x	x	x	x						
BG34	Barenbrug USA										*	*	*	*	
Grasslands Matua (PB)	AgResearch USA	x	x	x	x	x	x	x	x						
Linn	Public	*	*	x	x	x	x	x	x						
Quartet	Ampac Seed Co.										x	x	x	x	
Remington	Barenbrug USA	*	*	*	*	*	*	*	*						
Tonga											*	*	*	*	
<b>Experimental Varieties</b>															
AGRBP 101 (PB)	AgResearch USA	x	x	x	x	x	x	x	x						
AGRWBW 102 (PB)	AgResearch USA	x	x	x	x	x	x	x	x						
AGRRLM 108	AgResearch USA	x	*	x	x	x	x	x	x						
AGRRLM 109	AgResearch USA	x	*	x	x	x	x	x	x						
AGRRLP 108	AgResearch USA	x	*	x	x	x	x	x	x						
AGRRLP 113	AgResearch USA	x	*	x	x	x	x	x	x						
AGRRLP116	AgResearch USA	x	*	x	x	*	x	x	x						
SW ER3508FRI	SW Seed Ltd.										x	*	*	*	
SW ER3575	SW Seed Ltd.										*	*	*	*	
SW ER3579	SW Seed Ltd.										*	*	*	*	

<sup>1</sup> Establishment year.

<sup>2</sup> Date of visual rating of percent stand.

<sup>3</sup> x in the block indicates the variety was in the test but plant survival was significantly less than the most persistent variety. An open block indicates the variety was not in the test.

\* Not significantly different from the most persistent variety.

**Table 17. Summary of 1996-2007 Kentucky Tall Fescue Grazing Tolerance Trials (stand persistence shown as a percent of the stand rating of KY 31+).**

Variety	Proprietor	Lexington								Princeton		Mean <sup>3</sup> (#trials)
		1996 <sup>1,2</sup> 3yr <sup>4</sup>	1997 4yr	1998 3yr	1999 4yr	2000 4yr	2001 4yr	2002 4yr	2003 4yr	2004 3-yr	2002 4yr	
Bariane	Barenbrug USA								89			-
Barcel	Barenbrug USA	92										-
BAR9TMPO	Barenbrug USA				75							-
Bronson	Ampac Seed			39								-
Cattle Club	Green Seed		37	98	70	93	91					78(2)
Carmine	DLF-Jenks						90					-
Dovey	Barenbrug USA	92										-
Festival	Pickseed West						100	101			89	97(3)
Festorina	Advanta Seeds	98	86		57							80(3)
Fuego	Advanta Seeds			27								-
Hoedown	DLF-Jenks					88						-
Jesup EF	Pennington Seed		63	91					99			84(3)
Jesup MaxQ	Pennington Seed			44	79			103	97		105	86(5)
Johnstone	Proseeds		65	107			92					88(3)
KY31+	KY Agri. Exp Sta.	100	100	100	100	100	100	100	100	100	100	100(10)
KY31-	KY Agri. Exp Sta.	94	90	102	84		98	103	98	101	105	97(9)
Kenhy	Public			116								-
Kokanee	Ampac Seed					43						-
Martin II	International Seeds		59									-
Maximize	Turf Seed						99					-
Orygun								99				-
Resolute	Ampac Seed						23					-
Select	FFR/Sou. St.			109	69	107	101	100	100		98	98(7)
Southern Cross			25									-
Stargrazer	FFR/Sou. St.	90			52	86	89					79(4)
Stockman	Seed Res. of OR									92		-
TF33	Barenbrug USA			34								-
Vulcan	International Seeds			109								-

<sup>1</sup> Year trial was established.

<sup>2</sup> Use this summary table as a guide in making variety decisions, but refer to specific yearly reports to determine statistical differences in stand persistence between varieties. To find actual persistence ratings, look in the yearly report for the final year of each specific trial. For example, the Lexington trial planted in 1997 was grazed 4 years so the final report would be "2001 Cool-Season Grass Grazing Tolerance Report" archived in the KY Forage website at <[www.uky.edu/Ag/Forage](http://www.uky.edu/Ag/Forage)>.

