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UNIVERSITY OF KENTUCKY College of Agriculture

2011 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 15, 16, and 17 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 2007, 2008, 2009 and 2010. 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 steers or heifers and kept at 2 to 4 inches for the remainder of the grazing season. The trials were rated for grazing preference 10 to 20 days after cattle were allowed to start grazing (a rating of 1 indicates no forage removed and a rating of 9 indicates all forage was grazed).. Individual trials were occasionally clipped to remove seedheads or weed growth not controlled by herbicides. 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 30 pounds of actual N per acre in March, 30 pounds of actual N in May and 40 pounds of actual N in November. 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 11. 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.

Table 1. Temperature and rainfall at Lexington, Kentucky in 2008, 2009, 2010 and 2011.

	2008				2009				2010				2011[2]			
	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
JAN	32	+2	3.91	+1.05	28	-3	2.45	-0.41	29	-2	2.40	-0.46	29	-2	2.10	-0.76
FEB	36	+1	6.11	+2.90	38	+3	2.86	-0.35	29	-6	1.38	-1.83	39	+4	6.34	+3.13
MAR	44	+1	6.51	+1.91	48	+4	2.19	-2.21	47	+3	1.05	-3.35	47	+3	4.76	+0.36
APR	55	0	5.89	+2.01	55	0	4.48	+0.60	59	+4	2.74	-1.14	58	+3	12.36	+8.48
MAY	62	-2	4.33	+0.14	64	0	5.05	+0.58	67	+3	7.84	+3.37	64	0	6.72	+2.25
JUN	74	+2	3.59	-0.07	74	+2	5.41	-1.75	76	+4	4.61	+0.95	74	+2	2.61	-1.05
JUL	76	0	3.41	-1.59	71	-5	5.89	+0.89	78	+2	5.49	+0.49	80	+4	6.29	1.29
AUG	75	0	2.18	-1.75	73	-2	5.38	+1.45	78	+3	1.54	-2.39	75	0	2.89	-1.04
SEP	72	+4	1.42	-1.78	68	0	5.37	+2.17	71	+3	1.14	-2.06	66	-2	5.52	+2.32
OCT	57	0	1.53	-1.04	54	-3	4.83	+2.26	59	+2	1.22	-1.35	55	-2	4.10	+1.53
NOV	43	-2	2.53	-0.86	49	+4	0.94	-2.45	47	+2	4.58	+1.19				
DEC	35	-1	6.03	+2.05	36	0	3.86	-0.12	28	-8	2.15	-1.93				
Total			47.24	+2.69			48.71	+4.16			36.14	-8.41			53.69	+16.51

[1] DEP is departure from the long-term average.
[2] 2011 data is for ten months through October.

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 12 (fescue), Table 13 (orchardgrass), and Table 14 (perennial ryegrass and festulolium) summarize information about distributors and persistence across 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 15, 16, and 17 are summaries of stand persistence data from 1996 to 2011 of commercial tall fescue, orchardgrass, and perennial ryegrass varieties that have been entered in the Kentucky trials. In Table 15 the data is listed as a percentage of KY31+. In other words, in the tall 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 16 and 17 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 15, 16, and 17, but these comparisons do help identify varieties for further consideration. Varieties that have

Table 2. Seedling vigor, grazing preference and stand persistence of tall fescue varieties sown September 5, 2007 in a cattle grazing tolerance study at Lexington, Kentucky.

