

2010 Cool-Season Grass Grazing Tolerance Report

G.L. Olson, S.R. Smith, T.D. Phillips, and G.D. Lacefield, UK Department of Plant and Soil Sciences; E. Vanzant, UK Department of Animal and Food Sciences

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 13, 14, and 15 show the summaries of all tall fescue, orchardgrass and perennial ryegrass varieties tested in Kentucky during the past 15 years. 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

Grass variety tests for grazing tolerance were established in Lexington in the fall of 2006, 2007, 2008, and 2009. The soil at Lexington (Maury) is a well-drained silt loam and is 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 to 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 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.

Results and Discussion

Weather data for Lexington are presented in Table 1. Data on percent stand are presented in Tables 2 through 9. 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 differ-

Table 1. Temperature and rainfall at Lexington, Kentucky in 2006, 2007, 2008, 2009 and 2010.

	2006				2007				2008				2009				2010 ²			
	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
JAN	42	+11	4.77	+1.91	37	+6	2.93	+0.07	32	+2	3.91	+1.05	28	-3	2.45	-0.41	29	-2	2.40	-0.46
FEB	36	+1	2.13	-1.08	27	-8	1.83	-1.38	36	+1	6.11	+2.90	38	+3	2.86	-0.35	29	-6	1.38	-1.83
MAR	44	0	3.05	-1.35	52	+8	1.97	-2.43	44	+1	6.51	+1.91	48	+4	2.19	-2.21	47	+3	1.05	-3.35
APR	59	+4	3.52	-0.36	53	-2	3.87	-0.01	55	0	5.89	+2.01	55	0	4.48	+0.60	59	+4	2.74	-1.14
MAY	62	-2	2.99	-1.48	68	+4	1.45	-3.02	62	-2	4.33	+0.14	64	0	5.05	+0.58	67	+3	7.84	+3.37
JUN	70	-2	1.82	-1.84	74	+2	1.77	-1.89	74	+2	3.59	-0.07	74	+2	5.41	-1.75	76	+4	4.61	+0.95
JUL	76	0	5.13	+0.13	74	-2	6.90	+1.90	76	0	3.41	-1.59	71	-5	5.89	+0.89	78	+2	5.49	+0.49
AUG	76	+1	3.23	-0.70	80	+5	2.56	-1.37	75	0	2.18	-1.75	73	-2	5.38	+1.45	78	+3	1.54	-2.39
SEP	64	-4	9.27	+6.07	72	+4	1.15	-2.05	72	+4	1.42	-1.78	68	0	5.37	+2.17	71	+3	1.14	-2.06
OCT	54	-3	4.88	+2.31	63	+6	5.28	+2.71	57	0	1.53	-1.04	54	-3	4.83	+2.26	59	+2	1.22	-1.35
NOV	47	+2	1.78	-1.61	46	+1	2.86	-0.53	43	-2	2.53	-0.86	49	+4	0.94	-2.45				
DEC	42	+6	2.45	-1.53	40	+4	5.29	+1.31	35	-1	6.03	+2.05	36	0	3.86	-0.12				
Total			45.02	+0.47			37.86	-6.69			47.24	+2.69			48.71	+4.16			29.41	-7.77

¹ DEP is departure from the long-term average.
² 2010 data is for 10 months through October.

Table 2. Seedling vigor, grazing preference and stand persistence of tall fescue varieties sown September 8, 2006 in a cattle grazing-tolerance study at Lexington, Kentucky.

