

2012 Cool-Season Grass Horse Grazing Tolerance Report

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Introduction

Cool-season grasses such as bluegrass, tall fescue, and orchardgrass are dominant pasture grasses for horses in Kentucky. Variety evaluations for yield have been carried out for many years, but little work has been done to establish the effect of variety on persistence when subjected to close, continuous grazing by horses.

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

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.

Important Selection Considerations

Local adaptation and seasonal yield. The variety should be adapted to Kentucky as indicated by good winter survival and good performance across years and locations in replicated yield and grazing trials, such as those presented in this publication. Choose high-yielding persistent varieties and varieties that are productive during the desired season of use. Refer to the appropriate yield trial reports for yield data on specific varieties of interest.

Seed quality. Buy premium-quality seed that is high in germination, high in purity, and free from weed seed. Buy certified seed or proprietary seed of an improved variety. An improved variety is one that has performed well in indepen-

dent trials. Other information on the label will include the test date (which must be within the previous nine months), the level of germination, and percentage of other crop and weed seed. Order seed well in advance of planting time to assure that it will be available when needed.

Important: When seeding perennial ryegrasses for horse pasture (of any kind), insist on an endophyte-free variety. The endophyte level will be stated on a green tag on every bag of seed. Most forage types of perennial ryegrass are endophyte free, and most new turf types are infected. This endophyte is similar to the endophyte of tall fescue and produces alkaloids that are toxic to cattle and horses.

Description of the Tests

Tests were established in Lexington in the fall of 2008, 2009, 2010, and 2011. The soils at this location are well-drained silt loams and are well suited to tall fescue, orchardgrass, and other cool-season grasses. Plots were 5 feet by 15 ft in a randomized complete block design, with each variety replicated six times. Plots were seeded at the recommended seeding rate per acre and were planted into a prepared seedbed using a disk drill. Grazing was continuous from April to October.

Plots were grazed down to below 4 inches quickly and were maintained at 1 to 3 inches for the remainder of the grazing season. Individual trials were occasionally clipped to remove seedheads or weed growth not controlled by herbicides. Supplemental hay was fed during periods of slowest growth. Visual ratings of percent stand were made in the fall several weeks after the horses 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 early November after horses were removed from the pasture. Other fertilizers (lime, P, and K) were applied as needed.

Results and Discussion

Weather data for Lexington for 2009, 2010, 2011, and 2012 are presented in Table 1.

Data on percent stand are presented in tables 3, 4, 5, and 6. Table 2 presents grazing preference data.

Statistical analyses were performed on all entries (including experimentals) to determine if numerical 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.

In general, commercial varieties of tall fescue and orchardgrass tolerated overgrazing well (tables 3, 4, and 5), but the varieties of timothy in these trials did not. The sensitivity of timothy to heavy grazing was not surprising, as it is an erect species and sensitive to heavy

Table 1. Temperature and rainfall at Lexington, Kentucky, in 2009, 2010, 2011, and 2012.

	2009				2010				2011				2012 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	28	-3	2.45	-0.41	29	-2	2.40	-0.46	29	-2	2.10	-0.76	38	+7	4.80	+1.94
FEB	38	+3	2.86	-0.35	29	-6	1.38	-1.83	39	+4	6.34	+3.13	40	+5	5.39	+2.18
MAR	48	+4	2.19	-2.21	47	+3	1.05	-3.35	47	+3	4.76	+0.36	56	+12	5.64	+1.24
APR	55	0	4.48	+0.60	59	+4	2.74	-1.14	58	+3	12.36	+8.48	56	+1	3.26	-0.62
MAY	64	0	5.05	+0.58	67	+3	7.84	+3.37	64	0	6.72	+2.25	69	+5	4.02	-0.45
JUN	74	+2	5.41	-1.75	76	+4	4.61	+0.95	74	+2	2.61	-1.05	73	+1	2.42	-1.24
JUL	71	-5	5.89	+0.89	78	+2	5.49	+0.49	80	+4	6.29	1.29	81	+5	2.50	-2.50
AUG	73	-2	5.38	+1.45	78	+3	1.54	-2.39	75	0	2.89	-1.04	75	0	1.68	-2.25
SEP	68	0	5.37	+2.17	71	+3	1.14	-2.06	66	-2	5.52	+2.32	67	-1	6.40	+3.20
OCT	54	-3	4.83	+2.26	59	+2	1.22	-1.35	55	-2	4.10	+1.53	55	-2	2.00	-0.57
NOV	49	+4	0.94	-2.45	47	+2	4.58	+1.19	50	+5	9.53	+6.14				
DEC	36	0	3.86	-0.12	28	-8	2.15	-1.93	41	+5	5.58	+1.60				
Total			48.71	+4.16			36.14	-8.41			68.80	+24.25			38.11	+0.93