		Grazing Preference[2]				Percent Stand								
	Seedling	2008	2009	2010	2011	2007	2008		2009		2010		2011	
Variety	Vigor[1] Nov 7, 2007	May 16	May 14	May 3	May 2	Nov 7	Apr 9	Oct 17	Apr 8	Oct 12	Apr 8	Nov 22	Mar 31	Oct 4
Commercial Varieties-Available for Farm Use														
Nanryo	3.2	1.8	1.0	1.0	1.0	98	98	79	97	98	100	99	98	97*
KY31+[3]	3.2	6.0	1.0	4.0	2.4	96	96	97	98	98	98	98	97	97*
Jesup MaxQ	1.5	5.7	1.0	2.0	1.2	94	92	92	93	94	96	97	92	94*
BarOptima PLUS E34	3.5	5.8	2.0	4.3	3.0	98	98	99	98	99	99	99	96	94*
BarElite	3.3	6.0	3.3	5.0	3.3	97	97	98	98	98	97	98	97	93*
Select	2.1	3.7	1.0	2.7	1.6	92	93	94	94	96	94	90	88	90*
Barolex	2.3	6.8	3.2	5.0	3.0	91	89	91	91	90	92	92	88	83
Bariane	1.7	6.5	7.2	8.0	4.2	84	89	87	86	89	94	71	53	28
Experimental Varieties														
KRC 6581	4.2	5.0	1.5	4.5	2.8	99	100	100	100	100	99	100	98	98*
KY31-[3]	4.2	3.5	1.0	2.8	2.0	99	99	99	98	99	99	99	97	97*
AGRFA 140	2.8	2.3	1.0	1.5	1.0	95	97	97	99	99	99	84	97	96*
KYFA 9301/AR584	3.2	4.8	1.0	2.0	1.5	98	98	99	99	100	99	98	95	96*
KYFA 9821/AR584	3.7	3.7	1.0	3.0	1.7	99	99	99	99	99	99	99	96	95*
AGRFA 144	1.7	7.2	1.0	1.7	1.3	98	97	96	96	96	97	95	94	95*
KYFA 9821	3.3	2.8	1.0	1.7	1.3	96	96	98	99	99	99	98	94	95*
AGRGT 160	2.7	4.3	1.2	2.8	1.8	97	97	96	96	95	95	94	93	93*
KYFA 9301	3.2	4.3	1.2	2.7	1.7	97	94	96	95	95	96	96	94	93*
KYFA 9611	3.3	7.8	4.2	5.2	3.4	95	95	96	92	94	93	92	93	93*
FA2866	4.3	2.5	1.3	2.3	1.3	99	98	97	96	97	98	96	94	93*
AGRGT 159	2.7	4.0	1.0	2.7	2.2	96	96	95	96	96	96	96	94	93*
KRC 6582	3.0	7.2	4.8	5.3	2.8	97	96	95	95	92	94	94	94	92*
BARFA MT9301	3.0	5.8	2.2	5.0	2.8	95	96	97	98	98	97	97	91	91*
AGRFA 111	3.2	7.0	2.7	3.0	2.3	97	96	90	85	85	85	83	85	87
KRC 6580	1.0	8.3	1.3	2.3	1.8	59	47	65	68	70	78	75	77	76
AGRFA 156	1.8	7.8	1.5	1.7	2.0	91	78	75	62	62	68	66	67	72
Mean	2.9	5.2	1.9	3.3	2.1	94.3	93.1	93.1	93.0	93.4	94.4	92.0	90.3	89.0
CV,%	20.4	21.9	32.2	31.7	47.1	7.6	5.8	10.0	9.1	9.4	8.2	12.1	11.1	9.9
LSD,0.05	0.7	1.3	0.7	1.2	1.2	8.4	6.3	10.9	9.9	10.3	9.0	13.1	11.7	10.3

[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. Stand thinning may have been greater for preferred varieties due to closer grazing. Grazing time before rating; 2008-17 days, 2009-16 days, 2010-15 days, 2011-14 days.
[3] KY 31- is the variety KY31 from which the toxic endophyte has been removed. KY31+ contains the toxic endophyte. Jesup MaxQ contains a non-toxic endophyte. AR584 is a non-toxic endophyte. BarOptima Plus E34 contains a beneficial endophyte. The other fescue varieties in this test do not contain an endophyte.
* Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