Variety	Seedling Vigor ¹ Oct 25, 2006	Grazing Preference ²				Percent Stand									
		2007	2008	2009	2010	2006	2007		2008		2009		2010		
		May 19	May 16	May 14	May 3	Oct 25	Mar 30	Oct 15	Apr 9	Oct 17	Apr 8	Oct 12	Mar 29	Nov 22	
Commercial Varieties—Available for Farm Use															
JesupMaxQ	2.7	3.2	2.0	2.0	2.3	99	100	100	100	100	96	99	100	100*	
Barolex	3.3	6.5	6.8	4.7	5.3	100	100	100	100	100	98	69	99	99*	
Tuscany II	2.8	4.8	3.3	3.3	3.2	99	100	100	100	100	96	99	99	99*	
KY31+ ³	3.8	5.3	4.3	1.3	2.7	100	100	100	100	100	100	100	99	98*	
Select	3.3	2.7	2.7	3.7	3.1	100	100	100	100	100	91	96	99	98*	
Verdant	3.2	6.0	3.5	4.2	2.8	99	99	98	97	98	88	90	94	95*	
AdvanceMaxQ	3.2	7.8	4.3	5.2	3.5	99	98	98	98	99	87	88	90	92*	
Bariane	2.5	8.5	8.3	8.4	8.0	96	100	99	100	99	42	40	68	46	
Experimental Varieties															
KYFA 9301/AR584	4.2	4.0	2.2	1.0	2.3	100	100	100	100	100	100	100	100	100*	
AGRFA 140	3.8	2.5	1.0	1.2	2.2	100	100	100	100	100	98	100	99	99*	
K6560QII542	3.0	8.0	2.0	1.5	3.5	100	99	98	99	98	98	99	99	99*	
AGRFA 155	3.3	4.7	2.0	1.2	1.8	99	98	99	99	99	98	99	100	99*	
AGRFA 120	3.7	3.5	1.3	1.3	1.3	100	100	100	100	99	95	99	100	99*	
KY31- ³	4.2	4.0	2.5	2.3	3.3	100	100	100	100	100	98	99	99	99*	
FA 2864	3.2	6.2	4.3	3.0	3.8	99	99	99	99	99	97	99	99	99*	
KYFA 9304	3.8	5.2	4.0	4.3	3.7	100	100	100	100	100	93	99	99	99*	
KYFA 9821/AR584	4.0	2.8	2.7	1.5	1.7	100	100	100	100	100	100	100	100	99*	
AGRFA 144	3.7	1.3	1.3	1.0	1.2	100	100	85	100	100	98	100	100	98*	
KYFA 9301EF	3.7	4.0	3.3	2.0	2.5	99	100	100	100	100	98	99	99	98*	
TF 0202	3.2	6.2	5.3	4.5	4.7	99	100	100	100	100	98	99	100	98*	
AGRFA 121	3.5	3.8	1.3	1.2	1.2	100	100	100	100	100	97	99	99	98*	
FA 2865	3.7	6.0	3.7	3.3	4.0	99	100	98	98	99	95	96	98	98*	
FA 2863	3.3	5.2	3.7	5.7	3.7	99	100	100	99	99	91	96	96	97*	
KFa402V542	3.0	6.2	2.7	4.8	4.7	99	100	100	100	100	93	95	97	97*	
AGRFA 156	3.2	4.7	2.0	2.2	2.0	100	100	99	100	100	89	98	98	97*	
K4508Q	2.5	6.8	1.5	2.2	3.3	98	100	99	100	99	94	94	98	97*	
K5666VII	2.7	7.0	4.8	6.3	7.0	99	100	99	99	99	93	96	97	97*	
FA2862	2.7	4.0	2.8	3.3	2.7	99	100	100	100	99	94	94	97	96*	
K4508Q542	3.3	5.7	1.0	1.3	3.5	99	100	100	100	99	90	94	96	96*	
KYFA 9301/AR542	4.2	4.3	2.8	1.7	2.5	100	100	100	100	100	100	100	100	85	
AGRFA 148	3.7	2.2	1.8	1.3	2.3	100	100	100	100	100	100	100	100	83	
Mean	3.4	4.9	3.1	2.9	3.2	99.3	99.7	99.1	99.6	99.5	93.6	94.6	97.4	95.2	
CV,%	20.4	28.6	29.9	52.2	49.1	1.3	0.9	6.7	1.3	1.3	8.5	10.9	5.3	10.8	
LSD, 0.05	0.8	1.6	3.1	1.7	1.8	1.5	1.0	7.6	1.5	1.5	9.0	11.7	5.9	11.7	

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

² Preference score based on a scale of 1 to 9, with 9 indicating all forage was grazed. Grazing time before rating; 2007-25 days, 2008-17 days, 2009-16 days, 2010-15 days. Stand thinning may have been greater for preferred varieties due to closer grazing.

³ "+" 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.

ence 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 regard to grazing tolerance (Tables 2 and 3).

Table 10 (fescue), Table 11 (orchardgrass), and Table 12 (perennial ryegrass and festulolium) 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); an "x" in the block indicates that 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 based on the 0.05 LSD. It is best to choose a variety that has performed well over several years.