¹ DEP is departure from the long-term average.

² 2011 data is for the ten months through October.

defoliation. Perennial ryegrasses, Kentucky bluegrasses, and festuloliums vary in tolerance to grazing.

The lack of a defined “grazing-tolerant variety” for these species makes absolute interpretation difficult. For example, endophyte-infected “Kentucky 31” (KY31+) is known to be grazing tolerant. However, there are no proven grazing-tolerant varieties for the other species. Still, certain varieties were clearly more tolerant than others.

Differences in tolerance among varieties could be due to true grazing tolerance but also to preference, especially where highly palatable species such as bluegrass and ryegrass were in the same test as tall fescue. Because of potential preference between species, comparison between varieties is most accurate within a species. These data should be taken as an indication of tolerance to periods of overgrazing. For best pasture stands, forage grasses should not be abused as in this study.

Ranking Varieties by Preference

Differences in tolerance among varieties could be due to true grazing tolerance but also to preference, as horses may graze the preferred varieties more intensely than the less preferred varieties. In spring 2004 and spring 2005, the varieties sown in fall 2003 were used to assess the grazing preferences of horses. During the first week of grazing in both years, variety plots were measured for forage

Table 2. Preference rankings determined in the first week of grazing in Spring 2004 and Spring 2005 for cool season grass varieties sown September 17, 2003, at Lexington, Kentucky.

Variety	Species	Preference Rank ¹		2yr Rank ²	Percent Stand Oct. 25, 2007 ³
		Spring 2004	Spring 2005		
Haymate	orchardgrass	2	1	1	58
Barfleo	timothy	1	6	2	17
Peak	smooth brome	3	4	3	7
KYFA 9819	festulolium	5	3	4	16
Ginger	KY bluegrass	4	5	5	54
TM 9901	timothy	8	2	6	17
KYFA 0006	tall fescue	7	7	7	74
KYFA 9602	tall fescue	6	11	8	37
KYFA 9611	tall fescue	9	8	9	61
KYFA 9304	tall fescue	10	10	10	66
Select	tall fescue	12	12	11	65
KYTF 2	tall fescue	15	9	12	63
KY 31-4	tall fescue	11	14	13	69
Common	KY bluegrass	13	13	14	58
Estancia	tall fescue	14	15	15	73

¹ 1 = most preferred, 15 = least preferred; see text for explanation of ranking process.

² 1 = most preferred based on two-year total; when two varieties had the same two-year total, ties were broken using the 2004 rank.

³ Stand survival after four years of continuous grazing.

⁴ “-” indicates variety is endophyte free.

height and scored for forage density and evidence of grazing. Measurements were made before horses were given access to plots and on days 2, 5, and 7. Forage density was scored from 0 to 10, where 10 indicated that 100 percent of the plot was covered with the seeded variety and 0 indicated that there were no plants of the seeded variety. Similarly, grazing intensity was scored from 0 to 10; where 10 indicated that 100 percent of the plants had been grazed and 0 indicated that none of the plants had been grazed.