Table 3. 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] 2009 May 14	2010 May 3	2011 May 2	Percent Stand 2008 Oct 13	2009 Apr 8	2009 Oct 12	2010 Apr 6	2010 Nov 22	2011 Mar 31	2011 Oct 4
Commercial Varieties-Available for Farm Use											
KY31+[3]	2.5	6.8	4.5	3.2	98	100	100	100	100	100	100*
HyMark	3.8	2.8	3.2	1.7	99	100	100	100	100	99	99*
Select	3.3	2.2	2.2	1.2	98	100	100	100	100	99	98*
Jesup MaxQ	2.3	8.8	1.7	1.7	98	87	89	92	94	96	97
Experimental Varieties											
KY31-[3]	2.5	4.3	2.8	1.5	98	99	100	100	100	100	100*
KYFA 9301/AR584	4.7	2.7	3.0	2.0	100	100	100	100	100	100	100*
KYFA 9821/AR584	3.5	3.7	2.8	2.7	100	100	100	100	100	100	100*
TF 0201	2.5	6.2	3.0	2.5	100	99	100	100	100	100	100*
NFTF 1070	2.8	4.5	3.0	1.8	99	99	98	98	99	100	100*
AGRFA 144	2.5	3.7	1.7	1.7	98	98	99	99	98	98	99*
GA-593R	3.3	4.2	1.7	1.5	100	96	97	98	98	98	99*
GA-186	3.7	6.0	2.7	1.7	100	96	97	98	97	97	98
Mean	3.1	4.7	2.7	1.9	99.0	97.8	98.4	98.8	98.8	98.9	99.1
CV,%	24.9	41.0	36.6	34.6	2.4	5.2	4.2	3.1	2.4	2.2	1.6
LSD,0.05	0.9	2.2	1.1	0.8	2.7	5.9	4.7	3.5	2.8	2.6	1.9

[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, 2011-14 days.
[3] KY 31- is the variety KY31 from which the toxic endophyte has been removed. KY31+ contains the toxic endophyte. Jesup MaxQ contains a non-toxic endophyte. AR584 is a non-toxic endophyte. The other fescue varieties in this test do not contain an endophyte.
* Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

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 15, 16, and 17 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

Table 4. 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] 2010 Apr 28	2011 May 2	Percent Stand 2009 Oct 12	2010 Apr 7	2010 Nov 22	2011 Mar 16	2011 Oct 4
Commercial Varieties-Available for Farm Use								
KY31+[3]	4.3	6.7	4.5	100	100	100	100	100*
Bronson	3.5	3.0	1.8	99	99	99	100	100*
Jesup MaxQ	2.8	3.3	2.8	96	98	100	99	99*
Select	2.8	4.7	2.2	97	98	100	99	99*
Experimental Varieties								
AgR 1521	2.3	5.0	3.0	95	99	100	100	100*
KY31-[3]	3.7	5.8	2.7	100	99	100	100	100*
AgR 1502	2.7	6.3	3.5	99	99	99	100	100*
KYFA 0701	4.3	4.7	3.5	100	99	99	99	99*
GA-29	3.7	3.7	1.7	99	99	100	100	99*
TF 0202	3.3	7.1	4.0	98	97	98	99	98
Mean	3.4	5.0	3.0	98.2	98.8	99.5	99.6	99.4
CV,%	19.7	38.7	43.3	1.8	1.2	0.9	0.8	1.0
LSD,0.05	0.8	2.3	1.5	2.0	1.4	1.0	1.0	1.2

[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; 2010-10 days, 2011-14 days.
[3] KY 31- is the variety KY31 from which the toxic endophyte has been removed. KY31+ contains the toxic endophyte. Jesup MaxQ, AgR1502 and AgR1521 contain a non-toxic endophyte. The other fescue varieties in this test do not contain an endophyte.
* Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

Table 5. Seedling vigor, grazing preference and stand persistence of tall fescue varieties sown September 1, 2010 in a cattle grazing tolerance study at Lexington,Kentucky.

Variety	Seedling Vigor[1] Oct 14, 2010	Grazing Preference[2] Apr 25, 2011	Percent Stand 2010 Oct 14	2011 Mar 15	2011 Oct 4
Commercial Varieties-Available for Farm Use					
Bronson	3.9	2.8	99	100	99*
Jesup EF	3.1	2.3	99	100	99*
KY31+[3]	3.3	5.8	99	99	99*
Select	3.4	3.5	99	99	99*
Cajun II	3.6	3.2	99	99	99*
Jesup MaxQ	1.6	3.7	96	98	99*
Goliath	3.5	2.8	99	100	98*
BarOptima PLUS E34	2.2	6.5	95	97	98*
Experimental Varieties					
KYFA 0601	3.7	4.0	99	99	99*
TF 0202	2.9	6.5	98	99	99*
AgR1502	3.1	4.7	99	99	99*
AgR1521	2.6	4.2	98	99	99*
KY31-[3]	3.8	4.7	99	99	99*
KYFA 0701	3.5	4.3	98	99	99*
GA29	2.5	2.8	97	98	98*
KYFA 0901	2.6	4.8	96	96	96
Mean	3.1	4.2	98.0	98.7	98.4
CV,%	25.5	25.3	2.3	1.8	1.8
LSD,0.05	0.9	1.2	2.6	2.1	2.0

[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; 7 days.
[3] KY 31- is the variety KY31 from which the toxic endophyte has been removed. KY31+ contains the toxic endophyte. Jesup MaxQ, AgR1502 and AgR1521 contain a non-toxic endophyte. BarOptima PLUS E34 contains a beneficial endophyte. The other fescue varieties in this test do not contain an endophyte.
* Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

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.
- Avoid overgrazing it during times of extreme stress, such as drought.