Tables 13, 14, and 15 are summaries of stand persistence data from 1996 to 2010 of commercial tall fescue, orchardgrass, and perennial ryegrass varieties that have been entered in the Kentucky trials. In Table 13 the data is listed as a percentage of KY31+. In other words, in the tall

Table 3. Seedling vigor, grazing preference, and stand persistence of tall fescue varieties sown September 5, 2007 in a cattle grazing-tolerance study at Lexington, Kentucky.

Variety	Seedling Vigor ¹ Nov 7, 2007	Grazing Preference ²			Percent Stand						
		2008	2009	2010	2007	2008		2009		2010	
		May 16	May 14	May 3	Nov 7	Apr 9	Oct 17	Apr 8	Oct 12	Apr 8	Nov 22
Commercial Varieties—Available for Farm Use											
Nanryo	3.2	1.8	1.0	1.0	98	98	79	97	98	100	99*
BarOptima PLUS E34	3.5	5.8	2.0	4.3	98	98	99	98	99	99	99*
KY31+ ³	3.2	6.0	1.0	4.0	96	96	97	98	98	98	98*
BarElite	3.3	6.0	3.3	5.0	97	97	98	98	98	97	98*
JesupMaxQ	1.5	5.7	1.0	2.0	94	92	92	93	94	96	97*
Barolex	2.3	6.8	3.2	5.0	91	89	91	91	90	92	92*
Select	2.1	3.7	1.0	2.7	92	93	94	94	96	94	90*
Bariane	1.7	6.5	7.2	8.0	84	89	87	86	89	94	71
Experimental Varieties											
KRC 6581	4.2	5.0	1.5	4.5	99	100	100	100	100	99	100*
KY31- ³	4.2	3.5	1.0	2.8	99	99	99	98	99	99	99*
KYFA 9821/AR584	3.7	3.7	1.0	3.0	99	99	99	99	99	99	99*
KYFA 9821	3.3	2.8	1.0	1.7	96	96	98	99	99	99	98*
KYFA 9301/AR584	3.2	4.8	1.0	2.0	98	98	99	99	100	99	98*
BARFA MT9301	3.0	5.8	2.2	5.0	95	96	97	98	98	97	97*
AGRGT 159	2.7	4.0	1.0	2.7	96	96	95	96	96	96	96*
KYFA 9301	3.2	4.3	1.2	2.7	97	94	96	95	95	96	96*
FA2866	4.3	2.5	1.3	2.3	99	98	97	96	97	98	96*
AGRFA 144	1.7	7.2	1.0	1.7	98	97	96	96	96	97	95*
AGRGT 160	2.7	4.3	1.2	2.8	97	97	96	96	95	95	94*
KRC 6582	3.0	7.2	4.8	5.3	97	96	95	95	92	94	94*
KYFA 9611	3.3	7.8	4.2	5.2	95	95	96	92	94	93	92*
AGRFA 140	2.8	2.3	1.0	1.5	95	97	97	99	99	99	84
AGRFA 111	3.2	7.0	2.7	3.0	97	96	90	85	85	85	83
KRC 6580	1.0	8.3	1.3	2.3	59	47	65	68	70	78	75
AGRFA 156	1.8	7.8	1.5	1.7	91	78	75	62	62	68	66
Mean	2.9	5.2	1.9	3.3	94.3	93.1	93.1	93.0	93.4	94.4	92.0
CV,%	20.4	21.9	32.2	31.7	7.6	5.8	10.0	9.1	9.4	8.2	12.1
LSD, 0.05	0.7	1.3	0.7	1.2	8.4	6.3	10.9	9.9	10.3	9.0	13.1

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

² Preference score based on a scale of 1 to 9, with 9 indicating all forage was grazed. Grazing time before rating; 2008-17 days, 2009-16 days, 2010-15 days.

Stand thinning may have been greater for preferred varieties due to closer grazing.

³ "+" 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.

fescue trials KY31+ is 100 percent. Varieties with percentages over 100 persisted better than KY31+, and varieties with percentages less than 100 persisted less than KY31+. In Tables 14 and 15 the data are 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 percent. 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 13, 14, and 15, but these comparisons do help identify varieties for further consideration. Varieties that have performed better than average over many years have very stable performance; 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 13, 14, and 15 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.

Table 4. Seedling vigor, grazing preference and stand persistence of tall fescue varieties sown September 11, 2008 in a cattle grazing-tolerance study at Lexington, Kentucky.