Preference rankings were generated using a combination of measurements including the percent reduction in forage height between day 0 and day 7 (greatest reduction = most preferred); the unit

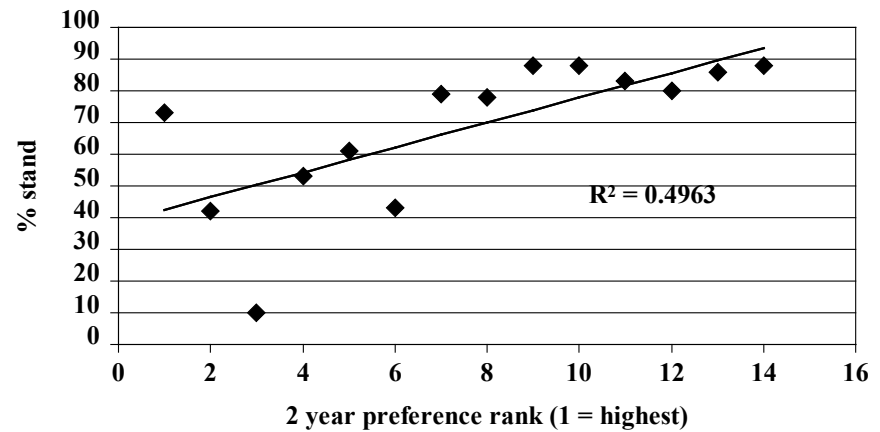
decrease in forage density from day 0 to day 7 (largest unit reduction = most preferred); and the grazing intensity scores from day 7 (highest grazing score = most preferred). The rankings for each characteristic were then totaled, and the varieties with the lowest totals were considered most preferred. Table 2 shows the preference rankings determined in spring 2004 and spring 2005 for the forage varieties sown in fall 2003. A two-year ranking was also determined based on the total from the 2004 and 2005 rankings. When two forages had the same two-year total, the tie was broken using the 2004 score. In general, tall fescue varieties were less preferred by horses than timothy and orchardgrass. However, only one variety

of orchardgrass was included in this test. Common bluegrass also appeared to have low palatability to horses, although the “ginger” variety of bluegrass was well accepted. This acceptance may have been influenced by maturity.

To determine whether grazing preferences might affect the grazing tolerance of cool-season grass varieties, the relationship of the two-year grazing preference ranking to the percent stand remaining in fall 2006 was plotted in Figure 1. There is a moderate relationship between preference rank and percent stand ($R^2 = 0.49$); least preferred varieties had the highest percent stand after three grazing seasons. Two varieties appear to have performed differently than the others: “Haymate” orchardgrass had a relatively high stand percentage (73 percent), even though it was highly preferred; the “Peak” variety of smooth brome had an extremely low stand percentage (10 percent) compared to all other varieties.

Tables 3, 4, 5, and 6 include preference ratings made two to three weeks after horses started grazing. These ratings do not provide information on initial prefer-

Figure 1. Relationship of preference ranking to percent stand remaining, Fall 2006.



Note: Species on figure are as follows: 1-orchardgrass, 2-timothy, 3-smooth brome, 4-festulolium, 5-KY bluegrass, 6-timothy, 7-13-tall fescue, 14-KY bluegrass.

ence but do provide a good indication of the varieties that the horses repeatedly grazed during the first few weeks on pasture.

Table 7 summarizes 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 the variety was in the test but was significantly different from 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

Table 3. Seedling vigor, grazing preference, and stand persistence of forage grasses sown September 4, 2009, in a horse grazing tolerance study at Lexington, Kentucky.