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Table 6. Grazing preference and stand persistence of orchardgrass varieties sown April 8, 2008 in a cattle grazing tolerance study at Lexington, Kentucky.

	Grazing Preference[1]			Percent Stand							
	2009	2010	2011	2008		2009		2010		2011	
Variety	May 14	Apr 28	May 2	Jul 17	Oct 17	Apr 8	Oct 12	Apr 7	Nov 22	Mar 31	Nov 7
Commercial Varieties-Available for Farm Use											
Benchmark Plus	2.8	2.8	5.0	98	96	96	95	96	80	85	76*
Persist	3.0	3.3	4.3	99	98	97	97	99	80	85	60*
Tekapo	6.7	6.6	6.2	98	96	84	90	91	64	72	58*
Ambrosia	8.2	7.7	5.0	97	96	93	94	96	60	58	53
Seco	6.5	8.1	5.7	96	95	95	93	96	56	58	48
Harvestar	8.3	7.5	5.4	98	97	94	92	93	48	44	42
Experimental Varieties											
OG0203G	4.8	5.6	4.3	97	97	94	96	96	73	76	51
Mean	5.8	5.9	5.1	97.6	96.2	93.1	94.0	95.3	66.5	69.0	55.9
CV,%	20.3	20.8	32.5	3.2	2.8	7.5	6.4	5.2	24.0	20.0	27.5
LSD,0.05	1.4	1.5	2.0	3.8	3.4	8.4	7.2	5.9	19.4	16.8	18.7

[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, 2011-14 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.

		Grazing Preference[2]		Percent Stand				
		2010	2011	2009	2010		2011	
Variety	Seedling Vigor[1] Oct 12, 2009	Apr 28	May 2	Oct 12	Apr 7	Nov 22	Mar 16	Nov 7
Commercial Varieties-Available for Farm Use								
Benchmark Plus	4.2	7.3	5.8	91	96	94	94	83*
Persist	2.7	7.5	4.8	85	95	95	95	77*
Profit	2.7	7.7	5.8	87	94	90	93	74*
Tekapo	2.0	8.8	6.0	79	85	86	89	68*
Mean	2.9	7.8	5.6	85.5	92.3	91.3	92.8	75.2
CV,%	29.3	9.1	22.1	7.1	5.4	7.2	4.0	23.0
LSD,0.05	1.0	0.9	1.5	7.5	6.2	8.1	4.5	21.3

[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; 2010-10 days, 2011-14 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 orchardgrass varieties sown September 1, 2010 in a cattle grazing tolerance study at Lexington, Kentucky.

			Percent Stand		
			2010	2011	
Variety	Seedling Vigor[1] Oct 14, 2010	Grazing Preference[2] Apr 25, 2011	Oct 14	Mar 15	Oct 4
Commercial Varieties-Available for Farm Use					
Profit	3.7	6.0	100	100	98*
Benchmark Plus	3.7	6.2	100	98	97*
Tekapo	3.0	6.2	100	100	97*
Harvestar	2.8	7.7	99	100	96*
Persist	1.2	7.5	91	93	92
Experimental Varieties					
OG0503	3.0	6.7	99	99	99*
OG9902	4.5	5.5	100	100	98*
Mean	3.1	6.5	98.5	98.5	96.6
CV,%	20.5	20.5	2.4	3.4	2.4
LSD,0.05	0.8	1.6	2.8	3.9	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; 7 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 and festulolium (FL) varieties sown September 5, 2007 in a cattle grazing tolerance study at Lexington, Kentucky.