Variety	Seedling Vigor ¹ Oct 13, 2008	Grazing Preference ²		Percent Stand				
		2009	2010	2008	2009		2010	
		May 14	May 3	Oct 13	Apr 8	Oct 12	Apr 6	Nov 22
Commercial Varieties—Available for Farm Use								
HyMark	3.8	2.8	3.2	99	100	100	100	100*
KY31+ ³	2.5	6.8	4.5	98	100	100	100	100*
Select	3.3	2.2	2.2	98	100	100	100	100*
Jesup MaxQ	2.3	8.8	1.7	98	87	89	92	94
Experimental Varieties								
KY31- ³	2.5	4.3	2.8	98	99	100	100	100*
KYFA 9301/AR584	4.7	2.7	3.0	100	100	100	100	100*
KYFA 9821/AR584	3.5	3.7	2.8	100	100	100	100	100*
TF 0201	2.5	6.2	3.0	100	99	100	100	100*
NFTF 1070	2.8	4.5	3.0	99	99	98	98	99*
AGRFA 144	2.5	3.7	1.7	98	98	99	99	98*
GA-593R	3.3	4.2	1.7	100	96	97	98	98*
GA-186	3.7	6.0	2.7	100	96	97	98	97
Mean	3.1	4.7	2.7	99.0	97.8	98.4	98.8	98.8
CV,%	24.9	41.0	36.6	2.4	5.2	4.2	3.1	2.4
LSD, 0.05	0.9	2.2	1.1	2.7	5.9	4.7	3.5	2.8

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

² Preference score based on a scale of 1 to 9, with 9 indicating all forage was grazed. Grazing time before rating; 2009-16 days, 2010-15 days. Stand thinning may have been greater for preferred varieties due to closer grazing.

³ "+" 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.

Authors

G.L. Olson, Research Specialist, Forages
 S.R. Smith, Extension Professor, Forages
 T.D. Phillips, Associate Professor, Tall Fescue Breeding
 G.D. Lacefield, Extension Professor, Forages
 E. Vanzant, Associate Professor, Beef Cattle Nutrition

Table 5. Seedling vigor, grazing preference, and stand persistence of tall fescue varieties sown September 3, 2009 in a cattle grazing-tolerance study at Lexington, Kentucky.

Variety	Seedling Vigor ¹ Oct 12, 2009	Grazing Preference ² Apr 28, 2010	Percent Stand		
			2009	2010	
			Oct 12	Apr 7	Nov 22
Commercial Varieties—Available for Farm Use					
Jesup MaxQ	2.8	3.3	96	98	100*
Select	2.8	4.7	97	98	100*
KY31+ ³	4.3	6.7	100	100	100*
Bronson	3.5	3.0	99	99	99*
Experimental Varieties					
AgR 1521	2.3	5.0	95	99	100*
KY31- ³	3.7	5.8	100	99	100*
GA-29	3.7	3.7	99	99	100*
AgR 1502	2.7	6.3	99	99	99*
KYFA 0701	4.3	4.7	100	99	99*
TF 0202	3.3	7.1	98	97	98
Mean	3.4	5.0	98.2	98.8	99.5
CV,%	19.7	38.7	1.8	1.2	0.9
LSD, 0.05	0.8	2.3	2.0	1.4	1.0

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

² Preference score based on a scale of 1 to 9, with 9 indicating all forage was grazed. Grazing time before rating; 10 days.

³ "+" 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. Grazing preference and stand persistence of orchardgrass varieties sown April 8, 2008 in a cattle grazing-tolerance study at Lexington, Kentucky.

Variety	Grazing Preference ¹		Percent Stand					
	2009	2010	2008		2009		2010	
	May 14	Apr 28	Jul 17	Oct 17	Apr 8	Oct 12	Apr 7	Nov 22
Commercial Varieties—Available for Farm Use								
BenchmarkPlus	2.8	2.8	98	96	96	95	96	80*
Persist	3.0	3.3	99	98	97	97	99	80*
Tekapo	6.7	6.6	98	96	84	90	91	64*
Ambrosia	8.2	7.7	97	96	93	94	96	60
Seco	6.5	8.1	96	95	95	93	96	50
Harvestar	8.3	7.5	98	97	94	92	93	48
Experimental Varieties								
OG0203G	4.8	5.6	97	97	94	96	96	73*
Mean	5.8	5.9	97.6	96.2	93.1	94.0	95.3	65.3
CV,%	20.3	20.8	3.2	2.8	7.5	6.4	5.2	24.3
LSD, 0.05	1.4	1.5	3.8	3.4	8.4	7.2	5.9	19.0

¹ Preference score based on a scale of 1 to 9, with 9 indicating all forage was grazed. Grazing time before rating; 2009-16 days, 2010-10 days.
* 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 orchardgrass varieties sown September 3, 2009 in a cattle grazing-tolerance study at Lexington, Kentucky.