Variety	Species	Seedling Vigor ¹ Oct 12, 2009	Grazing Preference ²			Percent Stand						
			2010	2011	2012	2009	2010		2011		2012	
			Jun 11	May 2	May 2	Oct 12	Apr 8	Dec 3	Mar 15	Nov 9	Mar 22	Oct 12
Commercial Varieties—Available for Farm Use												
KY31+ ³	tall fescue	3.8	1.2	2.5	1.0	100	100	100	100	100	100	98*
Jesup MaxQ	tall fescue	2.8	1.0	1.0	1.0	97	99	99	99	100	100	97*
Select	tall fescue	3.5	0.5	1.5	1.0	96	99	99	99	99	99	95*
Benchmark Plus	orchardgrass	3.2	2.7	1.8	1.2	98	99	93	92	92	91	88*
Profit	orchardgrass	2.8	5.7	4.3	1.7	97	98	89	91	84	82	85
Tekapo	orchardgrass	2.0	5.7	5.7	2.0	97	92	91	91	85	77	85
Persist	orchardgrass	2.5	1.7	1.7	1.2	95	99	93	91	78	74	84
Power	perennial ryegrass	5.0	5.0	7.2	7.8	100	100	85	88	81	89	79
Ginger	KY bluegrass	1.0	8.2	3.0	1.2	65	86	63	79	77	73	68
Granddaddy	perennial ryegrass	4.5	3.0	5.3	1.7	101	100	88	92	79	75	54
Climax	timothy	2.0	4.7	4.2	1.3	91	94	58	44	26	23	27
Giant	bentgrass species	1.2	6.3	2.8	1.0	81	90	84	83	45	38	23
Experimental Varieties												
KYFA0701	tall fescue	3.8	0.8	2.5	1.0	100	100	99	100	100	100	100*
KY31- ³	tall fescue	4.0	0.8	1.8	1.0	100	100	100	99	100	100	97*
AgR 1502	tall fescue	2.8	1.0	1.5	1.0	99	100	99	99	100	100	95*
AgR 1521	tall fescue	2.7	0.7	1.0	1.0	98	100	99	99	100	100	93*
B-8.0082	colonial bentgrass	1.2	8.5	5.8	6.2	69	84	88	82	93	94	80
Mean		3.0	3.4	3.2	1.9	94	96	90	90	85	83	79
CV,%		18.0	29.2	35.5	34.6	10	6	9	9	10	12	13
LSD,0.05		0.7	1.1	1.3	0.8	11	6	10	10	10	12	12

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; 2010-7 days, 2011-12 days, 2012-13 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.

0.05 LSD. It is best to choose a variety that has performed well over several years.

Tables 8 and 9 are summaries of stand persistence data from 1999 to 2012 of commercial tall fescue and orchardgrass varieties that have been entered in the Kentucky trials. In Table 8 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 Table 9 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 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 8 and 9, 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 footnotes in tables 8 and 9 to determine to which yearly report to refer.

Summary

These studies indicate that there are varieties of cool-season grasses that can tolerate overgrazing by horses for three to four seasons and still maintain reasonable stands. 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 generally recommended that tall fescue, orchardgrass, or other cool-season grasses be continuously overgrazed as was done in this trial. Although several varieties expressed tolerance to the level of grazing pressure used in these trials, overgrazing

Table 4. Seedling vigor, grazing preference, and stand persistence of forage grasses sown September 11, 2008, in a horse grazing tolerance study at Lexington, Kentucky.