		Grazing Preference[2]				Percent Stand								
		2008	2009	2010	2011	2007	2008		2009		2010		2011	
Variety	Seedling Vigor[1] Nov 7, 2007	May 16	May 14	Apr 28	May 2	Nov 7	Apr 9	Oct 17	Apr 8	Oct 12	Apr 7	Nov 22	Mar 31	Nov 8
Commercial Varieties-Available for Farm Use														
BG34	2.3	9.0	7.8	6.9	6.7	98	98	96	88	88	92	55	47	52
Power	2.3	8.3	8.0	7.3	6.3	98	98	95	86	87	92	32	31	48
Granddaddy	2.3	8.8	6.3	7.3	7.0	98	96	92	80	80	88	16	12	25
Quartet	4.5	8.8	8.0	7.5	8.2	98	88	81	16	14	20	11	10	18
Experimental Varieties														
KRC 6578	3.5	9.0	7.7	6.8	5.7	99	99	99	93	94	96	75	72	79*
KRC 6575	2.8	9.0	7.2	7.3	6.5	99	100	99	94	97	97	76	69	74*
KRC 6577	3.7	9.0	7.2	6.9	5.8	100	100	99	95	95	98	73	58	73*
KRC 6579	3.4	9.0	8.2	7.7	7.2	99	99	99	86	91	93	59	50	68*
KRC 6554	2.7	8.8	7.0	6.0	7.0	100	100	100	98	99	99	68	56	67*
KLp401	3.5	9.0	8.0	7.5	6.7	99	99	97	79	83	90	58	54	59
KRC 6576	2.3	9.0	7.7	7.1	6.7	99	98	96	85	82	91	40	33	55
KLp507	4.4	9.0	8.5	7.7	7.5	100	100	99	69	63	76	43	38	52
GO-ABS	3.2	8.5	7.2	7.0	6.2	100	100	98	73	88	93	39	38	46
GO-ABZ	3.7	8.5	8.0	6.7	7.2	99	100	100	74	84	91	50	42	45
KYFA 0236 (FL)	4.5	7.3	8.5	7.8	7.3	99	100	98	82	81	91	19	18	24
GO-ABM	2.3	8.5	7.5	7.2	7.6	96	94	94	73	75	81	18	13	20
KYFA 9819 (FL)	1.8	8.8	7.2	6.3	7.8	96	83	83	63	44	75	14	13	15
Mean	3.1	8.7	7.6	7.1	6.9	98.5	97.2	95.6	78.4	79.1	85.9	43.9	38.5	48.2
CV,%	19.7	5.7	14.4	14.2	22.6	1.6	4.4	4.7	17.7	14.7	9.2	35.6	43.3	34.4
LSD,0.05	0.7	0.6	1.3	1.2	1.9	1.8	4.9	5.1	16.0	13.4	9.1	18.0	19.1	19.0

[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, 2010-10days, 2011-14 days.
* 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 perennial ryegrass, festulolium (FL) and tall fescue (TF) varieties sown September 16, 2008 in a cattle grazing tolerance study at Lexington, Kentucky.

		Grazing Preference[2]			Percent Stand						
		2009	2010	2011	2008	2009		2010		2011	
Variety	Seedling Vigor[1] Oct 13, 2008	May 14	Apr 28	May 2	Oct 13	Apr 8	Oct 12	Apr 7	Nov 22	Mar 31	Nov 7
Commercial Varieties-Available for Farm Use											
SpringGreen (FL)	3.7	7.7	8.8	8.5	98	100	100	100	83	83	80*
Linn	3.5	5.8	7.5	6.5	98	100	100	99	84	76	70
Boost	3.8	7.3	7.8	7.3	99	100	100	100	74	68	68
Duo (FL)	5.0	6.0	8.3	8.2	99	97	95	98	64	55	58
Experimental Varieties											
AGRFA174 (TF)	1.8	5.8	2.0	2.5	96	97	99	99	99	96	89*
Mean	3.6	6.5	6.9	6.6	98.0	98.9	98.9	99.4	80.8	75.6	72.8
CV,%	11.1	17.5	12.8	18.9	2.8	1.7	1.8	1.2	13.4	14.8	16.7
LSD,0.05	0.5	1.4	1.1	1.5	3.3	2.2	2.2	1.4	13.6	13.4	14.7

[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; 2009-16 days, 2010-10days, 2011-14 days.
* 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 perennial ryegrass and festulolium (FL) varieties sown September 1, 2010 in a cattle grazing tolerance study at Lexington, Kentucky.