Variety	Seedling Vigor ¹ Oct 12, 2009	Grazing Preference ² Apr 28, 2010	Percent Stand		
			2009	2010	
			Oct 12	Apr 7	Nov 22
Commercial Varieties—Available for Farm Use					
Persist	2.7	7.5	85	95	95*
BenchmarkPlus	4.2	7.3	91	96	94*
Profit	2.7	7.7	87	94	90*
Tekapo	2.0	8.8	79	85	86
Mean	2.9	7.8	85.5	92.3	91.3
CV,%	29.3	9.1	7.1	5.4	7.2
LSD, 0.05	1.0	0.9	7.5	6.2	8.1

¹ Vigor score based on a scale of 1 to 5, with 5 being the most vigorous seedling growth.
² Preference score based on a scale of 1 to 9, with 9 indicating all forage was grazed. Grazing time before rating; 10 days.
* 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 perennial ryegrass and festulolium (FL) varieties sown September 5, 2007 in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Seedling Vigor ¹ Nov 7, 2007	Grazing Preference ²			Percent Stand						
		2008	2009	2010	2007	2008		2009		2010	
		May 16	May 14	Apr 28	Nov 7	Apr 9	Oct 17	Apr 8	Oct 12	Apr 7	Nov 22
Commercial Varieties—Available for Farm Use											
BG34	2.3	9.0	7.8	6.9	98	98	96	88	88	92	55
Power	2.3	8.3	8.0	7.3	98	98	95	86	87	92	32
Granddaddy	2.3	8.8	6.3	7.3	98	96	92	80	80	88	16
Quartet	4.5	8.8	8.0	7.5	98	88	81	16	14	20	11
Experimental Varieties											
KRC 6575	2.8	9.0	7.2	7.3	99	100	99	94	97	97	76*
KRC 6578	3.5	9.0	7.7	6.8	99	99	99	93	94	96	75*
KRC 6577	3.7	9.0	7.2	6.9	100	100	99	95	95	98	73*
KRC 6554	2.7	8.8	7.0	6.0	100	100	100	98	99	99	68*
KRC 6579	3.4	9.0	8.2	7.7	99	99	99	86	91	93	59*
KLp401	3.5	9.0	8.0	7.5	99	99	97	79	83	90	58*
GO-ABZ	3.7	8.5	8.0	6.7	99	100	100	74	84	91	50
KLp507	4.4	9.0	8.5	7.7	100	100	99	69	63	76	43
KRC 6576	2.3	9.0	7.7	7.1	99	98	96	85	82	91	40
GO-ABS	3.2	8.5	7.2	7.0	100	100	98	73	88	93	39
KYFA 0236(FL)	4.5	7.3	8.5	7.8	99	100	98	82	81	91	19
GO-ABM	2.3	8.5	7.5	7.2	96	94	94	73	75	81	18
KYFA 9819(FL)	1.8	8.8	7.2	6.3	96	83	83	63	44	75	14
Mean	3.1	8.7	7.6	7.1	98.5	97.2	95.6	78.4	79.1	85.9	43.9
CV,%	19.7	5.7	14.4	14.2	1.6	4.4	4.7	17.7	14.7	9.2	35.6
LSD, 0.05	0.7	0.6	1.3	1.2	1.8	4.9	5.1	16.0	13.4	9.1	18.0

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

² Preference score based on a scale of 1 to 9, with 9 indicating all forage was grazed. Grazing time before rating; 2008-17 days, 2009-16 days, 2010-15 days.

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

Table 9. Seedling vigor, grazing preference, and stand persistence of perennial ryegrass, festulolium (FL), and tall fescue (TF) varieties sown September 16, 2008 in a cattle grazing-tolerance study at Lexington, Kentucky.