Variety	Species	Seedling Vigor ¹ Oct 14, 2008	Grazing Preference ²						Percent Stand								
			2009		2010		2011		2009		2010		2011		2012		
			Jun 5	May 14	May 2	May 2	May 2	May 2	Apr 9	Apr 9	Apr 9	Apr 9	Apr 9	Apr 9	Mar 22	Mar 22	Oct 12
Commercial Varieties—Available for Farm Use																	
Select	tall fescue	3.2	2.7	1.0	1.0	1.0	1.0	98	98	100	100	99	99	97	97	98	99*
KY31+ ³	tall fescue	2.7	5.5	1.2	1.2	1.0	1.0	93	93	95	96	96	96	96	96	97	98*
Cowgirl	tall fescue	3.5	3.5	1.5	1.0	1.0	1.0	96	96	99	99	97	97	97	98	98	97*
Jesup MaxQ	tall fescue	2.8	4.5	1.0	1.0	1.7	1.0	93	90	91	94	93	93	93	94	96	96*
BenchMark Plus	orchardgrass	3.3	2.5	4.0	2.2	1.8	2.2	98	93	93	96	59	73	49	50	53	
Ginger	KY bluegrass	1.0	6.8	3.3	1.5	2.0	2.7	79	74	70	45	43	43	43	43	45	
Granddaddy	perennial ryegrass	4.8	3.0	7.8	6.0	1.0	97	100	97	88	35	30	22	20	11		
Climax	timothy	2.3	4.5	6.8	4.2	2.0	94	98	93	95	9	18	8	12	7		
Giant	bentgrass species	2.3	5.7	6.8	2.0	—	89	88	83	86	8	11	7	7	3		
Experimental Varieties																	
TF 0201	tall fescue	3.2	4.7	1.0	1.0	1.2	93	94	93	96	85	95	94	95	95	95	93*
KY31- ³	tall fescue	2.3	4.3	1.7	1.0	1.0	93	98	98	98	97	95	99	95	97	92*	
B-8.0082	colonial bentgrass	1.5	7.7	8.3	5.0	8.5	88	85	93	94	93	92	91	92	93	73	
TM 0501G	timothy	1.3	5.0	6.7	4.5	1.8	78	85	91	93	12	17	7	17	14		
TM 0502G	timothy	1.2	5.5	6.0	6.0	2.0	52	79	80	84	10	8	3	7	6		
Mean		2.6	4.7	4.1	2.6	2.8	84	92	91	92	60	62	56	59	59		
CV,%		26.0	31.6	27.2	44.6	25.0	17	12	9	12	25	23	23	23	24		
LSD,0.05		0.8	1.7	1.3	1.6	1.1	17	12	9	12	17	17	15	16	16		

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: 2009-25 days, 2010-19 days, 2011-12 days, 2012-13 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. 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 forage grasses sown September 1, 2010, in a horse grazing tolerance study at Lexington, Kentucky.

Variety	Species	Seedling Vigor ¹ Oct 26, 2010	Grazing Preference ²		Percent Stand				
			2011	2012	2010	2011		2012	
			May 2	May 2	Oct 26	Mar 15	Nov 9	Mar 22	Oct 12
Commercial Varieties—Available for Farm Use									
Tekapo	orchardgrass	3.3	2.7	3.0	85	100	100	100	100*
Benchmark Plus	orchardgrass	4.3	1.7	1.7	100	100	84	99	99*
KY31+ ³	tall fescue	2.8	1.2	1.0	99	100	100	100	99*
Persist	orchardgrass	3.2	1.7	1.2	99	99	99	99	99*
Jesup MaxQ	tall fescue	1.9	1.0	1.0	96	97	99	100	99*
Jesup EF	tall fescue	3.2	1.0	1.0	99	100	100	100	99*
Select	tall fescue	2.8	1.0	1.0	98	98	99	85	98*
BarOptima Plus E34	tall fescue	2.2	3.7	1.2	97	99	99	84	97*
Profit	orchardgrass	3.2	2.8	3.3	99	99	97	98	97*
Power	perennial ryegrass	5.0	6.7	9.0	100	100	98	99	96*
Granddaddy	perennial ryegrass	4.3	6.0	8.3	99	99	96	97	95*
Ginger	KY bluegrass	0.9	5.2	1.8	71	71	67	57	61
Climax	timothy	1.9	5.8	4.2	95	94	77	76	53
Experimental Varieties									
KY31- ³	tall fescue	3.3	1.0	1.0	99	100	100	100	99*
AgR 1521	tall fescue	2.3	1.2	1.0	96	98	99	100	99*
TM 0502G	timothy	0.8	7.0	4.0	36	44	34	40	33
Mean		2.8	3.1	2.7	92	93	90	89	89
CV,%		27.6	28.8	32.5	13	8	13	15	12
LSD,0.05		0.9	1.0	1.0	13	9	14	16	12

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; 2011-12 days, 2012-13 days.

³ KY 31- is the variety KY31 from which the toxic endophyte has been removed. KY31+ contains the toxic endophyte. Jesup MaxQ 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.

greatly reduces forage production. This information should be an indication of those varieties that will better withstand overgrazing when it occurs.