			Percent Stand		
			2010	2011	
Variety	Seedling Vigor[1] Oct 14, 2010	Grazing Preference[2] Apr 25, 2011	Oct 14	Mar 15	Oct 4
Commercial Varieties-Available for Farm Use					
BG34	4.2	7.7	100	100	100*
Linn	3.7	4.5	100	100	100*
Granddaddy	3.7	6.3	100	100	100*
SpringGreen (FL)	3.7	5.7	100	100	100*
Barfest (FL)	4.0	6.7	100	100	99*
Boost	4.3	4.8	100	99	99*
Power	3.7	7.5	100	100	99*
Duo (FL)	5.0	4.0	100	99	88
Mean	4.0	5.9	100.0	99.8	98.1
CV,%	12.7	10.6	0.0	1.1	1.3
LSD,0.05	0.6	1.4	0.0	1.2	1.5

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

Table 12. Summary of persistence of tall fescue and varieties under heavy grazing pressure across years at Lexington, Kentucky.[1]

Variety	Proprietor/ KY distributor	2007[2]								2008						2009				2010	
		Apr	Oct	Apr	Oct	Apr	Nov	Mar	Oct	Apr	Oct	Apr	Nov	Mar	Oct	Apr	Nov	Mar	Oct	Mar	Oct
		2008[3]		2009		2010		2011		2009		2010		2011		2010		2011		2011	
Commercial Varieties-Available for Farm Use																					
BarElite	Barenbrug USA	*	*	*	*	*	*	*	*												
Bariane	Barenbrug USA	x[5]	x	x	x	*	x	x	x												
Barolex	Barenbrug USA	x	*	*	*	*	*	*	x												
BarOptima PLUS E34	Barenbrug USA	*	*	*	*	*	*	*	*	*										x	*
Bronson	Ampac Seed															*	*	*	*	*	*
Cajun II	Smith Seed Services																			*	*
Goliath	Ampac Seed																			*	*
HyMark	Fraser Seeds									*	*	*	*	*	*						
Jesup EF	Pennington Seed																			*	*
Jesup Max Q	Pennington Seed	x	*	*	*	*	*	*	*	x	x	x	x	x	x	x	*	*	*	*	*
KY 31+[4]	KY Agric. Exp. Station	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Nanryo	Japanese Grassland Forage Seed/USDA-ARS,ElReno, OK	*	x	*	*	*	*	*	*												
Select	FFR/Southern States	x	*	*	*	*	*	*	*	*	*	*	*	*	*	x	*	*	*	*	*
Experimental Varieties																					
AgR 1502	AgResearch (USA)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
AgR 1521	AgResearch (USA)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
AGRFA 111	AgResearch (USA)	*	*	x	x	x	x	x	x												
AGRFA 140	AgResearch (USA)	*	*	*	*	*	x	*	*												
AGRFA 144	Noble Foundation/ AgResearch (USA)	*	*	*	*	*	*	*	*	*	*	*	*	*	*						
AGRFA 156	AgResearch (USA)	x	x	x	x	x	x	x	x												
AGRGT 159	AgResearch (USA)	*	*	*	*	*	*	*	*												
AGRGT 160	AgResearch (USA)	*	*	*	*	*	*	*	*												
BARFAMT 9301	Barenbrug USA	*	*	*	*	*	*	*	*												
FA 2866	AgResearch (USA)	*	*	*	*	*	*	*	*												
GA-29	Univ. of Georgia															*	*	*	*	*	*
GA-186	Univ. of Georgia									*	*	*	x	x	x						
GA-593R	Univ. of Georgia									*	*	*	*	*	*						
KY 31-[4]	KY Agric. Exp. Station	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
KYFA 0601	KY Agric. Exp. Station																			*	*
KYFA 0701	KY Agric. Exp. Station															*	*	*	*	*	*
KYFA 0901	KY Agric. Exp. Station																			x	*
KYFA 9301	KY Agric. Exp. Station	*	*	*	*	*	*	*	*												
KYFA 9611	KY Agric. Exp. Station	*	*	*	*	*	*	*	*												
KYFA 9821	KY Agric. Exp. Station	*	*	*	*	*	*	*	*												
KRC 6580	AgResearch (USA)	x	x	x	x	x	x	x	x												
KRC 6581	AgResearch (USA)	*	*	*	*	*	*	*	*												
KRC 6582	AgResearch (USA)	*	*	*	*	*	*	*	*												
NFTF 1070	Noble Foundation									*	*	*	*	*	*						
TF0201	Winfield Solutions LLC									*	*	*	*	*	*						
TF0202	Allied Seed															x	*	*	x	*	*