Variety	Seedling Vigor ¹ Oct 13, 2008	Grazing Preference ²		Percent Stand				
		2009	2010	2008	2009		2010	
		May 14	Apr 28	Oct 13	Apr 8	Oct 12	Apr 7	Nov 22
Commercial Varieties—Available for Farm Use								
Linn	3.5	5.8	7.5	98	100	100	99	84
SpringGreen	3.7	7.7	8.8	98	100	100	100	83
Boost	3.8	7.3	7.8	99	100	100	100	74
Duo	5.0	6.0	8.3	99	97	95	98	64
Experimental Varieties								
AGRFA 174	1.8	5.8	2.0	96	97	99	99	99*
Mean	3.6	6.5	6.9	98.0	98.9	98.9	99.4	80.8
CV,%	11.1	17.5	12.8	2.8	1.7	1.8	1.2	13.4
LSD, 0.05	0.5	1.4	1.1	3.3	2.2	2.2	1.4	13.6

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

² Preference score based on a scale of 1 to 9, with 9 indicating all forage was grazed. Grazing time before rating; 2009-16 days, 2010-10 days.

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

Table 10. Summary of persistence of tall fescue varieties under heavy grazing pressure across years at Lexington, Kentucky.¹

Variety	Proprietor/ KY distributor	2006 ²												2007				2008				2009				
		2007 ³			2008			2009			2010			2008			2009			2010			2011			
		Mar	Oct	Apr	Oct	Apr	Oct	Apr	Oct	Apr	Oct	Apr	Oct	Apr	Oct	Apr	Oct	Apr	Oct	Apr	Oct	Apr	Oct	Apr	Oct	
Commercial Varieties—Available for Farm Use																										
Advance MaxQ	Pennington Seed	x ⁵																								
BarElite	Barenbrug USA	*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Barlane	Barenbrug USA	*	*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Barolex	Barenbrug USA	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
BarOptima PLUS E34	Barenbrug USA																									
Bronson	Ampac Seed																									
HyMark	Fraser Seeds																									
Jesup Max Q	Pennington Seed	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
KY 31+ ⁴	KY Agric. Exp. Station	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Nanryo	Japanese Grassland Forage Seed/																									
Select	USDA-ARS, El Reno, OK																									
Tuscany II	FFR/Southern States Seed Research of Oregon	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Verdant	Amer. Grass Seed Prod.	*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Experimental Varieties																										
AgR 1502	AgResearch (USA)																									
AgR 1521	AgResearch (USA)																									
AGRFA 111	AgResearch (USA)																									
AGRFA 120	AgResearch (USA)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
AGRFA 121	AgResearch (USA)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
AGRFA 140	AgResearch (USA)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
AGRFA 144	Noble Foundation/AgResearch (USA)	*	X	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
AGRFA 148	Noble Foundation/AgResearch (USA)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
AGRFA 155	AgResearch (USA)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
AGRFA 156	AgResearch (USA)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
AGRGT 159	AgResearch (USA)																									
AGRGT 160	AgResearch (USA)																									
BARFAMIT 9301	Barenbrug USA																									
FA 2862	AgResearch (USA)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
FA 2863	AgResearch (USA)	*	X	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
FA 2864	AgResearch (USA)	*	X	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
FA 2865	AgResearch (USA)	*	X	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
FA 2866	AgResearch (USA)																									
GA-29	Univ. of Georgia																									

continued on next page

Table 10. Summary of persistence of tall fescue varieties under heavy grazing pressure across years at Lexington, Kentucky.¹

Variety	Proprietor/ KY distributor	2007 ²						2008						2009					
		2007 ³		2008		2009		2008		2009		2009		2010		2010		2010	
		Mar	Oct	Apr	Oct	Apr	Oct	Apr	Oct	Apr	Oct	Apr	Oct	Apr	Oct	Apr	Oct	Apr	Oct
GA-186	Univ. of Georgia																		
GA-593R	Univ. of Georgia																		
K4508Q	AgResearch (USA)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
K4508Q542	AgResearch (USA)	*	*	X	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
K5666VII	AgResearch (USA)	*	*	X	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
K6560QJ542	AgResearch (USA)	*	*	X	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
KFa402V542	AgResearch (USA)	*	*	X	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
KY 31-4	KY Agric. Exp. Station	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
KYFA 0701	KY Agric. Exp. Station																		
KYFA 9301	KY Agric. Exp. Station	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
KYFA 9301/AR542	KY Agric. Exp. Station	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
KYFA 9301/AR584	KY Agric. Exp. Station	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
KYFA 9304	KY Agric. Exp. Station	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
KYFA 9611	KY Agric. Exp. Station																		
KYFA 9821	KY Agric. Exp. Station																		
KYFA 9821/AR584	KY Agric. Exp. Station	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
KRC 6580	AgResearch (USA)																		
KRC 6581	AgResearch (USA)																		
KRC 6582	AgResearch (USA)																		
NFTF 1070	Noble Foundation																		
TF0201	Winfield Solutions LLC																		
TF0202	Allied Seed	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

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

² Establishment year.