<sup>3</sup> Mean only presented when respective variety was included in two or more trials.

<sup>4</sup> Number of years of data

**Table 18. Summary of 1996-2007 Kentucky Orchardgrass Grazing Tolerance Trials (stand persistence shown as a percent of the mean of the commercial varieties in the trial).**

Variety	Proprietor	Lexington								Princeton	Mean <sup>3</sup> (#trials)
		1996 <sup>1,2</sup> 3yr <sup>4</sup>	1997 4yr	1998 3yr	1999 4yr	2000 4yr	2001 4yr	2002 4yr	2003 4yr	2002 4yr	
Abertop	Pennington Seed							38			-
Albert	Univ. of Wisconsin						115				-
Amba	DLF-Jenks						71				-
Ambrosia	Pennington Seed		90								-
Athos	DLF-Jenks						93				-
Benchmark	FFR/Sou. States	100	105	115	94	118	123	114		133	113(8)
Benchmark Plus	FFR/Sou. States							120		133	127(2)
Boone	Public			131		102					117(2)
Cheyenne	Western Prod. Inc.			94							-
Crown	Donley Seed		86	96							91(2)
Crown Royale	Donley Seed						100				-
Crown Royale Plus	Donley Seed							124		83	104(2)
Hallmark	James VanLeeuwen	107		104	103		115		113	83	104(6)
Haymate	FFR/Sou. States	93	71	102	96	53	115	100	118	83	92(9)
Intensiv	Barenbrug USA								51		-
Mammoth	DLF-Jenks						115				-
Megabite	Turf Seed						77				-
Niva	DLF-Jenks							76		83	80(2)
Pizza	Advanta Seeds			63							-
Potomac	Public	98						116		117	110(3)
Prairie	Turner Seed					127	121			83	110(3)
Profile	Scott Seed	98						116			107(2)
Progress	Scott Seed	111									-
Tekapo	Ampac Seed	93	166	92	104		55	74	118	100	100(8)
Takena	Smith Seed		81				99				90(2)
WP300	Western Prod. Inc.			94							-

<sup>1</sup> Year trial was established.

<sup>2</sup> Use this summary table as a guide in making variety decisions, but refer to specific yearly reports to determine statistical differences in stand persistence between varieties. To find actual persistence ratings, look in the yearly report for the final year of each specific trial. For example, the Lexington trial planted in 1997 was grazed 4 years so the final report would be "2001 Cool-Season Grass Grazing Tolerance Report" archived in the KY Forage website at <[www.uky.edu/Ag/Forage](http://www.uky.edu/Ag/Forage)>.

<sup>3</sup> Mean only presented when respective variety was included in two or more trials.

<sup>4</sup> Number of years of data

**Table 19. Summary of 2000-2007 Kentucky Perennial Ryegrass Grazing Tolerance Trials (stand persistence shown as a percent of the mean of the commercial varieties in the trial).**

Variety	Proprietor	2000 <sup>1,2</sup>	2001	2003	Mean <sup>3</sup> (#trials)
		4yr <sup>4</sup>	3yr	4yr	
AGRLP103	AgResearch USA	133		86	110(2)
Aries	Ampac Seed		139		-
Citadel	Donley Seed	112			-
Granddaddy	Smith Seed Services		121		-
Lasso	DLF-Jenks		130		-
Linn	Public	117	129	63	103(3)
Maverick	Ampac Seed		36		-
Polly II	FFR/Southern States	37	68		53(2)
Quartet	Ampac Seed		77		-
Remington	Barenbrug USA			151	-

<sup>1</sup> Year trial was established.

<sup>2</sup> Use this summary table as a guide in making variety decisions, but refer to specific yearly reports to determine statistical differences in stand persistence between varieties. To find actual persistence ratings, look in the yearly report for the final year of each specific trial. For example, the Lexington trial planted in 2000 was grazed 4 years so the final report would be "2004 Cool-Season Grass Grazing Tolerance Report" archived in the KY Forage website at <[www.uky.edu/Ag/Forage](http://www.uky.edu/Ag/Forage)>.

<sup>3</sup> Mean only presented when respective variety was included in two or more trials.

<sup>4</sup> Number of years of data



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