[1] For detailed stand ratings over years, see individual trial tables.
[2] Establishment year.
[3] Date of rating of percent stand.
[4] KY 31- is the variety KY31 from which the toxic endophyte has been removed. KY31+ contains the toxic endophyte. Jesup MaxQ, AgR1502 and AgR1521 contain a non-toxic endophyte. BarOptima PLUS E34 contains a beneficial endophyte. The other fescue varieties in this table do not contain an endophyte.
[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.

Table 13. Summary of persistence of orchardgrass varieties under heavy grazing pressure across years at Lexington, Kentucky.

		2008[1,2]								2009				2010	
		Jul	Oct	Apr	Oct	Apr	Nov	Mar	Nov	Apr	Nov	Mar	Nov	Mar	Oct
Variety	Proprietor/KY distributor	2008[3]		2009		2010		2011		2010		2011		2011	
Commercial Varieties-Available for Farm Use															
Ambrosia	Amer. Grass Seed Producers	*	*	*	*	*	x[4]	x	x						
Benchmark Plus	FFR/Southern States	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Harvestar	Columbia seeds	*	*	*	*	x	x	x	x					*	*
Persist	Smith Seed Services	*	*	*	*	*	*	*	*	*	*	*	*	x	x
Profit	Ampac Seed Co.									*	*	*	*	*	*
Seco	FFR/Southern States	*	*	*	*	*	x	x	x						
Tekapo	Ampac Seed Co.	*	*	x	x	x	*	*	*	x	x	x	*	*	*
Experimental Varieties															
OG0203G	FFR/Southern States	*	*	*	*	*	*	*	x						
OG0503	FFR/Southern States													*	*
OG9902	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 indicate the variety was in the test but stand survival was significantly less than themost persistent variety. Open blocks indicate the variety was not in the test.
* Not significantly different from the most persistent variety.

Table 14. Summary of persistence of perennial ryegrass and festulolium (FL) varieties under heavy grazing pressure across years at Lexington, Kentucky.

		2007[1]								2008						2010	
	Proprietor/KY	Apr	Oct	Apr	Oct	Apr	Nov	Mar	Nov	Apr	Oct	Apr	Nov	Mar	Nov		
Variety	Distributor	2008[2]		2009		2010		2011		2009		2010		2011		2011	
Commercial Varieties-Available for Farm Use																	
Barfest (FL)	Barenbrug USA															*	*
BG34	Barenbrug USA	*	*	*	*	*	x	x	x							*	*
Boost	Allied Seed									*	*	*	*	x	*	*	*
Duo (FL)	Ampac Seed Co.									x	x	x	x	x	x	*	x
Granddaddy	Smith Seed	*	x[3]	x	x	x	x	x	x							*	*
Linn	Public									*	*	*	*	*	*	*	*
Power	Ampac Seed Co.	*	*	*	*	*	x	x	x							*	*
Quartet	Ampac Seed Co.	x	x	x	x	x	x	x	x								
SpringGreen (FL)	Rose Agri-Seed									*	*	*	*	*	*	*	*
Experimental Varieties																	
GO-ABM	Grassland Oregon	x	x	x	x	x	x	x	x								
GO-ABS	Grassland Oregon	*	*	x	*	*	x	x	x								
GO-ABZ	Grassland Oregon	*	*	x	x	*	x	x	x								
KRC 6554	AgResearch (USA)	*	*	*	*	*	*	*	*								
KRC 6575	AgResearch (USA)	*	*	*	*	*	*	*	*								
KRC-6576	AgResearch (USA)	*	*	*	x	*	x	x	x								
KRC 6577	AgResearch (USA)	*	*	*	*	*	*	*	*								
KRC 6578	AgResearch (USA)	*	*	*	*	*	*	*	*								
KRC 6579	AgResearch (USA)	*	*	*	*	*	*	*	*								
KLp401	AgResearch (USA)	*	*	x	x	*	*	*	x								
KLp507	AgResearch (USA)	*	*	x	x	x	x	x	x								
KYFA 0236 (FL)	KY Agric.Exp. Station	*	*	*	x	*	x	x	x								
KYFA 9819 (FL)	KY Agric.Exp. Station	x	x	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 15. Summary of 1996-2011 Kentucky Tall Fescue Grazing Tolerance Trials (stand persistence shown as a percent of the stand rating of KY 31+).