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

About the Authors

G.L. Olson is a research specialist and S.R. Smith and G.D. Lacefield are Extension professors of Forages. L.M. Lawrence is a professor of Horse Nutrition, and T.D. Phillips is an associate professor of Tall Fescue Breeding.

Table 6. Seedling vigor, grazing preference, and stand persistence of forage grasses sown September 13, 2011, in a horse grazing tolerance study at Lexington, Kentucky.

Variety	Species	Seedling Vigor ¹ Oct 11, 2011	Grazing Preference ² May 2, 2012	Percent Stand		
				2011	2012	
				Oct 11	Mar 22	Oct 12
Commercial Varieties—Available for Farm Use						
BarOptima Plus E34	tall fescue	2.6	1.5	100	100	100*
Benchmark Plus	orchardgrass	2.5	1.7	100	100	100*
Jesup EF	tall fescue	2.7	1.0	100	100	100*
Jesup MaxQ	tall fescue	2.8	1.0	100	100	100*
KY31+ ³	tall fescue	2.8	2.3	100	100	100*
Persist	orchardgrass	2.5	2.0	100	100	100*
Select	tall fescue	2.7	1.0	100	100	100*
Tekapo	orchardgrass	3.0	2.7	100	100	100*
Spring Green	festulolium	3.8	6.2	100	100	99
Duo	festulolium	4.5	5.5	100	100	94
Experimental Varieties						
AGRFA 148	tall fescue	2.7	1.0	100	100	100*
KY31- ³	tall fescue	3.0	1.4	100	100	100*
KYFA0804	tall fescue	3.0	1.0	100	100	100*
KYFA0902	tall fescue	2.8	1.7	100	100	100*
KYFA0905	tall fescue	3.0	1.8	100	100	100*
NFTF 1411	tall fescue	3.0	1.0	100	100	100*
OG 0605G	orchardgrass	2.3	1.5	100	100	100*
OG 0704DT	orchardgrass	2.2	2.0	100	100	100*
OG 0708DT	orchardgrass	2.5	1.3	100	100	100*
KYFA1016	festulolium	3.8	6.8	100	100	100*
KYFA1015	festulolium	3.8	6.2	100	100	99
Mean		2.9	2.4	100	100	100
CV,%		14.3	32.0	0	0	1
LSD,0.05		0.5	0.9	0	0	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; 13 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. 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 7. Summary of persistence of forage grasses under heavy grazing pressure by horses across years at Lexington, Kentucky.

Variety	Species	Proprietor/ KY Distributor	2008 ¹												2009			2010			2011		
			Apr ²	Nov	Apr	Nov	Dec	Mar	Apr	Nov	Dec	Mar	Apr	Nov	Dec	Mar	Apr	Nov	Dec	Mar	Apr	Nov	Dec
Commercial Varieties—Available for Farm Use																							
BarOptima PLUS E34	tall fescue	Barenbrug USA	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Benchmark Plus	orchardgrass	FFR/Southern States	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Cowgirl	tall fescue	Rose-Agri Seed	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Climax	timothy	Canada Agr. Res. Station	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Duo	festulolium	Ampac Seed Company	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Giant	bentgrass species	Rose-Agri Seed	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Ginger	KY bluegrass	ProSeeds Marketing	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Granddaddy	perennial ryegrass	Smith Seed Services	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Jesup EF	tall fescue	Pennington Seed	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Jesup Max Q	tall fescue	Pennington Seed	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
KY 31+ ³	tall fescue	Public	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Persist	orchardgrass	Smith Seed Services	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Power	perennial ryegrass	Ampac Seed Company	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Profit	orchardgrass	Ampac Seed Company	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Select	tall fescue	FFR/Southern States	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Spring Green	festulolium	Rose-Agri Seed	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Tekapo	orchardgrass	Ampac Seed Company	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Experimental Varieties																							
AgR 1502	tall fescue	AgResearch	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
AgR 1521	tall fescue	AgResearch	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
AGRFA 148	tall fescue	Noble Foundation	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
B-8-0082	colonial bentgrass	Blue Moon Farms	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
KY 31-3	tall fescue	KY Agric. Exp. Station	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
KYFA0701	tall fescue	KY Agric. Exp. Station	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
KYFA0804	tall fescue	KY Agric. Exp. Station	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
KYFA0902	tall fescue	KY Agric. Exp. Station	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
KYFA0905	tall fescue	KY Agric. Exp. Station	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
KYFA1015	festulolium	KY Agric. Exp. Station	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
KYFA1016	festulolium	KY Agric. Exp. Station	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
NFTF 1411	tall fescue	Noble Foundation	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
OG 0605G	orchardgrass	FFR/Southern States	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
OG 0704DT	orchardgrass	FFR/Southern States	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
OG 0708DT	orchardgrass	FFR/Southern States	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
TF 0201	tall fescue	Winfield Solutions/FFR	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
TM 0501G	timothy	FFR/Southern States	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
TM 0502G	timothy	FFR/Southern States	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