³ Date of rating of percent stand.

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

⁵ 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 in the test.

Variety	Proprietor/KY Distributor	2008 ^{1,2}						2009	
		Jul	Oct	Apr	Oct	Apr	Nov	Apr	Nov
		2008 ³		2009		2010		2010	
Commercial Varieties—Available for Farm Use									
Ambrosia	Amer. Grass Seed Producers	*	*	*	*	*	x ⁴		
Benchmark Plus	FFR/Southern States	*	*	*	*	*	*	*	*
Harvestar	Columbia seeds	*	*	*	*	X	X		
Persist	Smith Seed Services	*	*	*	*	*	*	*	*
Profit	Ampac Seed Co.							*	*
Seco	FFR/Southern States	*	*	*	*	*	X		
Tekapo	Ampac Seed Co.	*	*	X	X	X	*	X	X
Experimental Varieties									
AGRDG101	AG Research USA								
OG0203G	FFR/Southern States	*	*	*	*	*	*		

¹ Establishment year.
² This trial was replanted in April 2008 due to poor establishment in the fall of 2007.
³ Date of visual rating of percent stand.
⁴ x in the block indicates the variety was in the test but stand 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.

Variety	Proprietor/KY Distributor	2007 ¹						2008			
		Apr	Oct	Apr	Oct	Apr	Nov	Apr	Oct	Apr	Nov
		2008 ²		2009		2010		2009		2010	
Commercial Varieties—Available for Farm Use											
BG34	Barenbrug USA	*	*	*	*	*	X				
Boost	Allied Seed							*	*	*	*
Duo (FL)	Ampac Seed Co.							X	X	X	X
Granddaddy	Smith Seed	*	x ³	X	X	X	X				
Linn	Public							*	*	*	*
Power	Ampac Seed Co.	*	*	*	*	*	X				
Quartet	Ampac Seed Co.	X	X	X	X	X	X				
SpringGreen (FL)	Rose Agri-Seed							*	*	*	*
Experimental Varieties											
GO-ABM	Grassland Oregon	X	X	X	X	X	X				
GO-ABS	Grassland Oregon	*	*	X	*	*	X				
GO-ABZ	Grassland Oregon	*	*	X	X	*	X				
KRC 6554	AgResearch (USA)	*	*	*	*	*	*				
KRC 6575	AgResearch (USA)	*	*	*	*	*	*				
KRC-6576	AgResearch (USA)	*	*	*	X	*	X				
KRC 6577	AgResearch (USA)	*	*	*	*	*	*				
KRC 6578	AgResearch (USA)	*	*	*	*	*	*				
KRC 6579	AgResearch (USA)	*	*	*	*	*	*				
KLp401	AgResearch (USA)	*	*	X	X	*	*				
KLp507	AgResearch (USA)	*	*	X	X	X	X				
KYFA 0236 (FL)	KY Agric. Exp. Station	*	*	*	X	*	X				
KYFA 9819 (FL)	KY Agric. Exp. Station	X	X	X	X	X	X				

¹ Establishment year.
² Date of visual rating of percent stand.
³ 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 13. Summary of 1996-2010 Kentucky Tall Fescue Grazing Tolerance Trials (stand persistence shown as a percent of the stand rating of KY 31+).