		Lexington													Princeton	
		1996[1,2]	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2002	Mean[3]
Variety	Proprietor	3yr[4]	4yr	3yr	4yr	4yr	4yr	4yr	4yr	4yr	4yr	4yr	4yr	3yr	4yr	(#trials)
Advance MaxQ	Pennington Seed											94				–
Bariane	Barenbrug USA								89		75	47	29			60(4)
Barcel	Barenbrug USA	92														–
BarElite	Barenbrug USA												96			–
Barolex	Barenbrug USA										78	101	86			88(3)
BarOptima PLUS E34	Barenbrug USA										100		97			99(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										–
HyMark	Fraser Seeds													99		–
Jesup EF	Pennington Seed		63	91					99							84(3)
Jesup MaxQ	Pennington Seed			114	79			103	97		68	102	97	97	105	96(9)
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(14)
KY31-[5]	KY Agri. Exp Sta.	94	90	102	84		98	103	98	100	82	100	100	100	105	97(13)
Kenhy	Public			116												–
Kokanee	Ampac Seed					43										–
Martin II	International Seeds		59													–
Maximize	Rose Agri-Seed						99									–
Nanryo	Japanese Grassland For. Seed/USDA-ARS,ElReno,OK												100			–
Orygun								99								–
Resolute	Ampac Seed						23									–
Select	FFR/Sou. St.			109	69	107	101	100	100		67	100	93	98	98	95(11)
Southern Cross			25													–
Stargrazer	FFR/Sou. St.	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 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>.

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

[4] Number of years of data

[5] KY 31- is the variety KY31 from which the toxic endophyte has been removed. KY31+ contains the toxic endophyte. Jesup MaxQ and Advance MaxQ contain a non-toxic endophyte. BarOptima PLUS E34 contains a beneficial endophyte. The other fescue varieties in this table do not contain an endophyte.

Table 16. Summary of 1996-2011 Kentucky Orchardgrass Grazing ToleranceTrials (stand persistence shown as a percent of the mean of the commercial varieties in the trial).

		Lexington											Princeton	Mean[3]
		1996[1,2]	1997	1998	1999	2000	2001	2002	2003	2004	2005	2007	2002	
Variety	Proprietor	3yr[4]	4yr	3yr	4yr	4yr	4yr	4yr	4yr	4yr	4yr	4yr	4yr	(#trials)
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	135	133	135(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	107		123(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	103	100	96(10)
Takena	Smith Seed		81				99							90(2)
Seco	FFR/Sou. States											85		–
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 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>.
[3] Mean only presented when respective variety was included in two or more trials.
[4] Number of years of data. Stand thinning may have been greater for preferred varieties due to closer grazing. See individual trial tables for preference ratings.

Table 17. Summary of 2000-2011 Kentucky Perennial Ryegrass and Festulolium(FL) Grazing Tolerance Trials (stand persistence shown as a percent of the mean of the commercial varieties in the trial).

Variety	Proprietor	2000[1,2] 4yr[4]	2001 3yr	2003 4yr	2005 3-yr	2007 4yr	2008 3yr	Mean[3] (#trials)
AGRLP103	AgResearch USA	128		86				107(2)
Aries	Ampac Seed		139					–
BG 34	Barenbrug USA				176[5]	145[5]		185(2)
Boost	Allied Seed						99	–
Citadel	Donley Seed	107						–
Duo (FL)	Ampac Seed	116					84	100(2)
Granddaddy	Smith Seed Services		121			70		89(2)
Lasso	DLF-Jenks		130					–
Linn	Public	112	129	63			101	101(4)
Maverick	Ampac Seed		36					–
Polly II	FFR/Southern States	36	68					52(2)
Power	Ampac Seed					134		–
Quartet	Ampac Seed		77		63	50		60(3)
Remington	Barenbrug USA			151[5]				–
Spring Green (FL)	Rose Agri-Seed	101					116	109(2)
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 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>.
[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.

12-2011