¹ Establishment year.

² Date of rating of percent stand.

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 table do not contain an endophyte.

⁴ x in the block indicates the variety was in the test but the 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 in the test.

Table 8. Summary of 1999-2012 Kentucky tall fescue horse grazing tolerance trials in Lexington (stand persistence shown as a percent of the stand rating of KY 31-).

Variety	Proprietor/KY Distributor	1999 ^{1,2}	2001	2002	2003	2004	2005	2006	2007	2008	2009	Mean ³ (#trials)
		3yr ⁴	4yr	4yr	4yr	4yr	4yr	4yr	4yr	4yr	3yr	
BarOptima PLUS E34	Barenbrug								107			–
Bronson	Ampac Seed	80										–
Cattle Club	Green Seed	95										–
Cowgirl	Rose Agri-Seed									105		–
Festorina	Advanta Seed	102										–
Jesup MaxQ	Pennington Seed			98			78			104	100	95(4)
Johnstone	ProSeeds		88									–
KY31+ ⁵	KY Agri. Exp.Sta.		105				102	109	120	107	101	107(6)
KY31- ⁵	KY Agri. Exp.Sta.	100	100	100	100	100	100	100	100	100	100	100(10)
Nanryo	Japanese Grassland For. Seed/ USDA-ARS, El Reno, OK								72			–
Seine	Seed Research of OR					135						–
Select	FFR/Southern States	82		109	94	99	73	104	76	108	98	94(9)
Stargrazer	FFR/Southern States	70										–
Stockman	Seed Research of OR					125						–

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 2001 was grazed four years so the final report would be "2005 Cool-Season Grass Horse 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 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. BarOptima PLUS E34 contains a beneficial endophyte. The other fescue varieties in this table do not contain an endophyte.

Table 9. Summary of 1999-2012 Kentucky orchardgrass horse grazing tolerance trials in Lexington (stand persistence shown as a percent of the commercial varieties in the trial).

Variety	Proprietor/KY Distributor	1999 ^{1,2}	2000	2001	2002	2005	2006	2009	Mean ³ (#trials)
		3yr ⁴	4yr	4yr	4yr	4yr	4yr	3yr	
Albert	Univ. of Wisconsin			95					–
Ambrosia	Amer.Grass Seed Prod.						61		–
Benchmark	FFR/Southern States	104			85				95(2)
Benchmark Plus	FFR/Southern States				111	157	139	103	127(4)
Crown Royale	Grassland Oregon			95					–
Crown Royale Plus	Grassland Oregon				97				–
Haymate	FFR/Southern States	96	85		97				93(3)
Persist	Smith Seed					114		98	106(2)
Potomac	Public				117				–
Prairie	Turner Seed			100					–
Profit	Ampac Seed							99	–
Tekapo	Ampac Seed	101	115		93	30		99	88(5)

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 2005 was grazed four years so the final report would be "2009 Cool-Season Grass Horse 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.



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