Variety	Proprietor	Lexington													Princeton	Mean ³ (# trials)
		1996 ^{1,2} 3yr ⁴	1997 4yr	1998 3yr	1999 4yr	2000 4yr	2001 4yr	2002 4yr	2003 4yr	2004 4yr	2005 4yr	2006 4yr	2007 3yr	2002 4yr		
Advance MaxQ	Pennington Seed												94			-
Bariane	Barenbrug USA								89		75	47	72			71(4)
Barcel	Barenbrug USA	92														-
BarElite	Barenbrug USA												100			-
Barolex	Barenbrug USA										78	101	94			91(3)
BarOptima PLUS E34	Barenbrug USA										100		101			101(2)
BAR9TMPO	Barenbrug USA				75											-
Bronson	Ampac Seed			39												-
Cattle Club	Green Seed		37	98	70	93	91									78(2)
Carmine	DLF-Jenks						90									-
Cowgirl	Rose Agri-Seed									99						-
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			114	79				103	97		68	102	99	105	96(8)
Johnstone	Proseeds		65	107			92									88(3)
KY31+ ⁵	KY Agri. Exp Sta.	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100(13)
KY31- ⁵	KY Agri. Exp Sta.	94	90	102	84		98	103	98	100	82	100	101	105		96(12)
Kenhy	Public			116												-
Kokanee	Ampac Seed					43										-
Martin II	International Seeds		59													-
Maximize	Rose Agri-Seed						99									-
Nanryo	Japanese Grassland For.Seed/USDA-ARS, El Reno, OK												101			-
Orygun	-							99								-
Resolute	Ampac Seed						23									-
Select	FFR/Southern States			109	69	107	101	100	100		67	100	92	98		94(10)
Southern Cross			25													-
Stargrazer	FFR/Southern States	90			52	86	89									79(4)
Stockman	Seed Res. of OR									102						-
TF33	Barenbrug USA			34												-
Tuscany II	Seed Res. of OR											100				-
Verdant	Am.Grass Seed											97				-
Vulcan	International Seeds			109												-

¹ Year trial was established.

² 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 four years, so the final report would be "2001 Cool-Season Grass Grazing Tolerance Report" archived in the KY Forage web site at <www.uky.edu/Ag/Forage>.

³ Mean only presented when respective variety was included in two or more trials.

⁴ Number of years of data.

⁵ "+" indicates variety is endophyte infected; "-" indicates variety is endophyte free.

Table 14. Summary of 1996-2010 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 ³ (# trials)	
		1996 ^{1,2} 3yr ⁴	1997 4yr	1998 3yr	1999 4yr	2000 4yr	2001 4yr	2002 4yr	2003 4yr	2004 4yr	2005 4yr	2007 3yr	2002 4yr		
Abertop	Pennington Seed							38							-
Albert	Univ. of Wisconsin						115								-
Amba	DLF-Jenks						71								-
Ambrosia	Pennington Seed		90									94			92(2)
Athos	DLF-Jenks						93				60				77(2)
Benchmark	FFR/Sou. States	100	105	115	94	118	123	114						133	113(8)
Benchmark Plus	FFR/Sou. States							120			152	126		133	133(4)
Boone	Public			131		102									117(2)
Cheyenne	Western Prod. Inc.			94											-
Command	Seed Research of OR									81					-
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)
Harvestar	Columbia Seeds											75			-
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)
Persist	Smith Seed										138	126			132(2)
Pizza	Advanta Seeds			63											-
Potomac	Public	98						116		119				117	113(4)
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		50	101	100		95(10)
Takena	Smith Seed		81				99								90(2)
Seco	FFR/Sou. States											79			-
WP300	Western Prod. Inc.			94											-

¹ Year trial was established.

² 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 four years, so the final report would be "2001 Cool-Season Grass Grazing Tolerance Report" archived in the KY Forage web site at <www.uky.edu/Ag/Forage>.

³ Mean only presented when respective variety was included in two or more trials.

⁴ Number of years of data.

Note: Stand thinning may have been greater for preferred varieties due to closer grazing. See individual trial tables for preference ratings.

Table 15. Summary of 2000-2010 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 ^{1,2}	2001	2003	2005	2007	Mean ³ (# trials)
		4yr ⁴	3yr	4yr	3-yr	3yr	
AGRLP103	AgResearch USA	133		86			110(2)
Aries	Ampac Seed		139				-
BG 34	Barenbrug USA				176 ⁵	193 ⁵	185(2)
Citadel	Donley Seed	112					-
Granddaddy	Smith Seed Services		121			56	89(2)
Lasso	DLF-Jenks		130				-
Linn	Public	117	129	63			103(3)
Maverick	Ampac Seed		36				-
Polly II	FFR/Southern States	37	68				53(2)
Power	Ampac Seed					112	-
Quartet	Ampac Seed		77		63	39	60(3)
Remington	Barenbrug USA			151 ⁵			-
Tonga	Ampac Seed				61		-

¹ Year trial was established.

² 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 four years, so the final report would be "2004 Cool-Season Grass Grazing Tolerance Report" archived in the KY Forage web site at <www.uky.edu/Ag/Forage>.

³ Mean only presented when respective variety was included in two or more trials.

⁴ Number of years of data.

⁵ Grazing tolerance values for these entries may have been elevated due to the low survival of the other commercial varieties in the trials for these years.



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